



THE VISION OF THE FOURTH INDUSTRIAL REVOLUTION

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Purpose of Today's talk

- The vision of the fourth industrial revolution
 - The fourth industrial revolution is entering all industrial productions.
 - Smart robots, coworkers, IoT, data analytics and robotized decision making will be the future.
 - Learn from examples from automotive and aerospace.



Agenda

Introduction

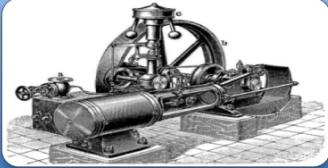
The Fourth Industrial Revolution

Towards Smarter Production System

Summary and Conclusions



The Fourth Industrial Revolution



FIRST Industrial Revolution

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



SECOND Industrial Revolution

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



THIRD Industrial Revolution

- Use of electronic and IT systems that further automate production

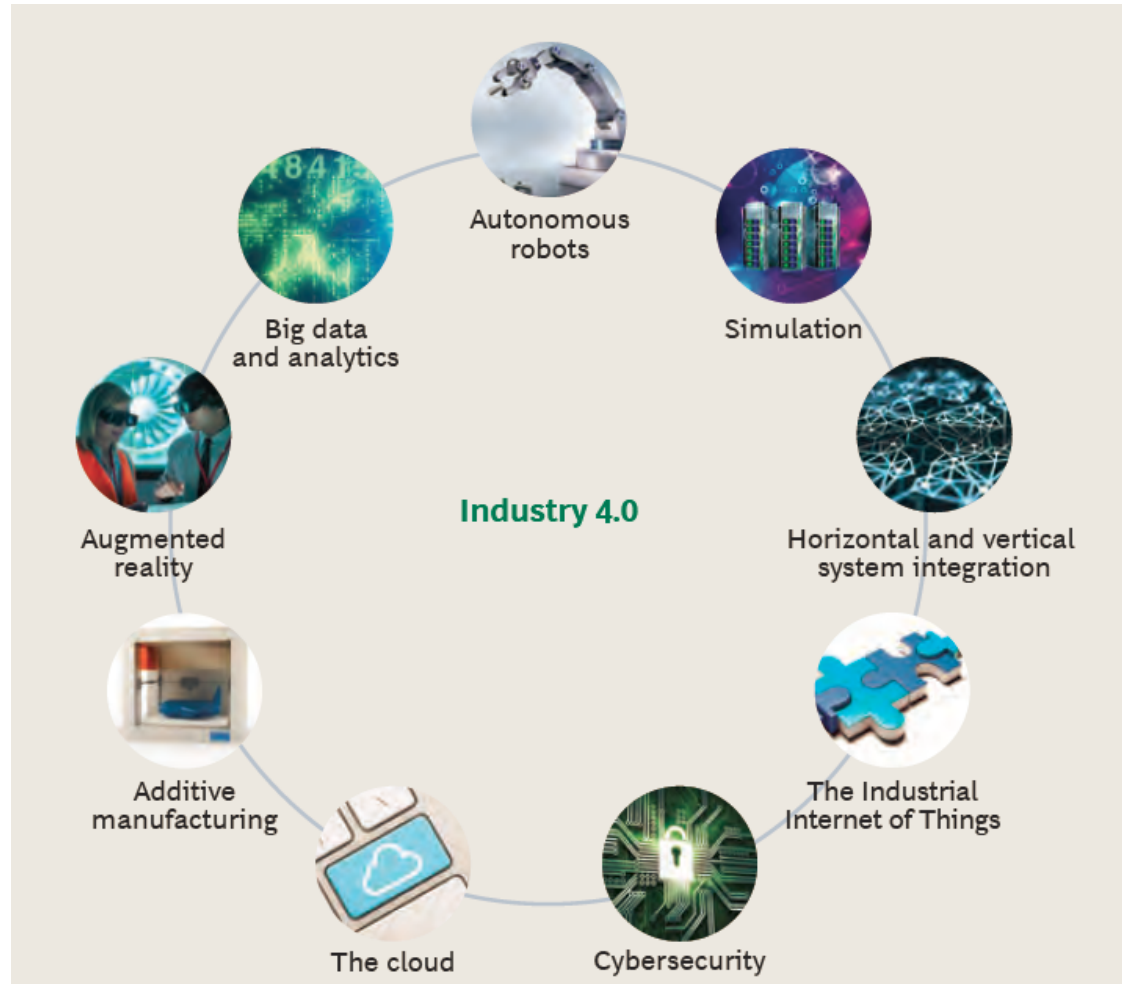


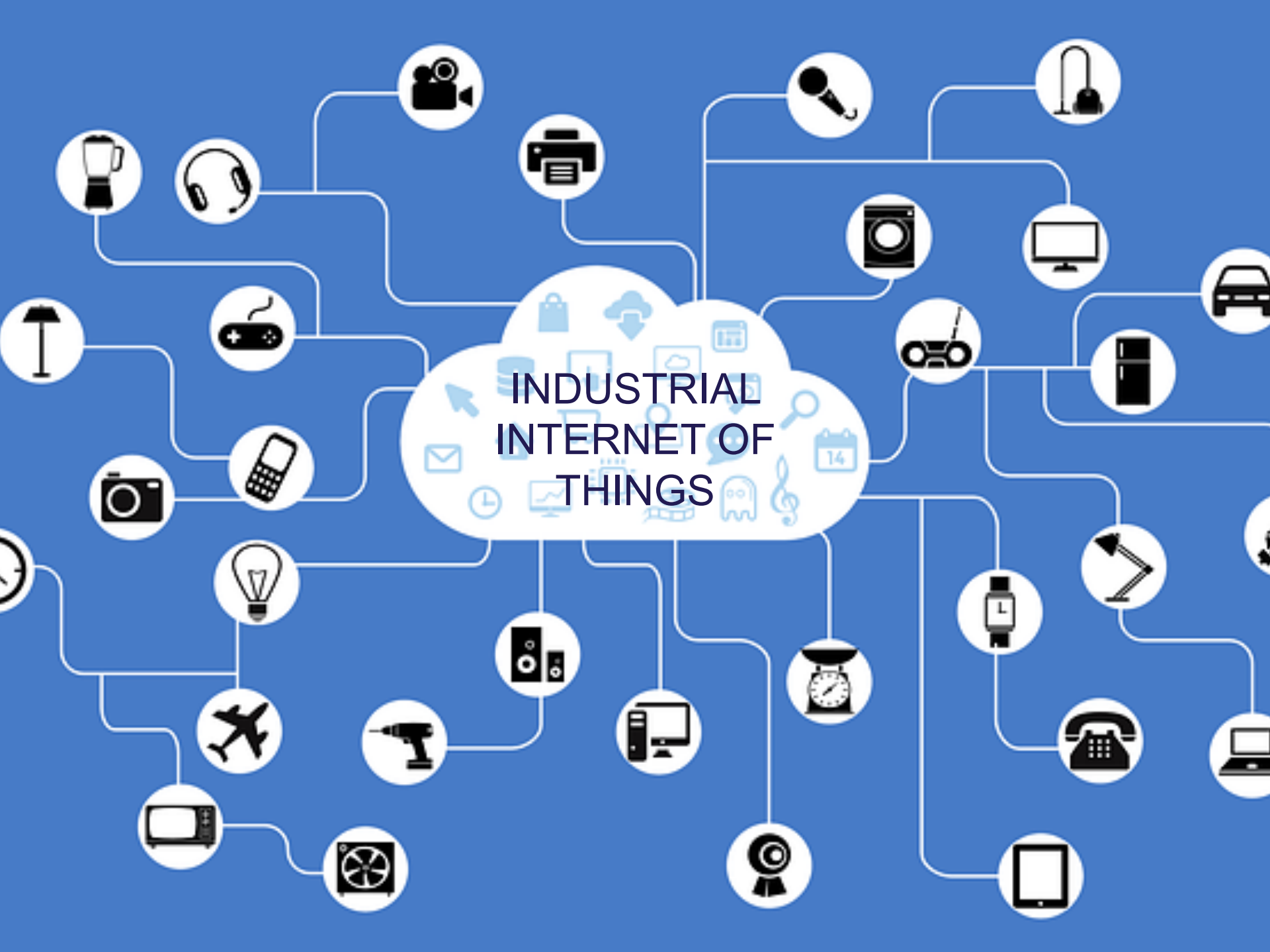
FOURTH Industrial Revolution

- Convergent physical, bio and digital systems



Technologies Are Driving the Fourth Industrial Revolution

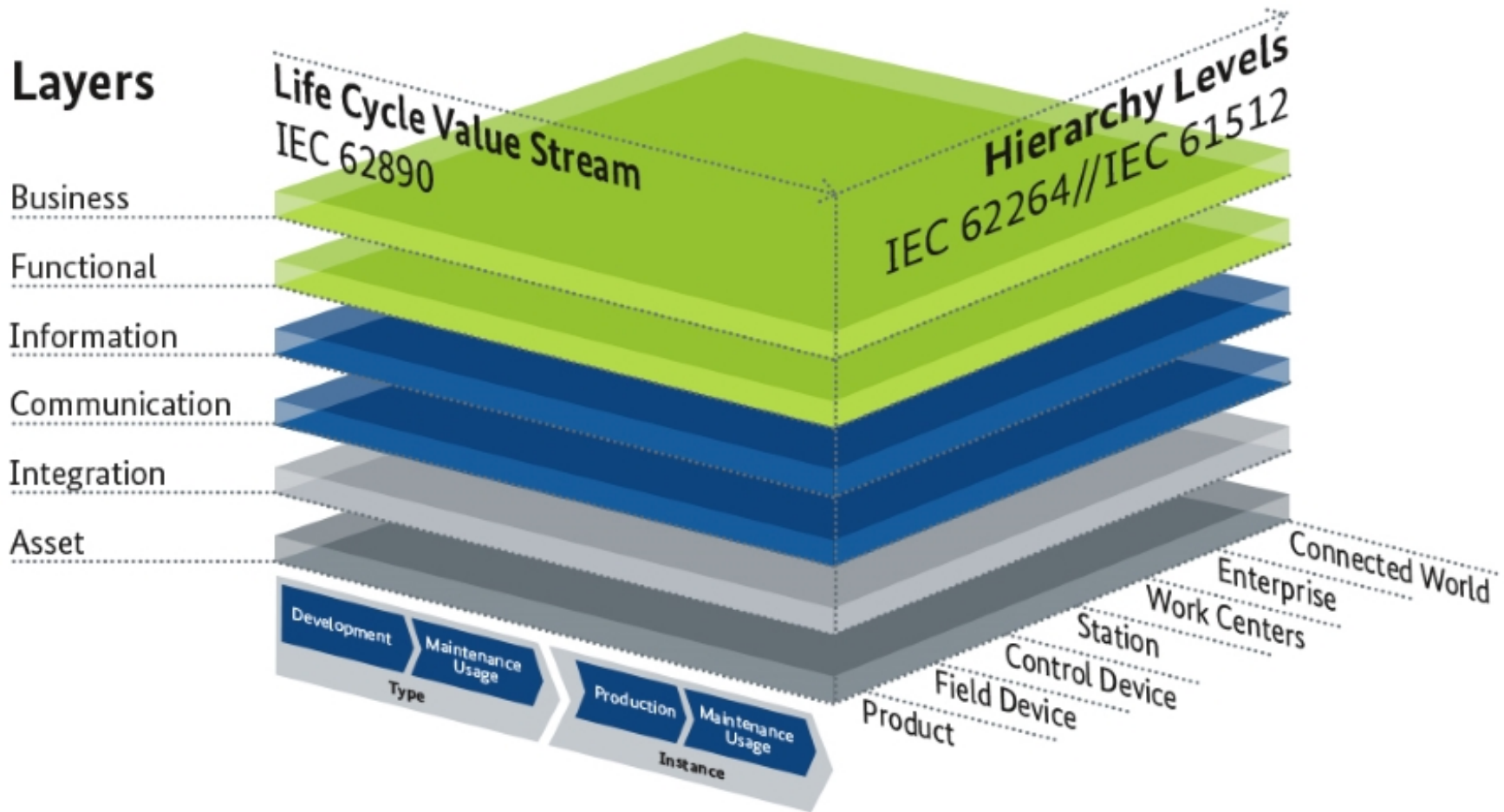




INDUSTRIAL
INTERNET OF
THINGS

The diagram features a central white cloud containing the text 'INDUSTRIAL INTERNET OF THINGS' and several small icons like a shopping bag, cloud, calendar, and speech bubble. This central cloud is connected by white lines to a wide array of black icons in white circles, representing various smart devices and industrial components. These include a blender, headphones, camera, printer, microphone, washing machine, TV, car, drone, refrigerator, lamp, game controller, mobile phone, camera, lightbulb, speaker, drill, computer monitor, scale, watch, desk lamp, smartphone, fan, and many others.

Reference Architecture Model for Industry 4.0 (RAMI 4.0)



AUTOMOTIVE AND AEROSPACE INDUSTRY



The Danish Context

- Distinguishing features of Danish industry
 - Customer oriented production
 - Employee competence and engagement
 - Share of Small and Medium Sized companies
- Specific Danish industrial challenges
 - Customization
 - Low Volume
 - High Flexibility
 - Collaboration
- Value in integration
 - Leveraging standard technologies
 - Co-creation of new integrative knowledge
 - Transforming the organization through digitalization



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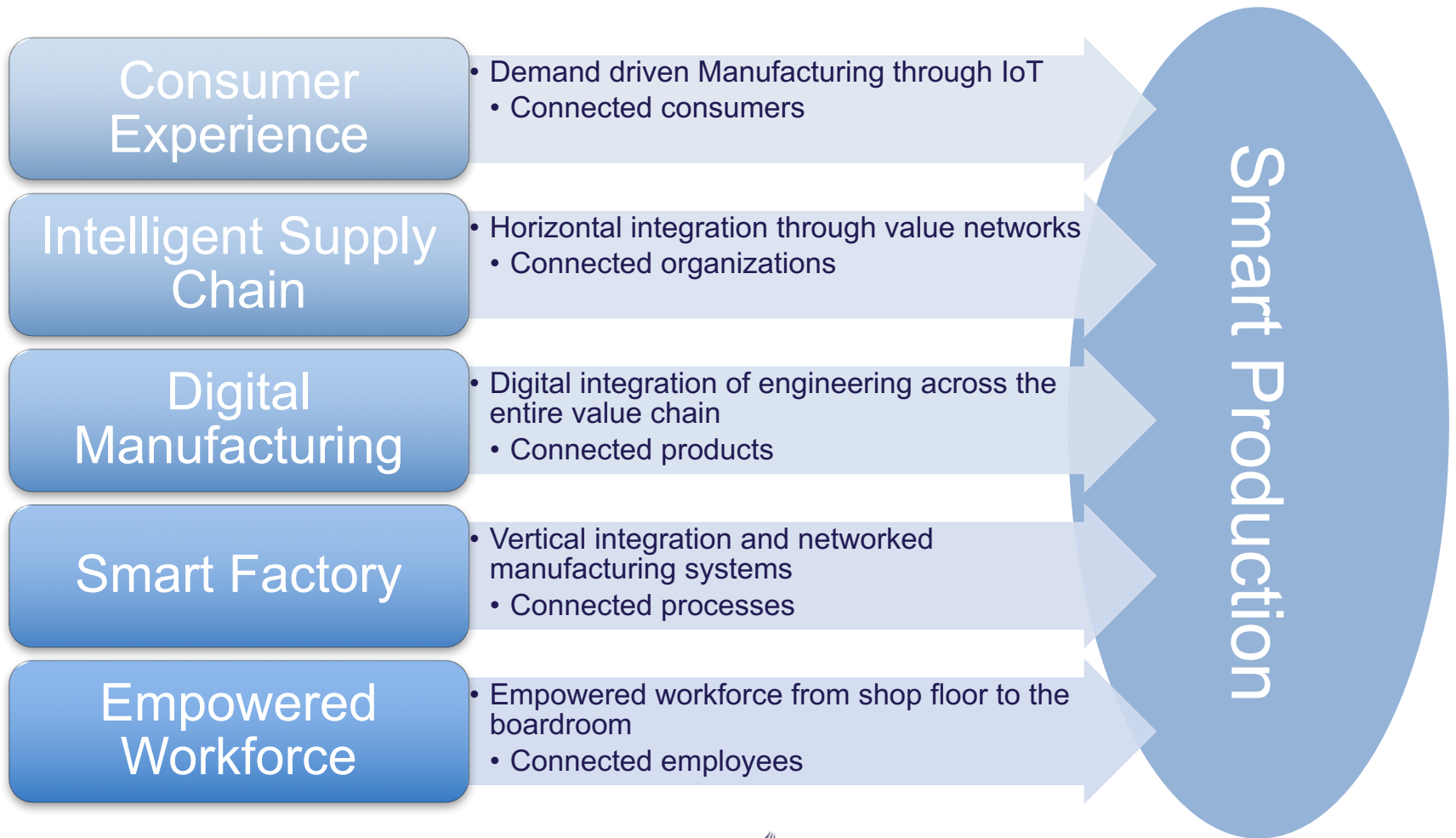


The Danish Approach to Industry 4.0

- The Danish Government
 - Produktionspanelet 4.0
 - Forsk2025
 - Innovationsfonden/Boston Consulting
 - Regional focus on manufacturing/SME
- Danish Industry
 - Manufacturing Academy of Denmark (MADE)
 - Future Production Systems (SPIR)
 - MADE Digital (Grand Solution)
 - Knowledge and Innovation Consortium (KIC)
- Aalborg University
 - Strengthen the Production agenda
 - AAU Production
 - Smart Production



Towards Smarter Production Systems



Towards Smarter Production Systems: 道

- An integrated approach to digitalization, automation, and organization
 - DAO, in Chinese "The Way" 道
- Roadmap for implementing Smarter systems
 - Iterative experimental process
- Methodologies for designing
 - Consumer Experience
 - Intelligent Supply Chain
 - Digital Manufacturing
 - Smart Factory
 - Empowered Workforce
- Best practice cases
- Toolbox
 - Adapted for Small and Medium Sized Enterprises



Digital Compass

McKinsey, 2016



Digital Transformation Roadmap



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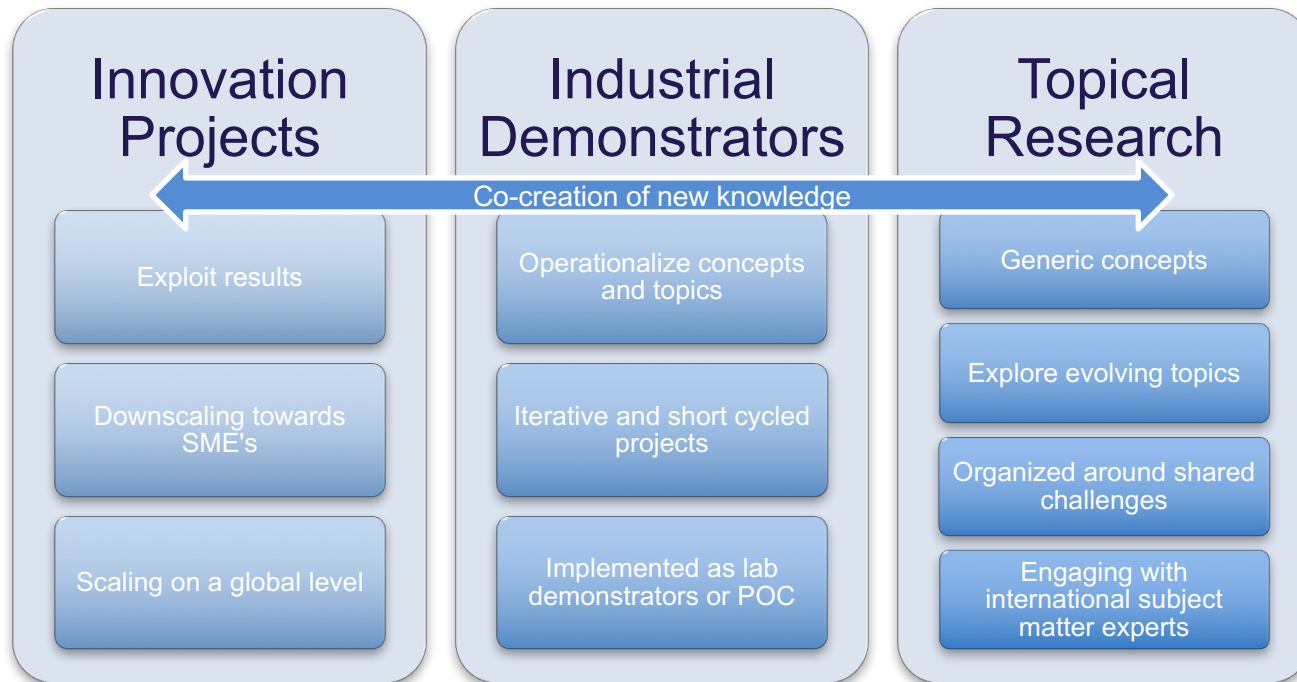
Digital Transformation

Kagermann, Wahlster & Helbig, 2013

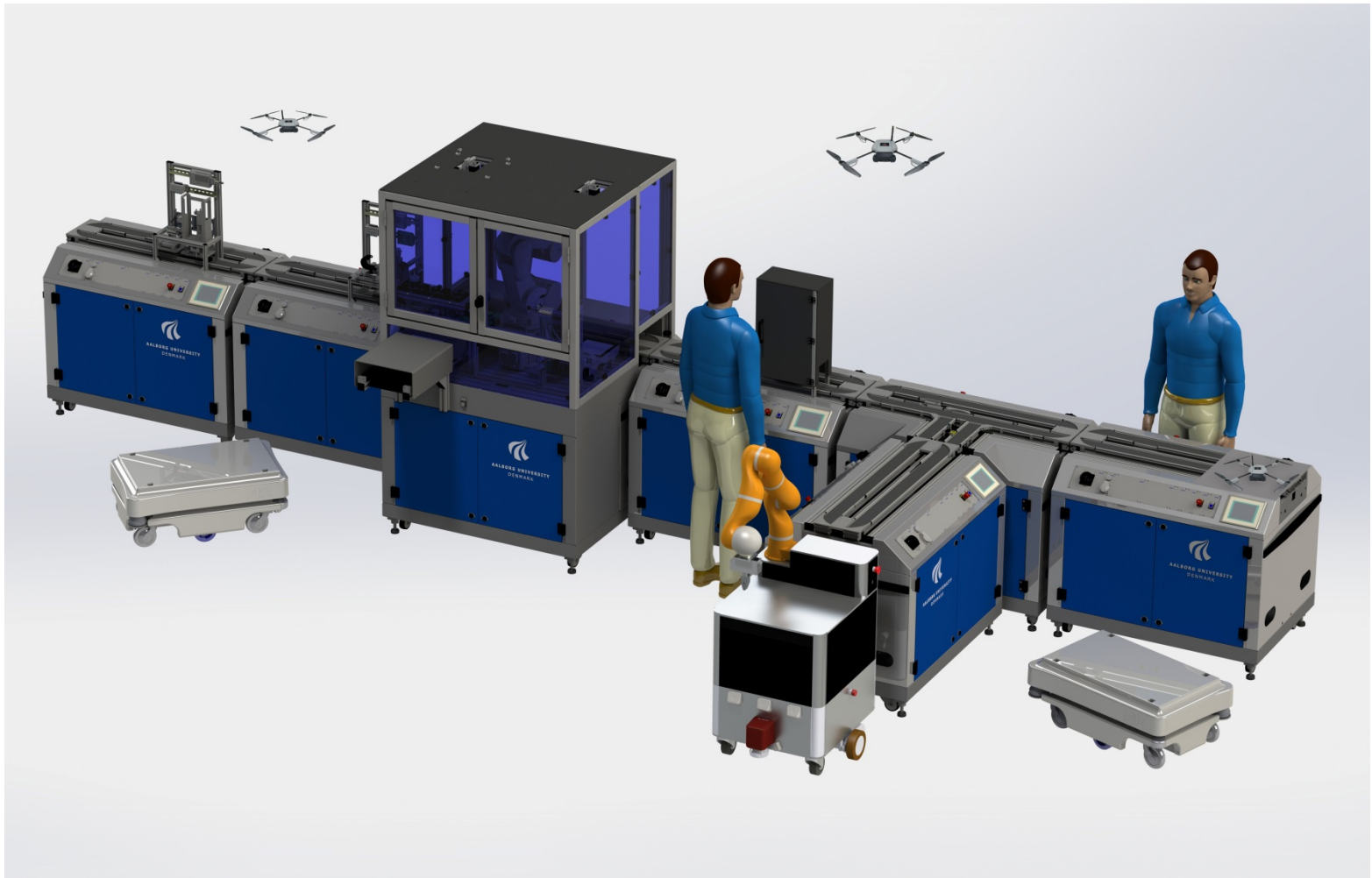
- The journey towards the future of digital manufacturing will be an **evolutionary process**
- Current basic technologies and experience will have to be **adapted** to the specific requirements of manufacturing engineering and **innovative solutions** for new locations and new markets will have to be **explored**
- Achieving the benefits from digital manufacturing is a long-term endeavor and will involve a gradual **experimental learning** process involving both **technology, systems** and **management** processes
- For a company it will be key to ensure that the value of existing manufacturing systems is **preserved**
- At the same time, it will be necessary to come up with migration strategies that **deliver benefits and productivity** from an early stage.



Engagement Model for Research and Innovation



Learning Factory for Industry 4.0 Concepts (Nardello et al, 2017)



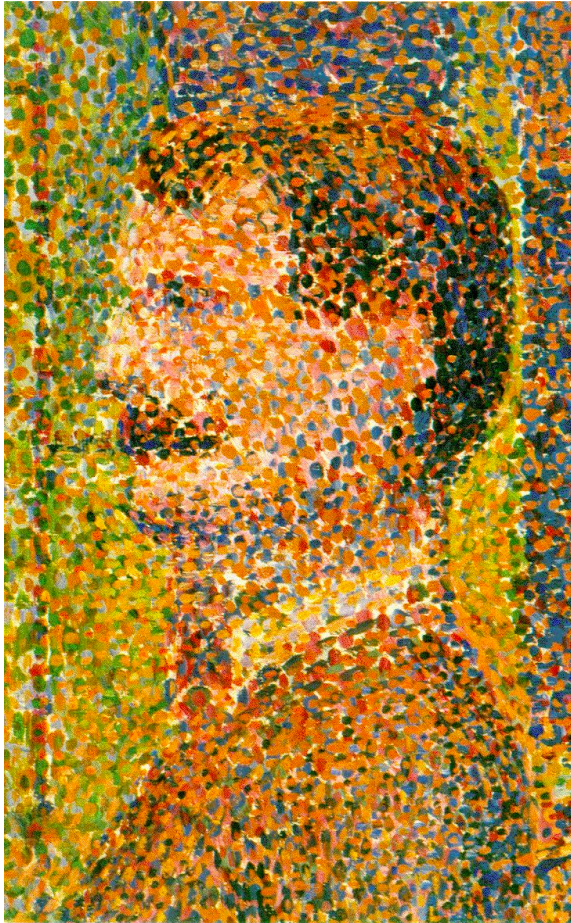
Reflections from the back of the theater



- Digital transformation is ubiquitous
- Organizational transformations is a prerequisite
- From managing change towards staging change
- We don't want to talk about
 - Failed IT projects
 - Security and trust



Thanks for your Attention



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