CADMES Event 2025

Virtual Twin Technology for Machine builders

A demonstration of the added value of incorporation of Virtual Twins in machines

18-09-2025
OMRON Corporation & Cadmes

Agenda

- **Market situation**
- **The value of a virtualized machine**
- **Demonstration**
- **Q&A**
- **Recap**
- **Back-up slides**


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OPERATION STATUS MANAGEMENT
DIGITAL ENGINEERING
EFFICIENCY SURVEILLANCE MANAGEMENT
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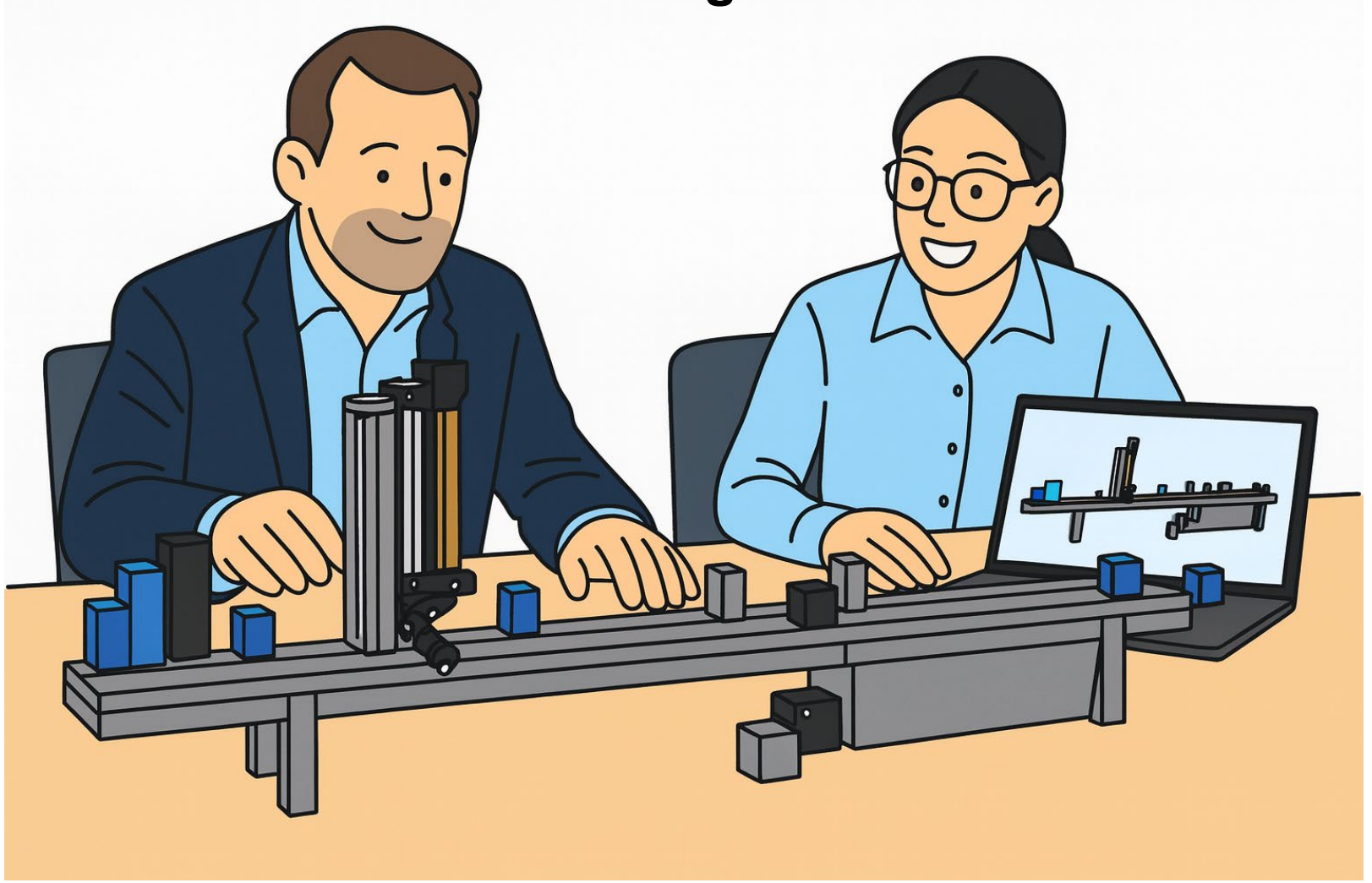
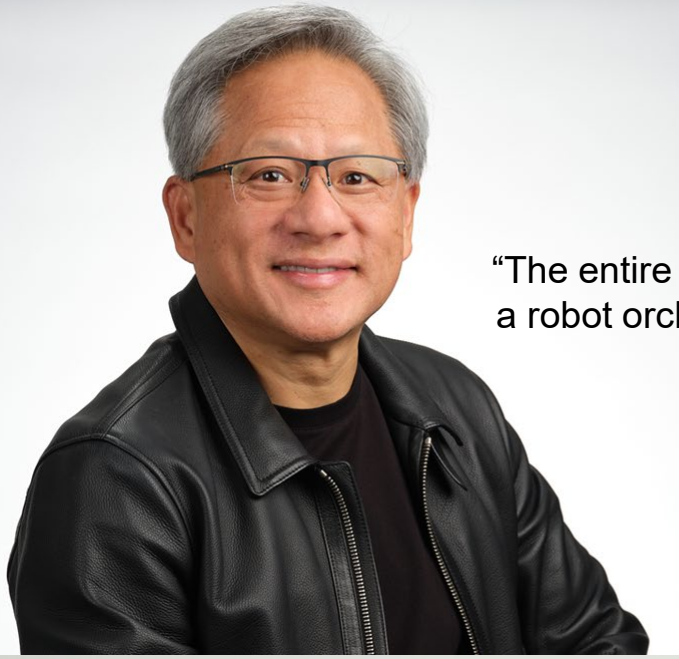
Purpose of the demo

Demonstrate the added value of digitalization for machine builders.



Market situation

Virtual Twin technology linked to the demands in the market



NVIDIA

"The entire factory is software-driven… a robot orchestrating a whole bunch of robots inside."

Jensen Huang – CEO NVIDIA

P&G

"Don't settle for good when you can have excellence… […] You absolutely must invest in digital transformation now to stay relevant and continue to grow profitably."

Maciej Stawicki — Global VP for Manufacturing, Procter & Gamble

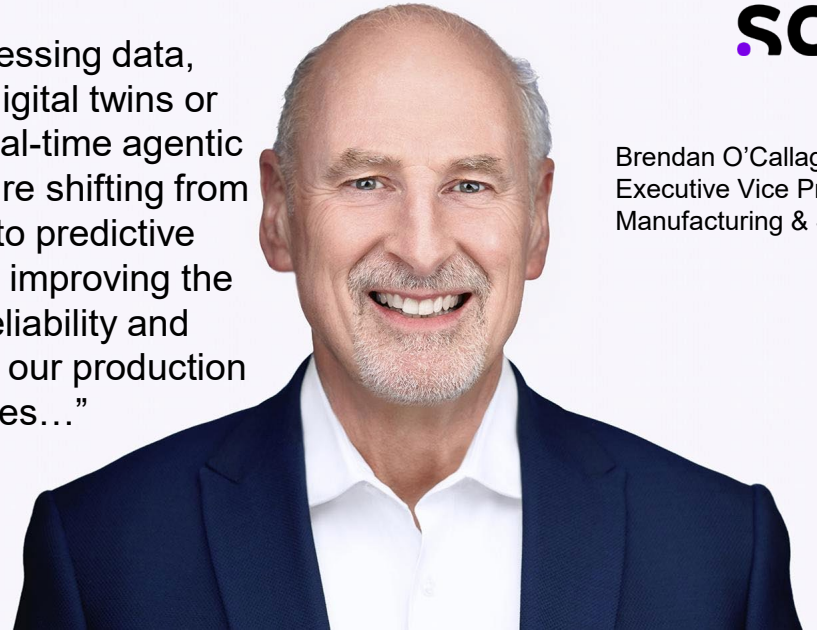
TOYOTA

"We are taking on the challenge of creating Toyota-style Monozukuri through an interactive digital twin that reflects digital improvements in the real workplace."

Kazuaki Shingo - Chief Production Officer, Toyota

sanofi

"By harnessing data, enabling digital twins or providing real-time agentic insights, we're shifting from reactive to predictive operations, improving the agility, reliability and efficiency of our production lines…"



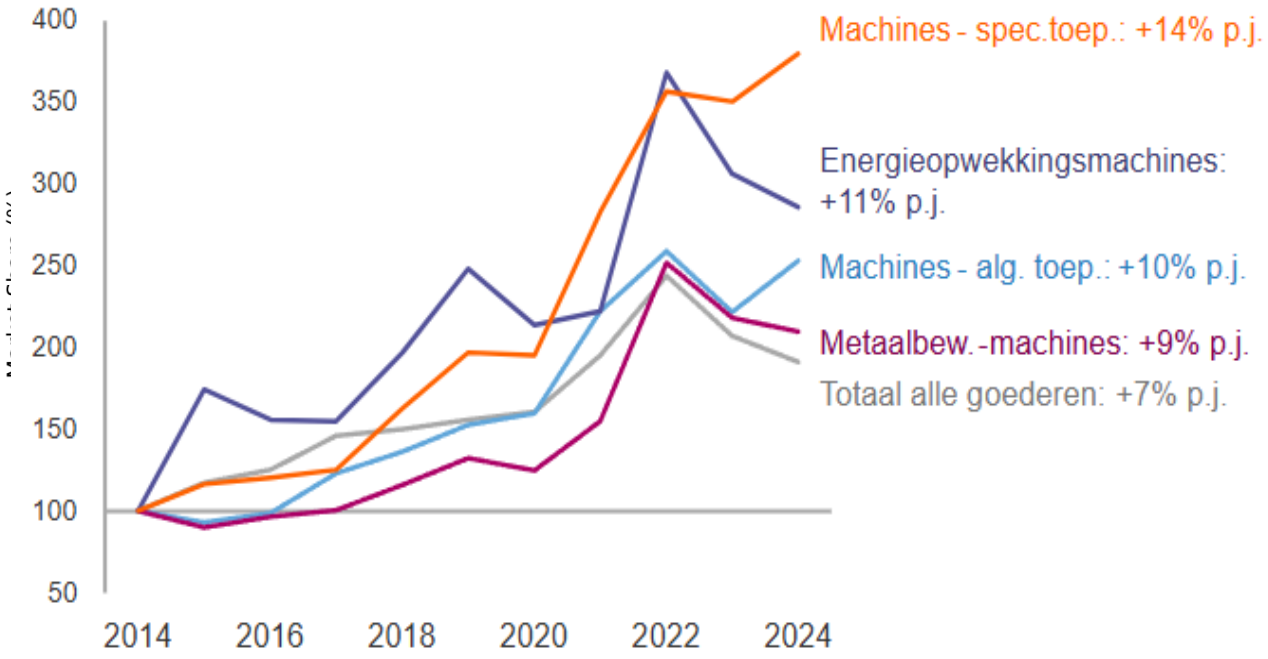
Brendan O'Callaghan
Executive Vice President, Manufacturing & Supply, Sanofi

Market situation 1: Global competition

According to a recent market report, the global industrial machinery market is projected to grow from $743.1 billion in 2025 to $1.61 trillion by 2034, with a 9% CAGR. **Asia-Pacific, especially China, is a major driver of this growth due to industrialization, smart factories, and automation**

Import Chinese machines sterker toegenomen dan totale import uit China

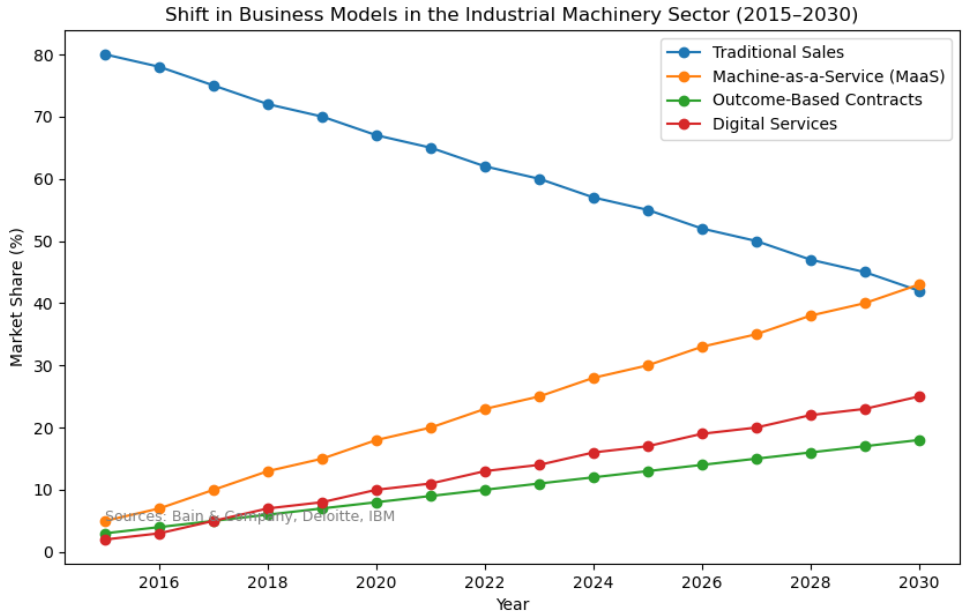
Waarde Nederlandse import uit China, in euro's, index, 2014 = 100

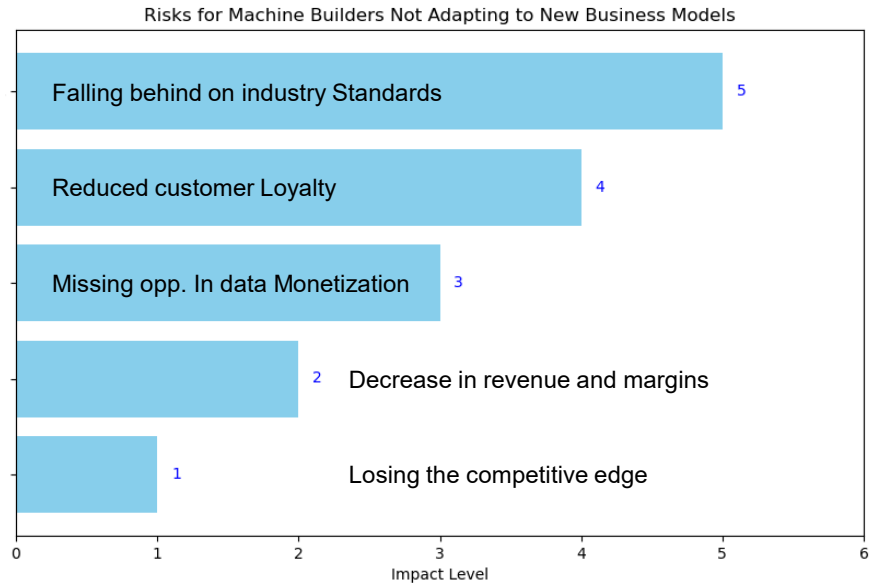


Bron: Eurostat, ING Research

- **Europe's** market share is projected to **decline from 40% in 2015 to 19% by 2030.**
- **China's** share is expected to **rise** significantly **from 15% to 36%,** overtaking Europe.
- Other Asian countries (e.g., India, South Korea, Vietnam) are also growing steadily, reaching 22% by 2030.

Market situation 2: Shift in business models



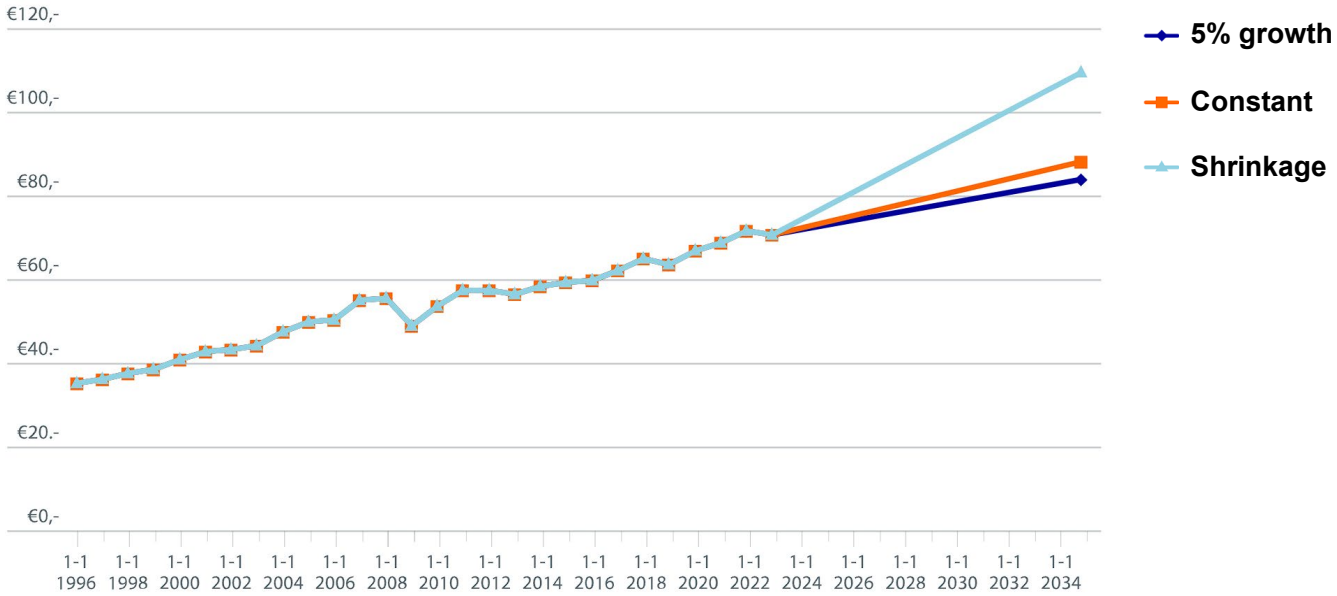


- Traditional Sales are declining, dropping from 90% in 2015 to 42% by 2030.
- Machine-as-a-Service (MaaS) is rising fast, expected to reach 43% by 2030.
- Outcome-Based Contracts and Digital Services are steadily growing, reflecting demand for performance and data-driven value.
- The shift signals a move from one-time sales to recurring, service-based models.

Machine builders who do not adapt to new business models face significant risks, including loss of competitive edge, declining revenue, missed data monetization opportunities, reduced customer loyalty, and falling behind industry standards. Adapting is crucial for long-term success, resilience, and relevance in a rapidly evolving industrial landscape.

Market situation 3: Competition demand digitalization

Industry labour productivity per hour (in Euro)



Labor productivity must increase by 60% over the next 10 years to maintain competitive position

Based on several assumptions, the Rabobank did outline three scenarios for the required increase in labour productivity by 2035:

Scenario 1
The inflow of young workers stays the same, while employees aged 55–65 retire by 2035. With no additional inflow from other sectors, the workforce shrinks by 20%—from 783,000 in 2022 to 626,000 in 2035.

Scenario 2
The sector offsets retirements by attracting young workers, career switchers, and labour migrants. The workforce remains stable at 2022 levels.

Scenario 3
With targeted measures, the workforce grows by 5% by 2035.

If we assume that the industry continues to grow by an average of 2.1% per year until 2035 (as it has done over the past 10 years, see the figure above, labour productivity per hour), this will have the following impact on the scenarios outlined:

In scenario 1, labour productivity must increase from €72 per hour in 2022 to €111 (54% increase) to achieve an average economic growth of 2.1% in 2035.

In scenario 2, labour productivity must increase from €72 per hour in 2022 to €89 (24% increase).

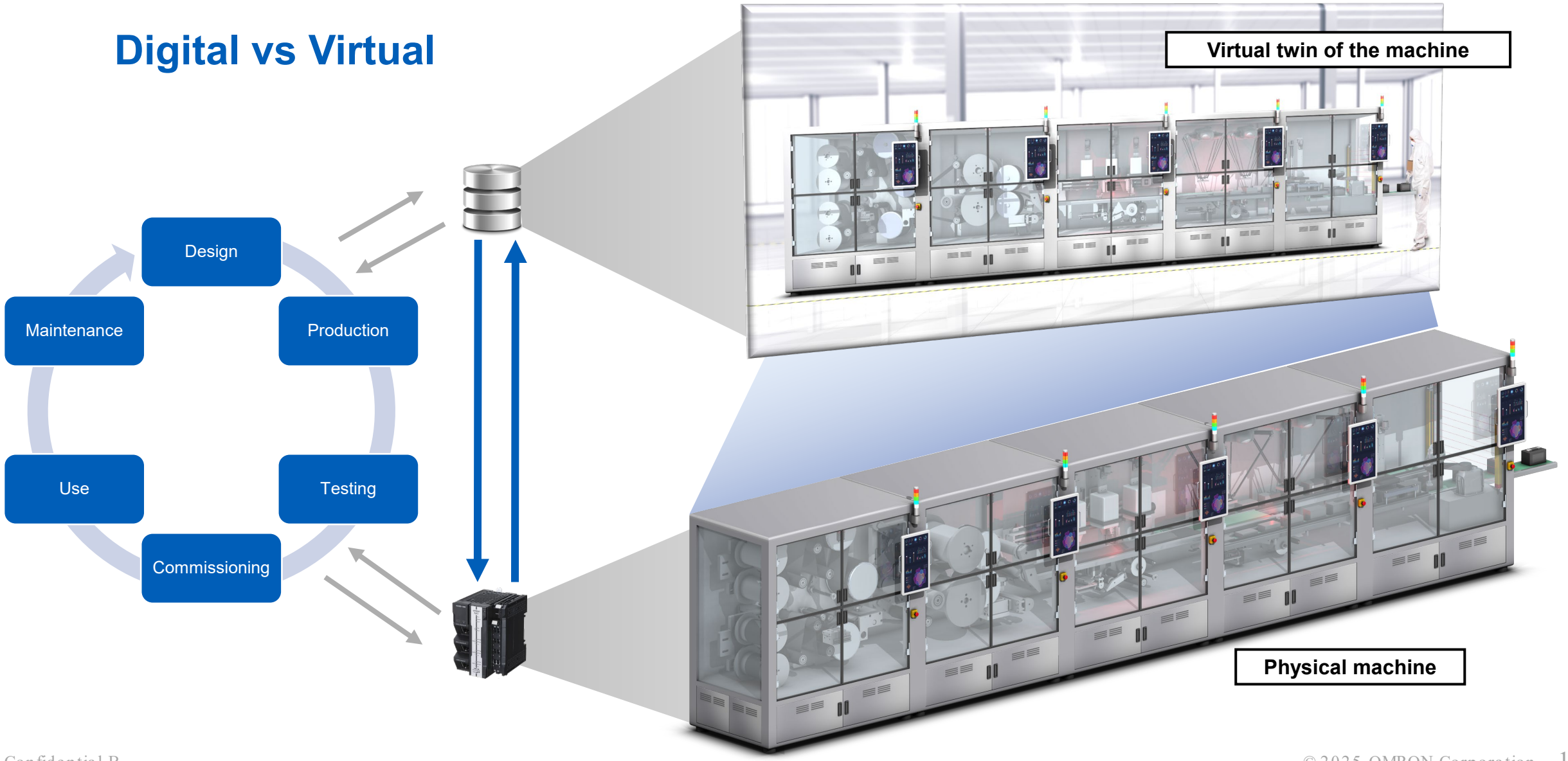
In scenario 3, labour productivity must increase from €72 per hour in 2022 to €85 (18% increase).

The value of the virtualized machine

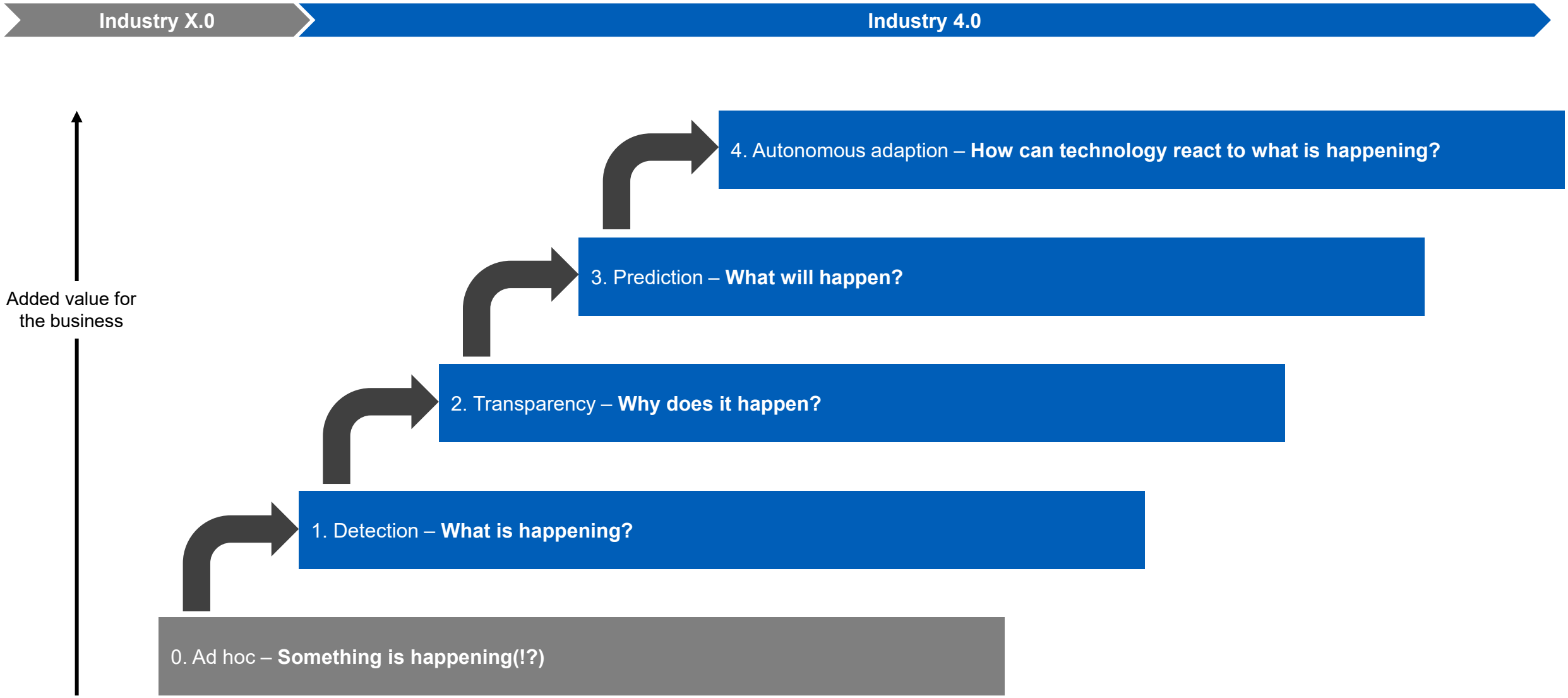
How can a virtual twin of a machine benefit the machine builder?

The virtualized machine

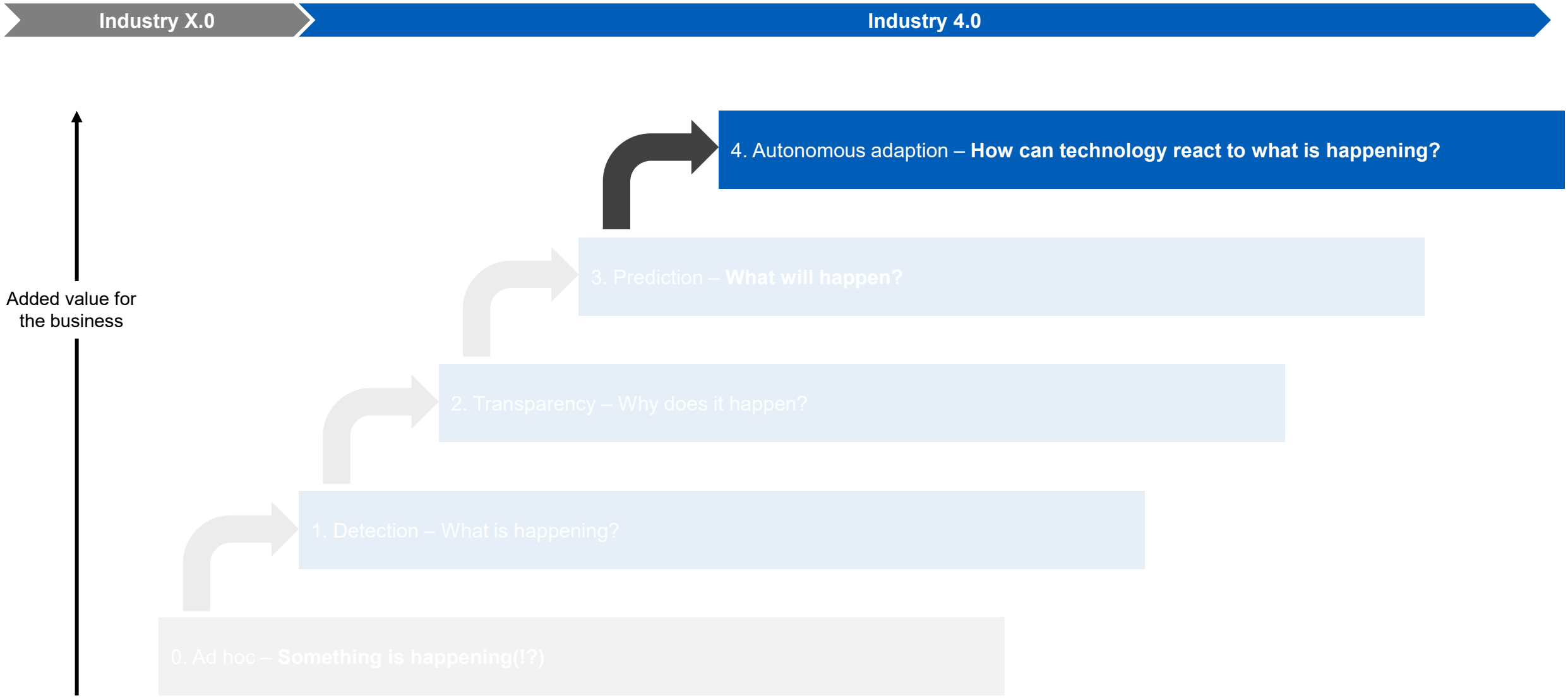
Digital vs Virtual



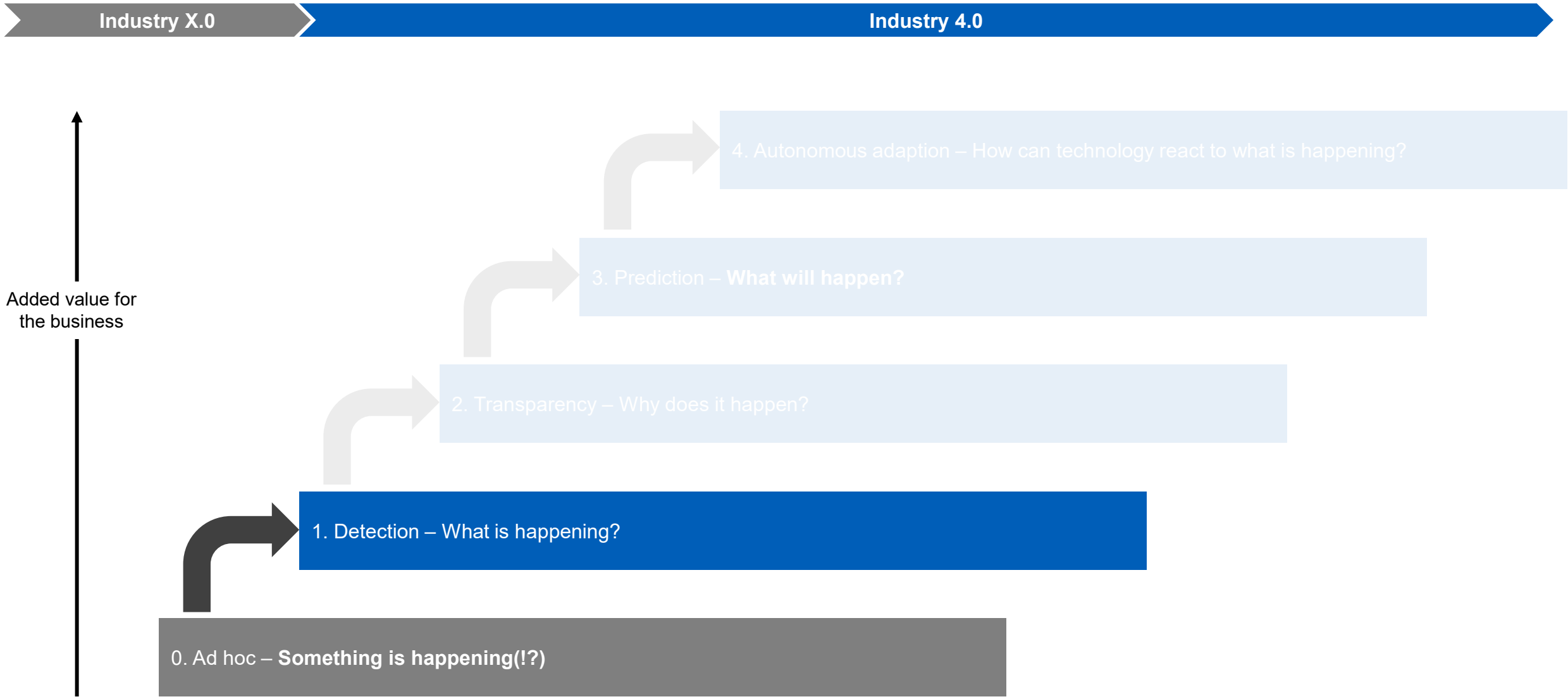
Digitalization – Ambition levels (1)



Digitalization – Ambition levels (1)



Digitalization – Ambition levels (1)



Digitalization – Ambition levels (2)

4	**Autonomous adaption** level
3	**Prediction** level
2	**Transparency** level
1	**Detection** level
0	**Ad hoc** level

Autonomous feedback loop

Capacity simulation

Capacity simulation

Ergonomics

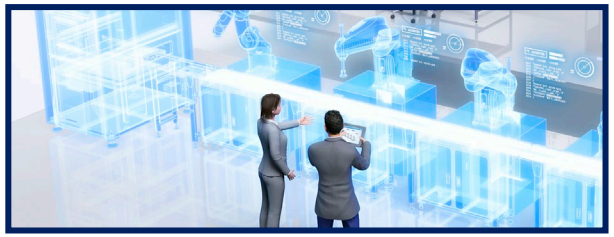
Virtual commissioning

3D Layouts

PLC Programming

Design validation

Sales



Develop

Deploy

Turnover growth because of a virtualized twin of your machine

Sales proposal time

Engineering and testing

Machine construction

Shorter production time

Machine with virtual twin

New unique features

Flexible machines

Predictive maintenance

Operator interactivity

Continuous product updates

New business models

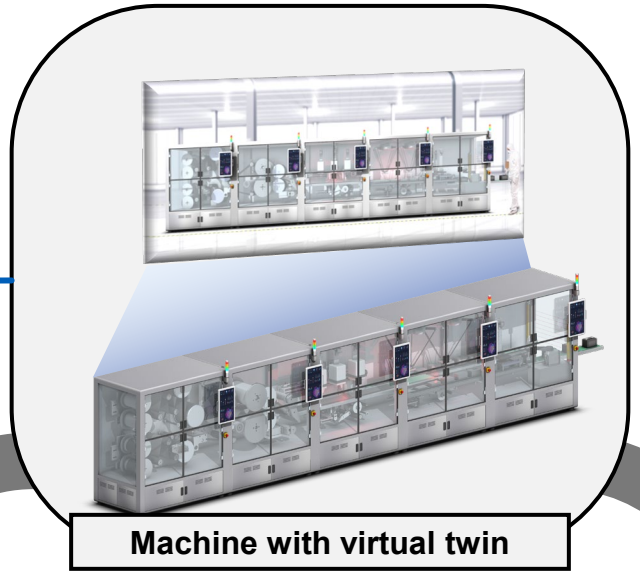
Deeper and better customer interaction / relationships

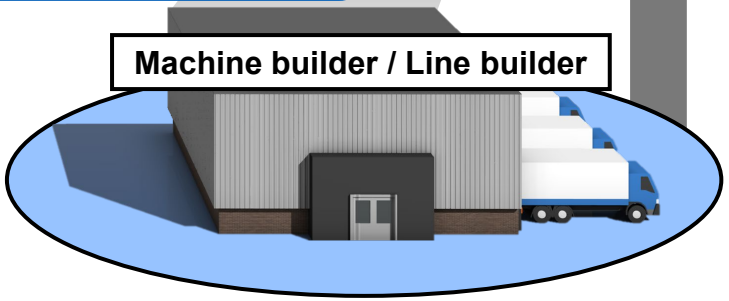
Machine builder / Line builder

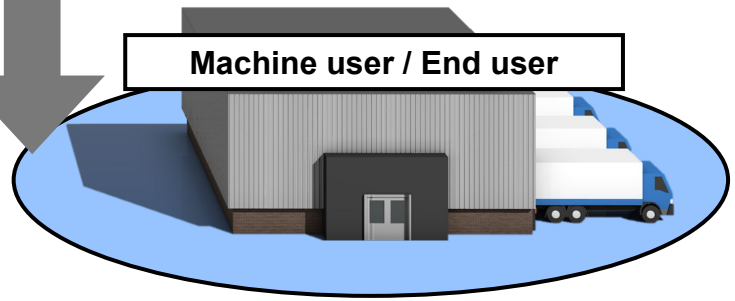
Machine user / End user

Cost reduction because of a virtualized twin of your machine

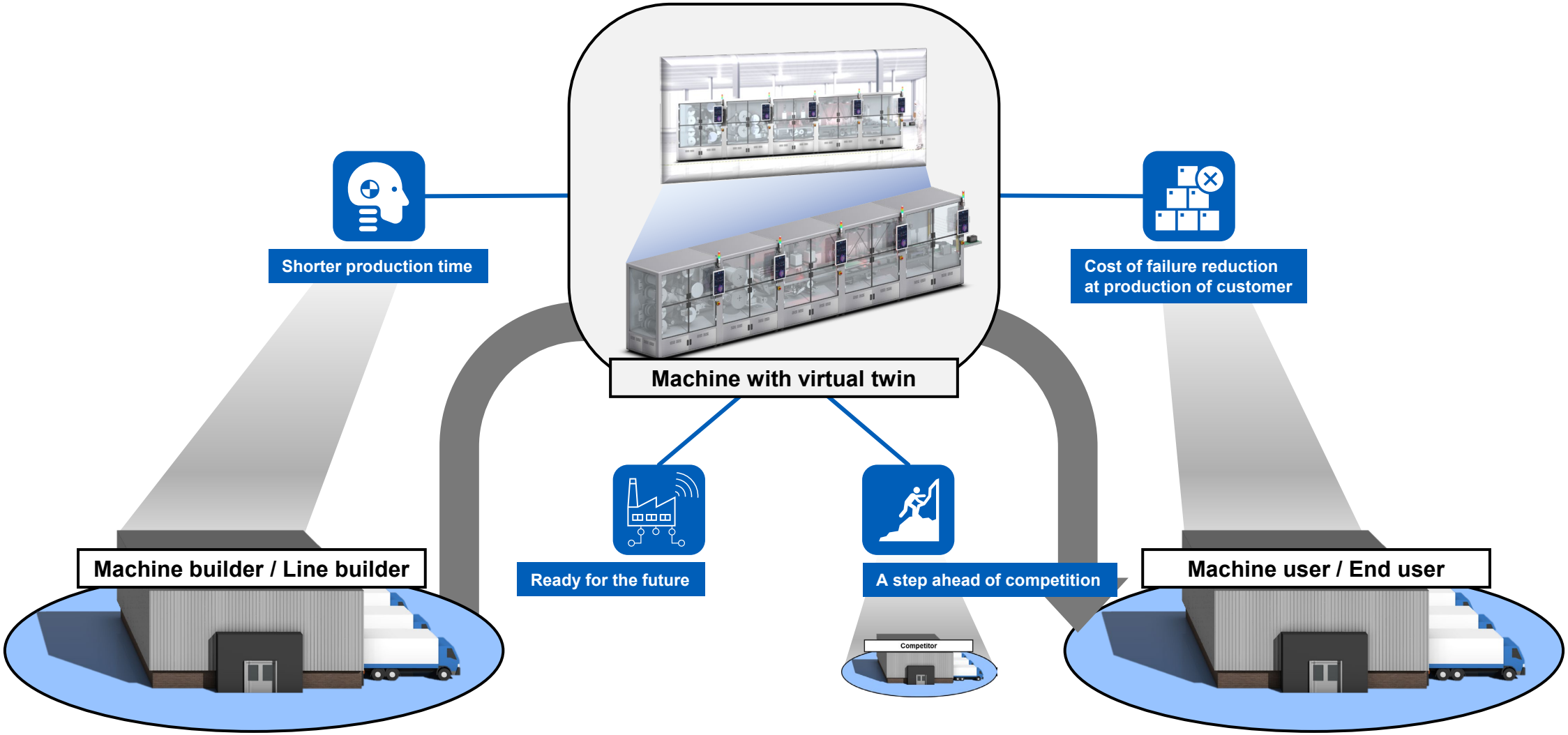
Cost reduction







Risk reduction because of a virtualized twin of your machine

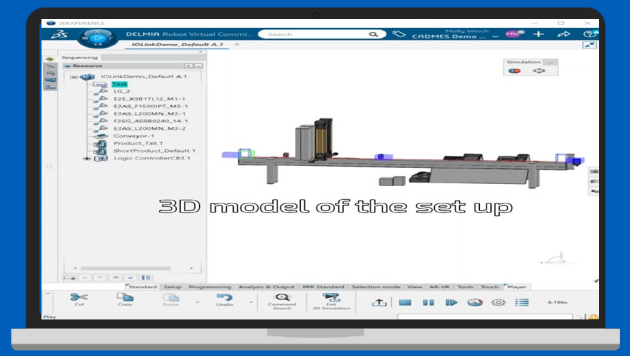


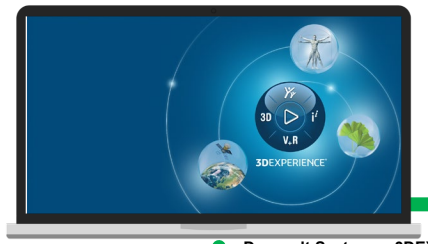
Demonstration

Physical demo of the Virtual Twin Technology

The unique technology…

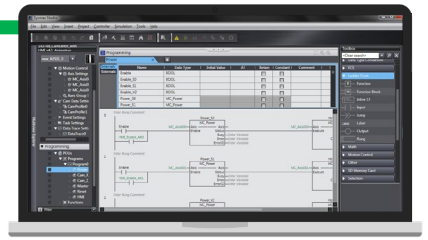
Virtual twin of the machine





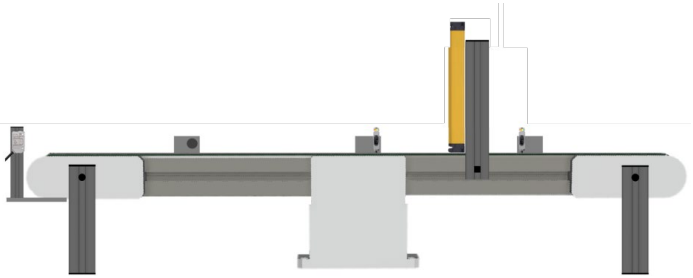
Dassault Systemes 3DEXPERIENCE

OPC UA

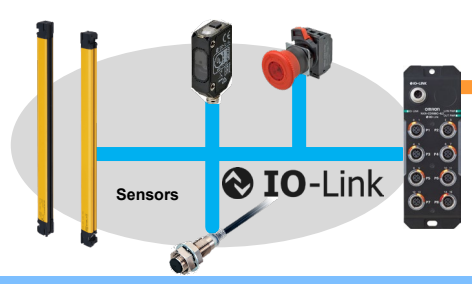


OMRON Sysmac Studio

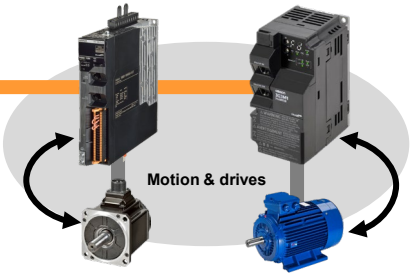
Physical machine



OMRON Machine Controller



EtherCAT



Demo set-up

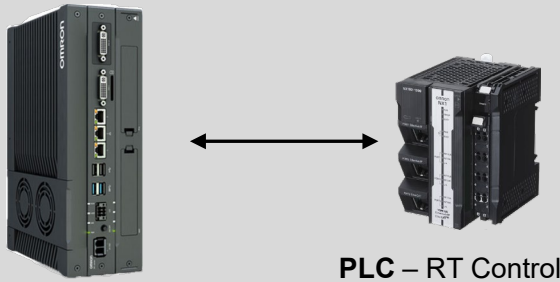
Monitor – HMI & HIL interaction
HMI – Symac Studio NA Runtime
HIL interaction: 3DX Experience running on IPC

Laptop – Not connected to the demo, running the Virtual Twin

Virtual Twin Simulation
Software in the loop (HIL)

The virtual twin is not connected with the physical machine

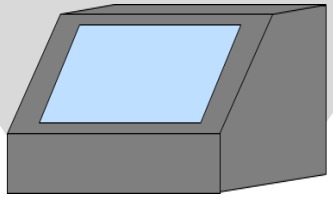
IPC – Running PLC software & Simulation software
Sysmac Studio: PLC programming environment
3DX Experience: Simulation software



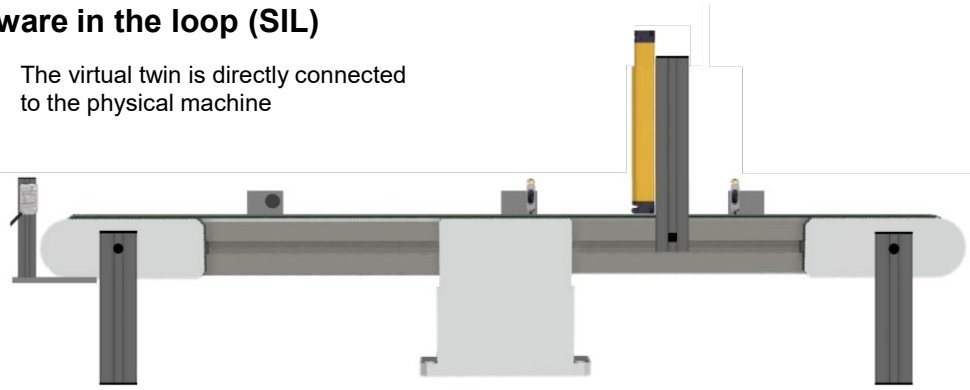
PLC – RT Control of the demo

Virtual Twin Simulation
Hardware in the loop (SIL)

The virtual twin is directly connected to the physical machine



Control cabinet – connected to the demo



Physical twin – connected to the control cabinet

Demo 1: **Design Validation**

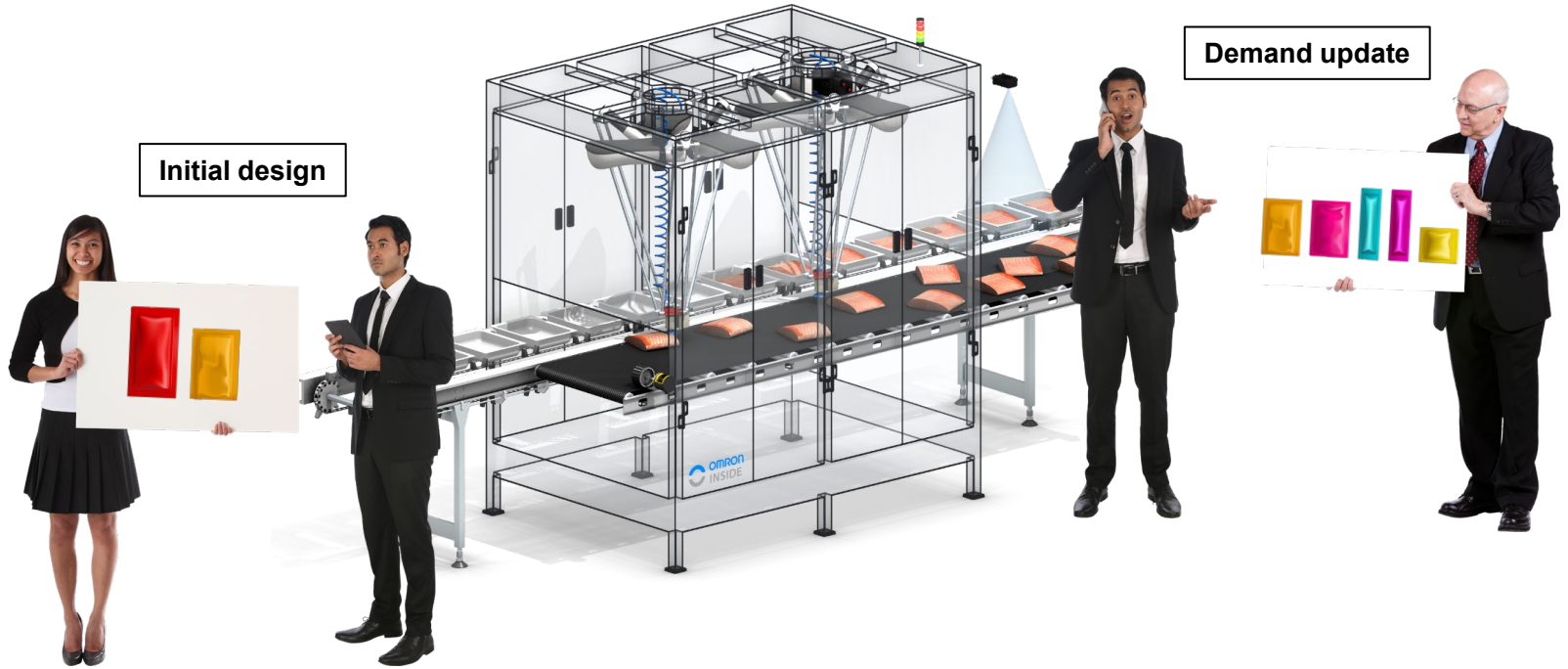
Design | Production | Testing | Commissioning | Use | Maintenance

Design

The machine design phase involves conceptualizing and detailing the machine's specifications and components to meet production needs. This includes creating drawings, selecting materials, and ensuring compliance with standards.

Machine validation

During the design phase, the machine was developed for a specific task or product. During the later process of the machine lifecycle, this differs from the initial idea. With machine validation these changes can be tested with the Virtual Twin



Demo 2: **Virtual Commissioning**

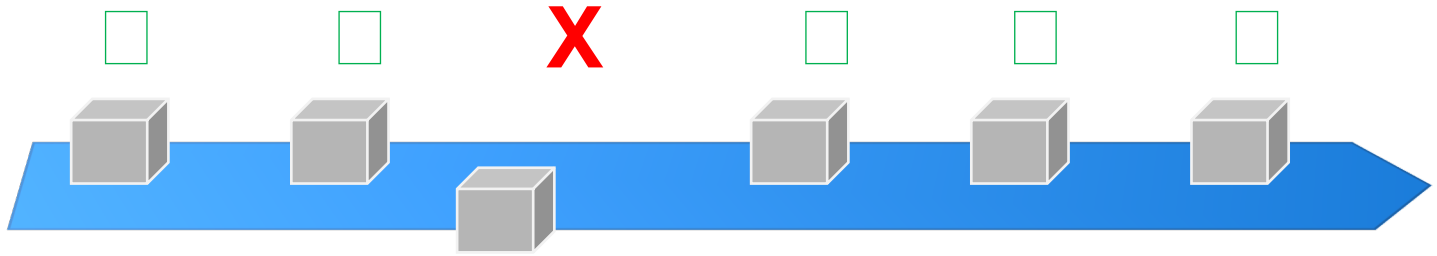
Design | Production | Testing | Commissioning | Use | Maintenance

Validation of the machine operation

The machine validation phase involves testing and verifying that the machine meets all design specifications and operational requirements. This includes conducting performance tests, safety checks, and ensuring compliance with regulatory standards.

Programming validation

During machine development it is common for engineers to engineer or program the "happy flow" of the machine. But it is important to validate the operation of the machine in non-standard situations. This can be done with virtual PLC program validation



Demo 3: **Operator Interaction**

Design | Production | Testing | Commissioning | **Use** | Maintenance

Operation and usage of the machine

The machine is operational and is running at the customer. In this phase the main interaction with the machine is done with the operator.

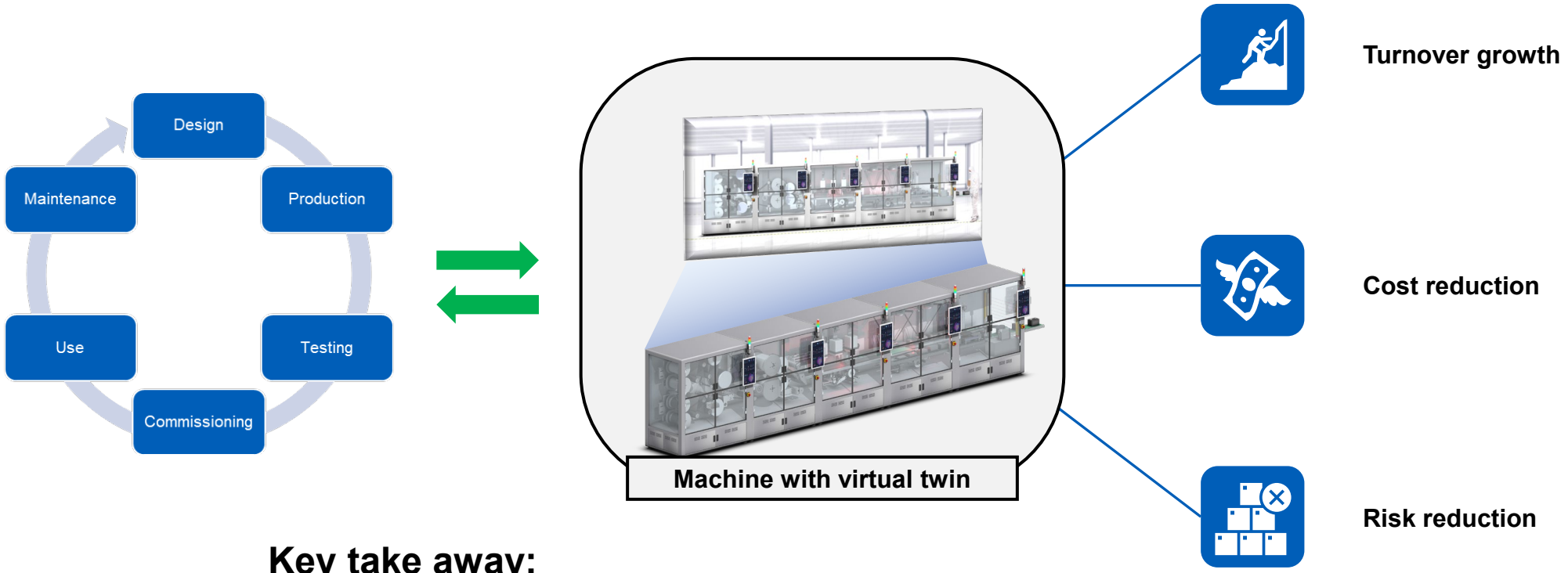
Operator interaction validation

Human operators will try to use the machine all kinds of ways. This can use of wrong usage of the machine. To analyze, detect and improve the machine control based on human interaction a virtual twin will reduce these steps.

Recap

A brief summary of the content shared during this presentation

Recap



Key take away:

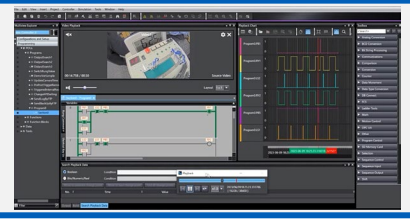
1. Start small;
2. Incorporate a digitalization strategy;
3. It is a company wide process;
4. Collaborate!

Future demo developments

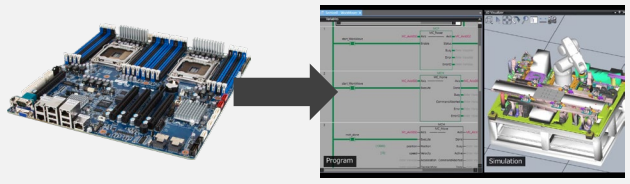
Design | Production | Testing | Commissioning | Use | Maintenance

Motor feasibility testing

Remote troubleshooting



Production cad to simulation



Robot load & path simulation

“Creating the future of manufacturing TODAY”

Precautions

- When constructing a system based on the contents of this proposal document, please carefully read the user manuals and instruction manuals of all the product to be used in the configuration, and confirm their specifications, performance and safety.
- Usage not described in the user manual, instruction manual, or in this proposal document may cause an accident or equipment malfunction. Please confirm the function and safety of the equipment and devices before using.
- The system proposed in this document is limited to the conditions and methods described herein, and does not guarantee the operation of your product or system.
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