

AUTOMAATIOPÄIVÄT²⁴

13.-14.4.2021 | Virtual event

Digitalization of Industry - past, present and future

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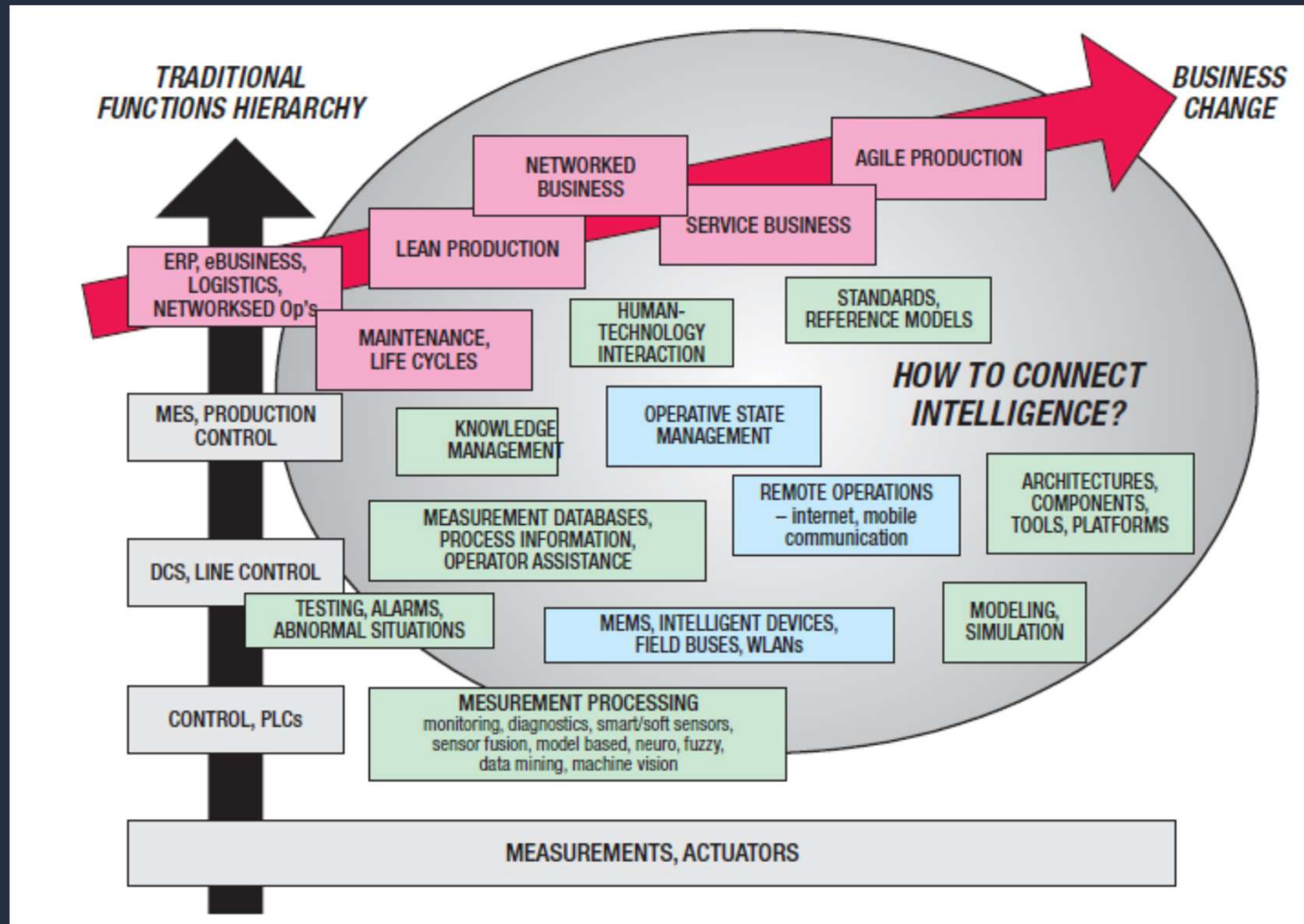
Past, present, future

2003 – 2011 – 2020 – 2020++



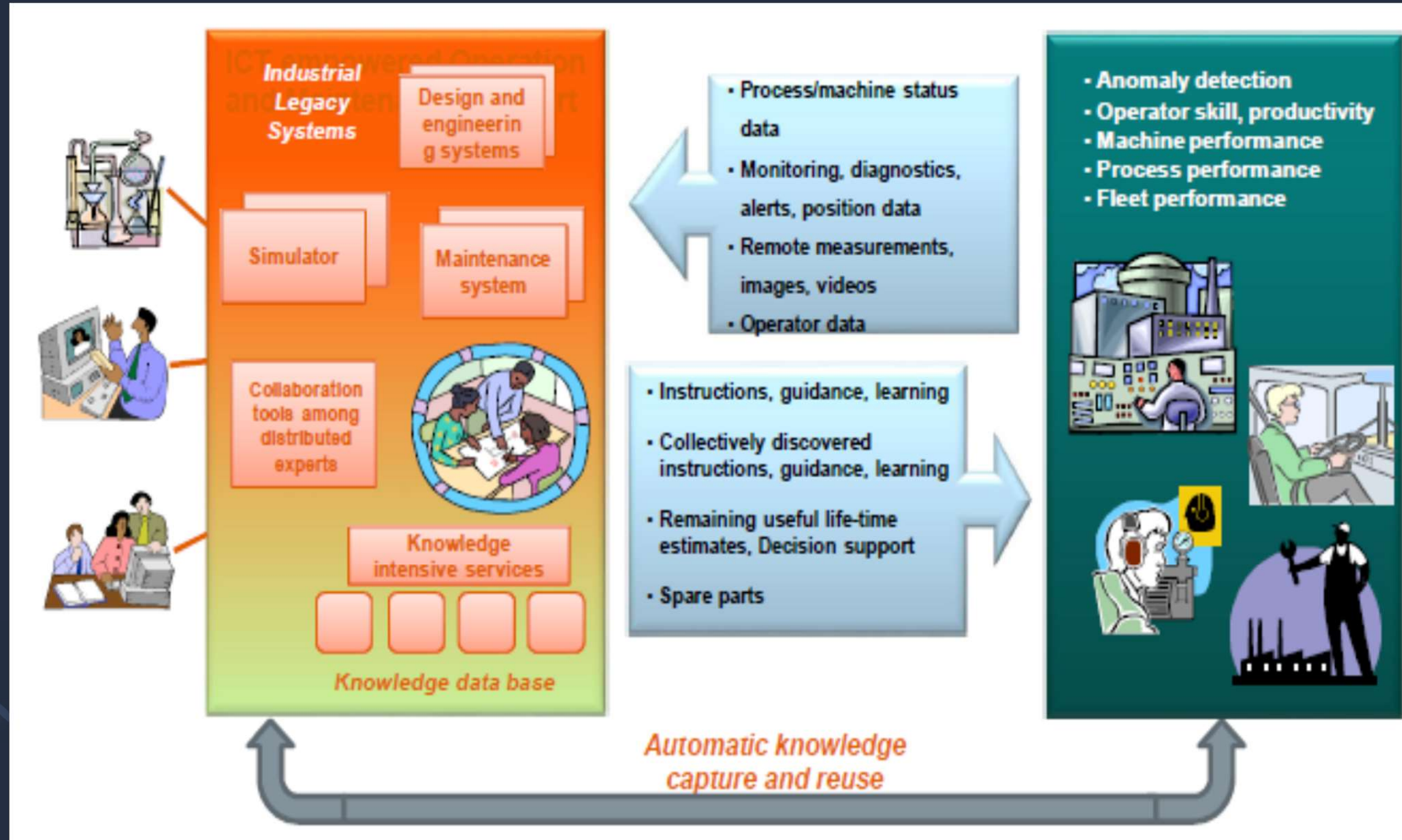
State-of-art and vision 2003

[Intelligent Automation Systems – technology programme]



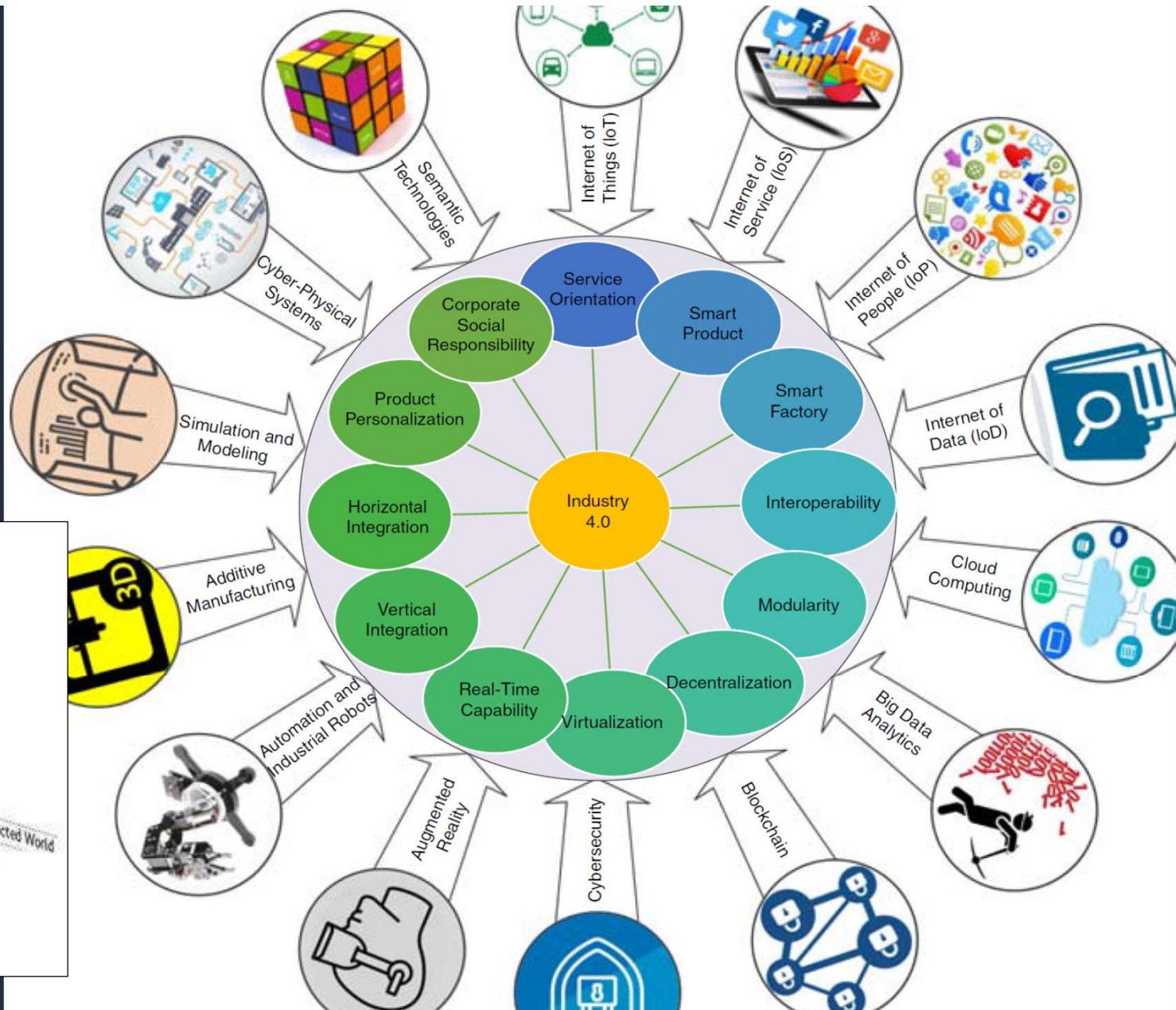
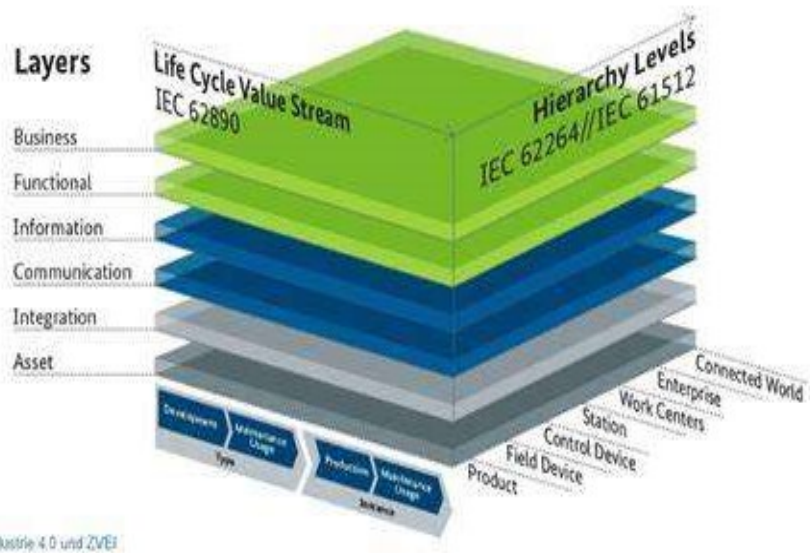
State-of-art and vision 2011

[Industrial service business at FIMECC Ltd.]



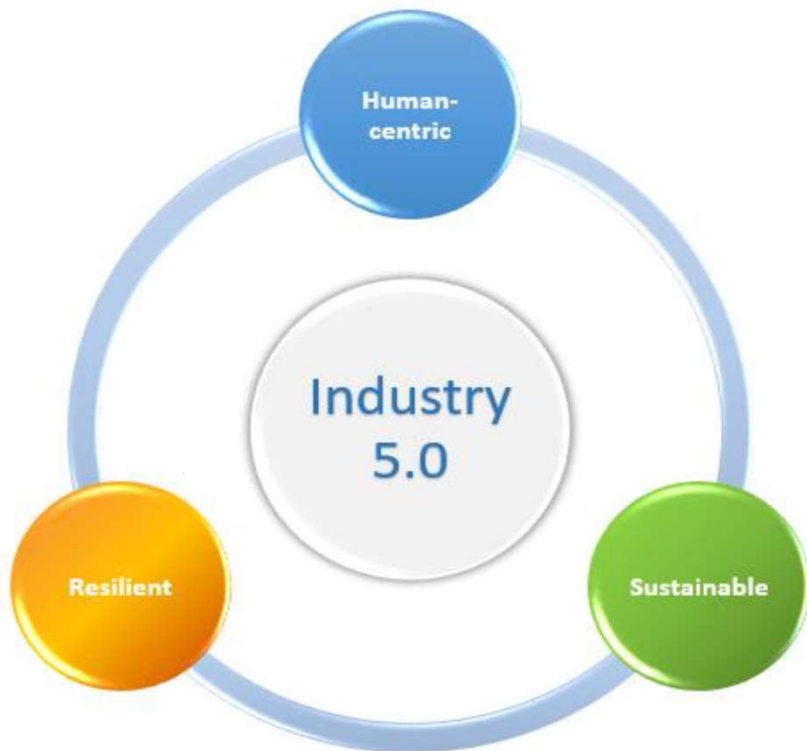
Industrie 4.0

2011-



Industry 5.0

2020-



Highlights of Industry 5.0 compared to Industry 4.0

INDUSTRY 4.0

Focus on connecting machines

Mass customization

Intelligent Supply Chain

Smart products

Manpower distanced from factories



INDUSTRY 5.0
Focus on delivering customer experience

Hyper customization

Responsive & Distributed supply chain

Experience Activated (Interactive) Products

Return of Manpower to factories

So what!

- One one hand, things have changed and expanded – some quickly – but, on the other hand, **many things look the same** as decades ago.
- **Maturity of technologies has grown.**
 - What was research 20 years ago, is in serious development or use at present.
 - Eg. Simulation/digital twin and Artificial Intelligence.
- **The perimeter of automation has grown.**
 - Difficult to define or outline.
 - Let's rather talk about ***Digitalization of Industry.***
- **Digitalization is expanding dramatically**
 - Digitalization of industries has become most challenging ***software engineering projects.***
 - Challenges of business, challenges of manufacturing processes and machinery, automation functions, factory information systems, software tools, platforms, standards, cybersecurity, ...



Digital Industry - scope

Discrete manufacturing

Process industry

Working machines, robots, worksites

Supply chains, value chains and lifecycles. Logistics.



Function hierarchies

Discrete manufacturing

Continuous process, Batch processes

Machines, vehicles, robots (moving, standing, fleets)

Mobility, transport (cars, trucs, trains, planes, ships)

Electronics prod.

White goods

Chemical

Oil&gas

Energy

Pharma

Food

Textile

Metal, mining

Pulp&paper

Mgmt hierarchies, levels

Packages

Supply, Value chains

Logistics, retail

Networking, modularization, globalization

Servicitation

Sustainability, carbon free, recycling, env., material saving

Project business

Finance

Safety, security, reliability

Digital single market

Smart factory

Smart product

Product personalization

Service orientation

Lifecycles

Condition mgmt

Decentralization, distributed

Performance mgmt

Virtualization

Digital Twin

Horizontal and vertical integration

Competence growth, help desks

Digital platforms

Ind.internet, IOT

Additive manufacturing

Modelling and simulation

Eng.tool

5G

Edge & cloud, fog

Eng.tools

Automation and robotics

VR, AR, MR

Big data, data mgmt

Cybersecurity, critical systems

Blockchains

AI, DL

Systems Engineering

Semantics

Standards, interoperabilitie

HPC

HSI

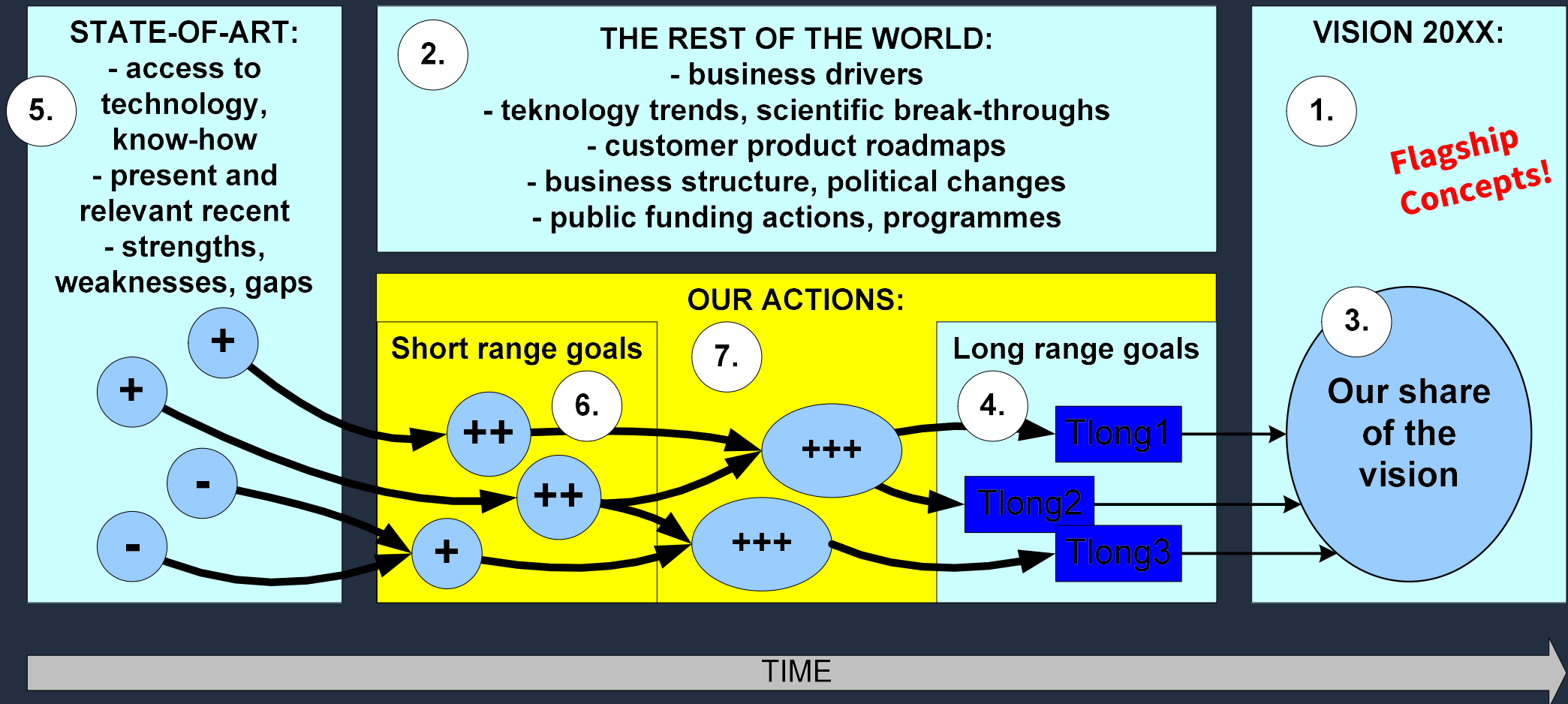
Mechatronics

CPS

Industrial Software engineering

Analytics

Simple Roadmapping Techniques [OV ~2003]

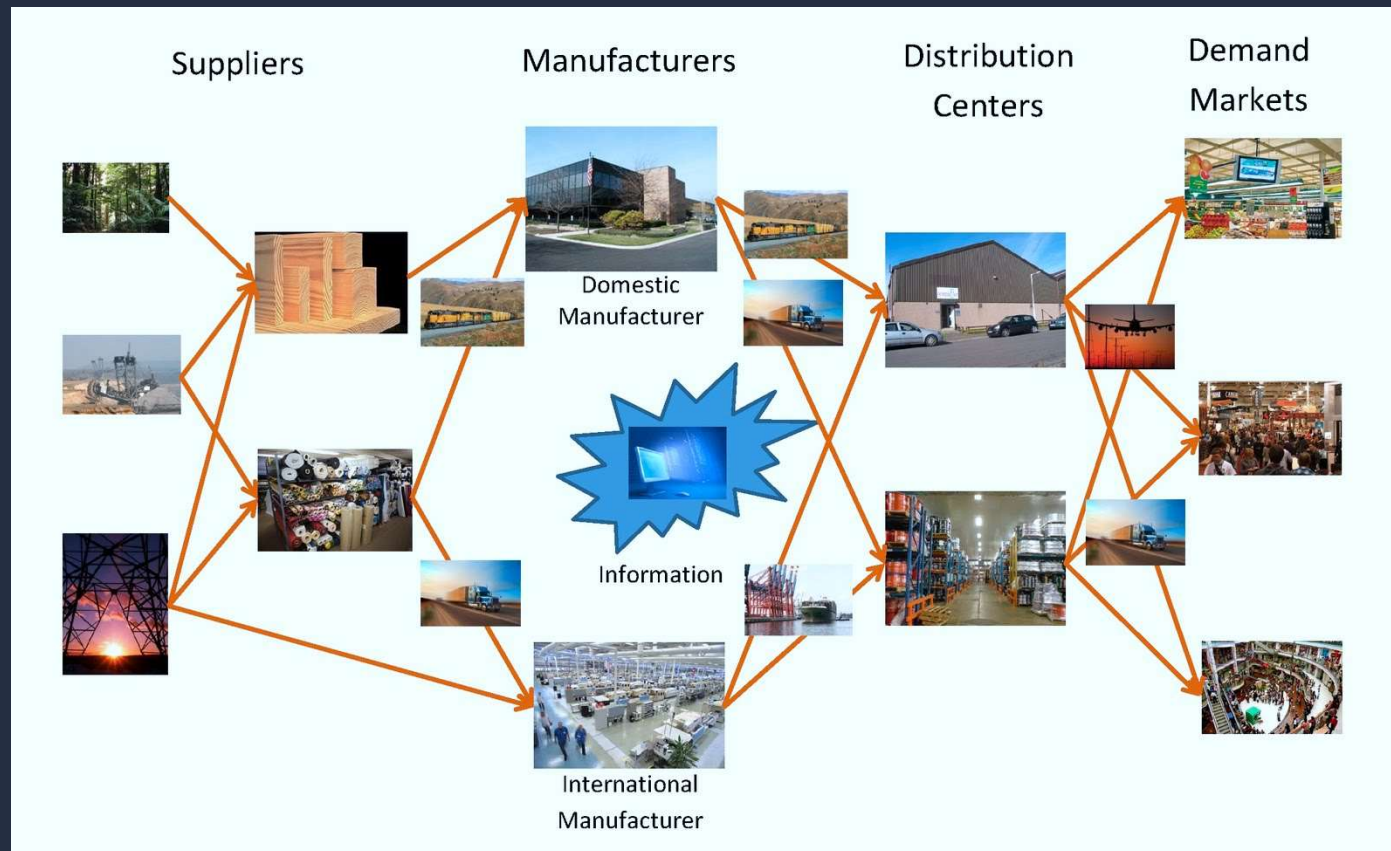


Trends

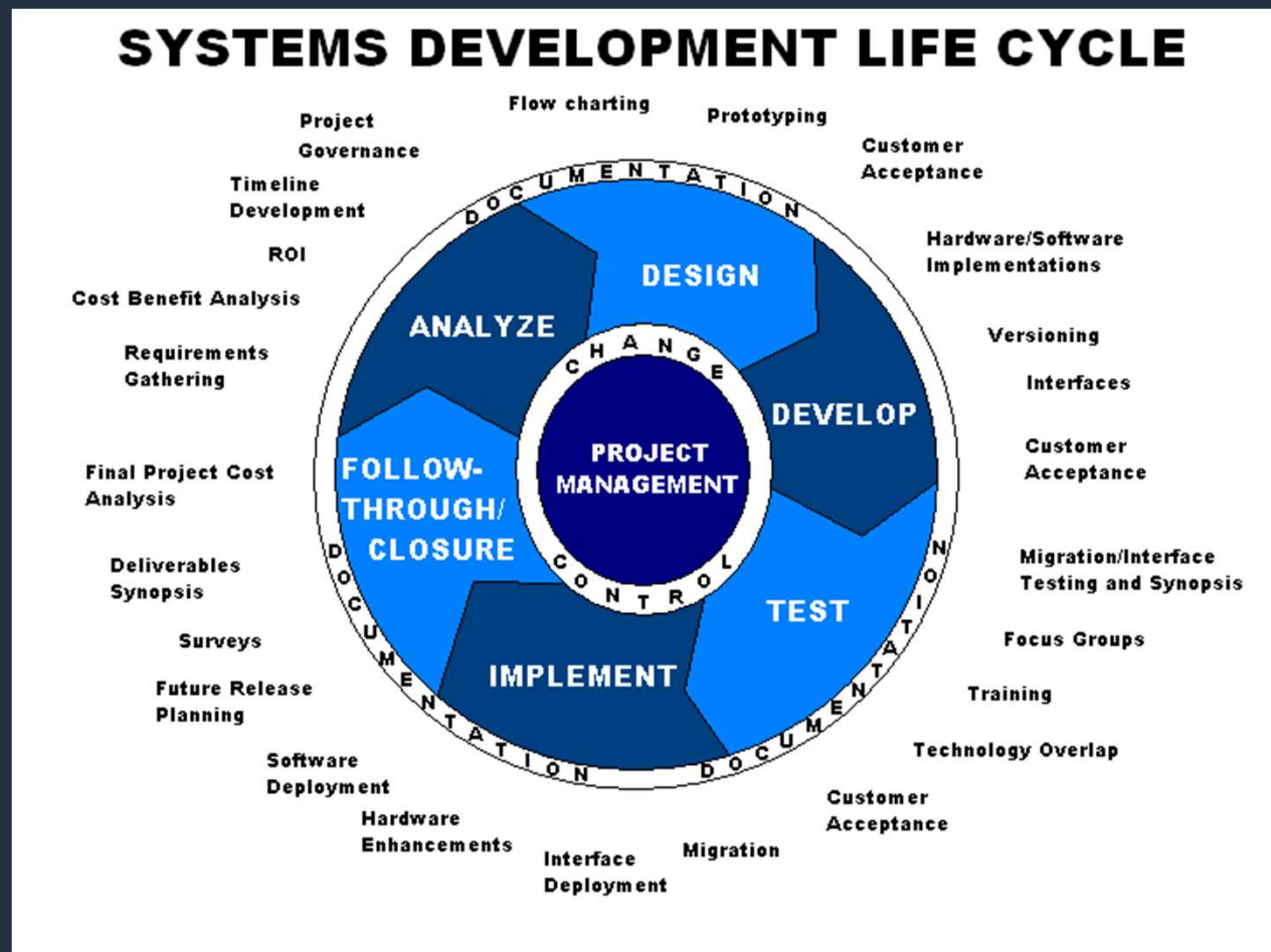


Established trend:

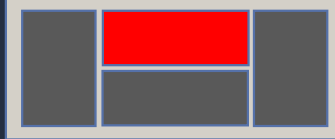
Supply chains, networked business, globalization



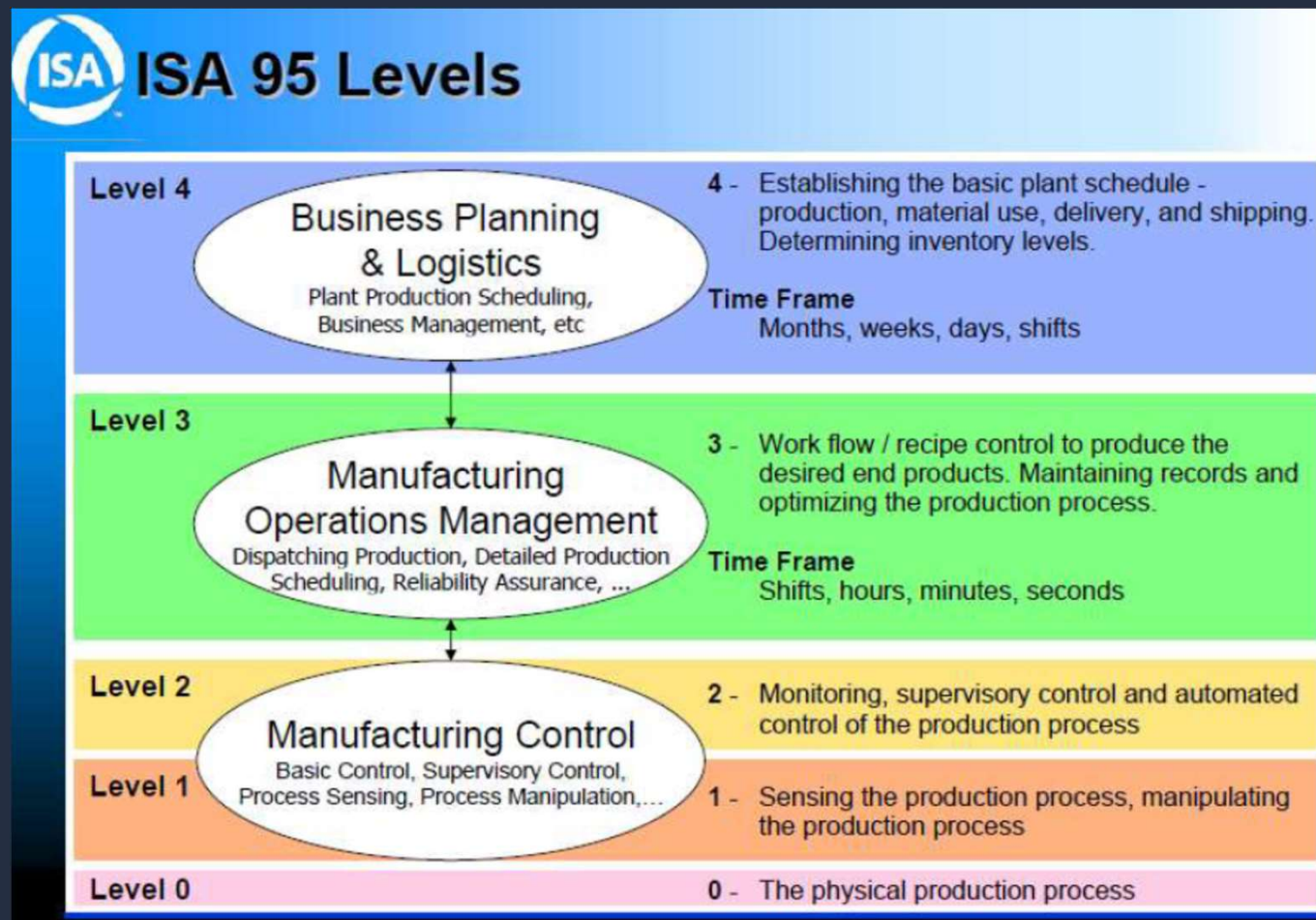
Established trend: Lifecycles



Established trend: One-of-a-kind

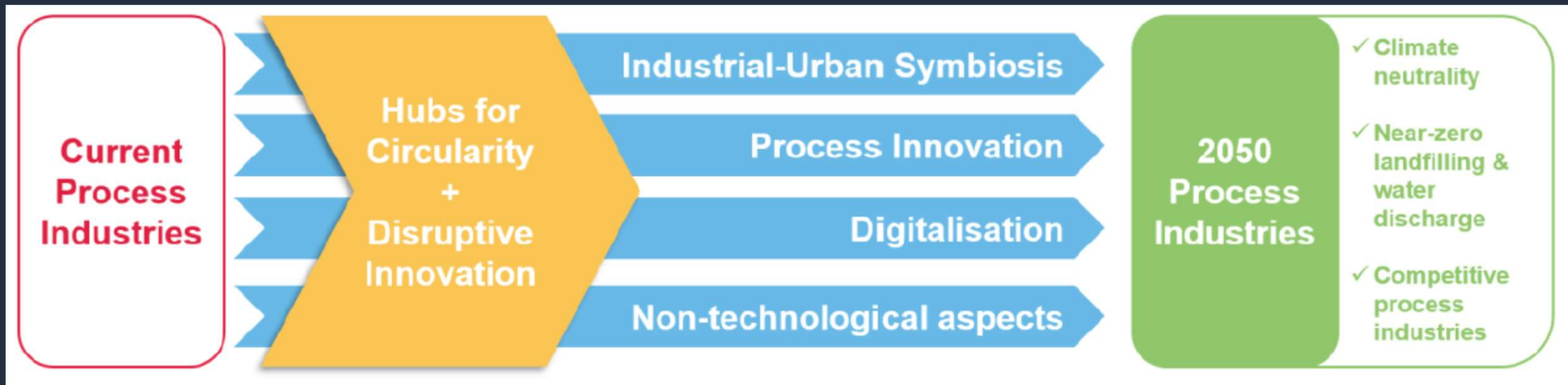
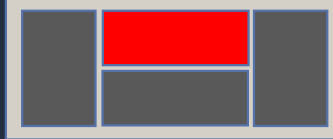


Function hierarchies. Getting flexible?



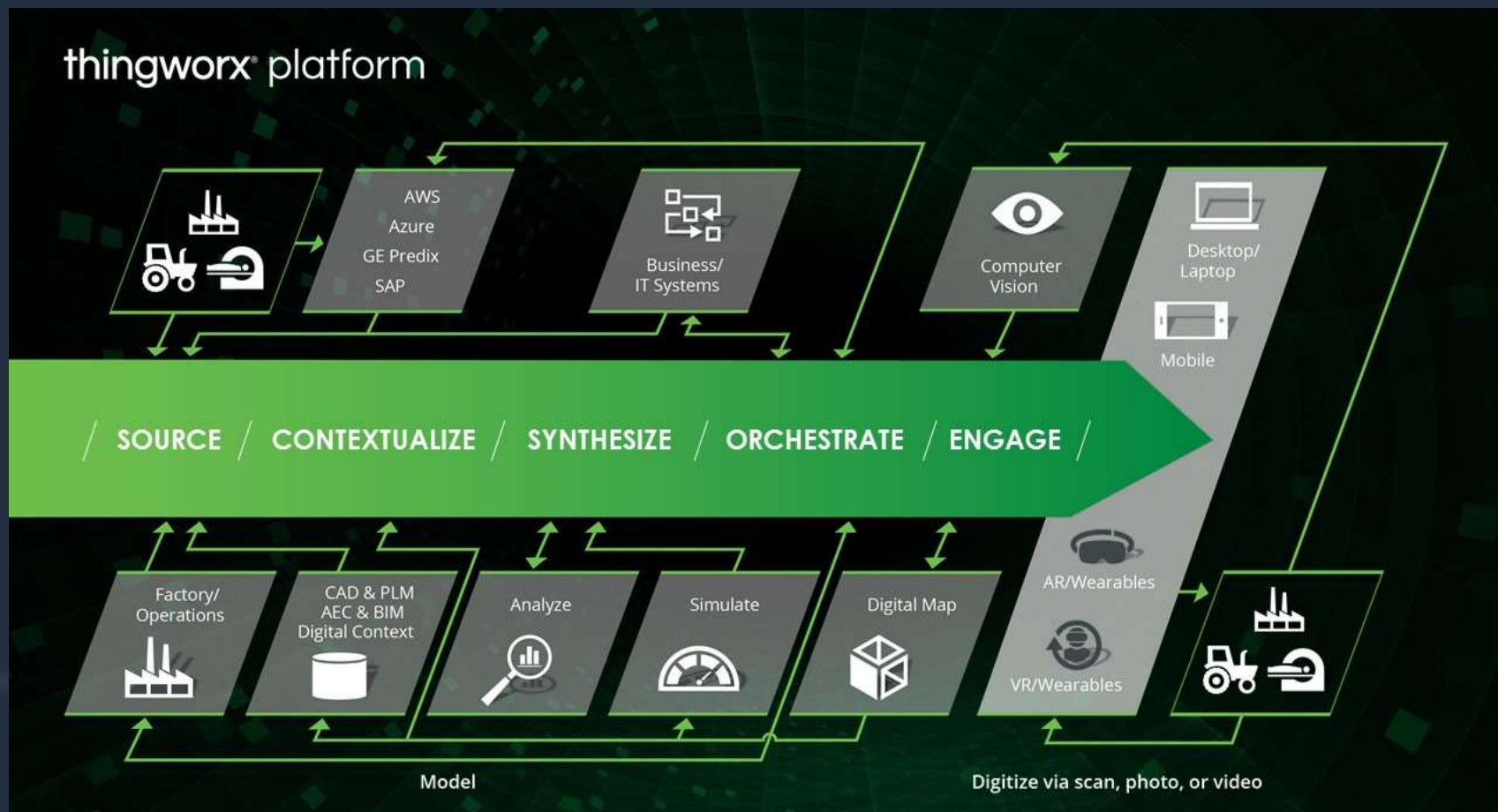
Recent trend:

Sustainability, saving the planet, Green transformation.



Recent trend:

Managing digitalization by platforms



Trend: Benefit of prestigious legacies

- Feedback control, model-based control
- Alarm systems, measurements
- Standards
- Reference architectures, function hierarchies
- Criticalities: real-time, safety, security, quality, trust
- Version / generation varieties running in parallel

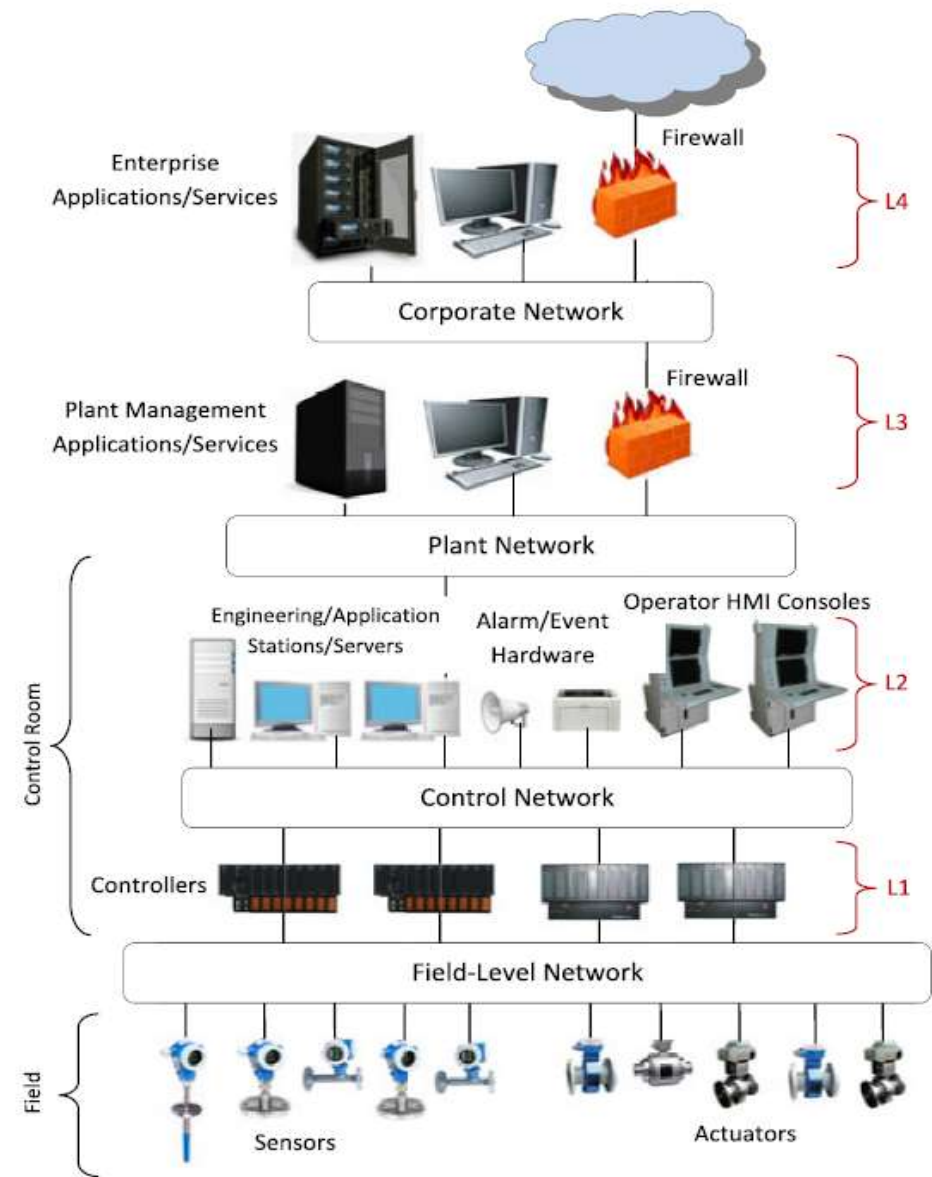
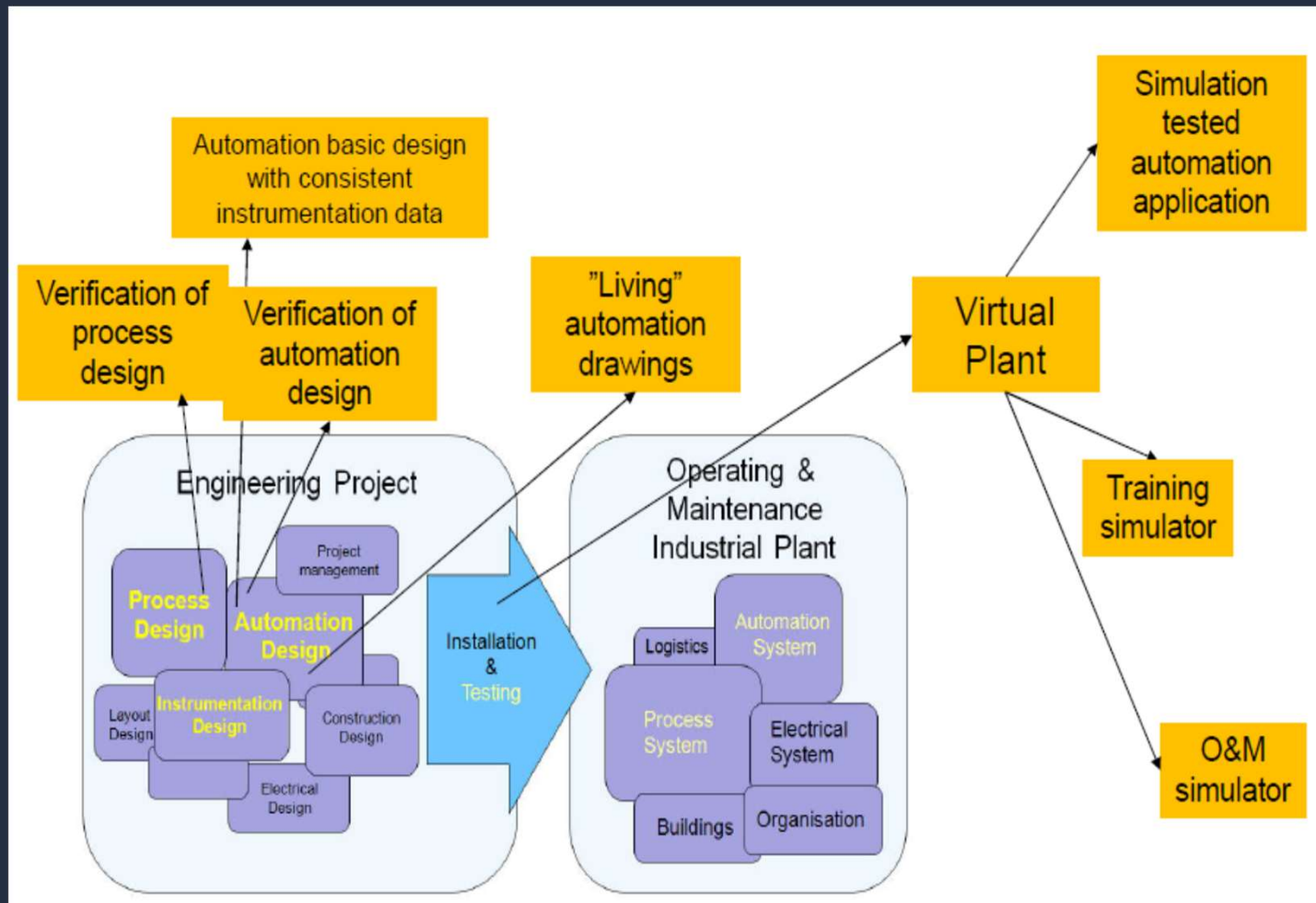
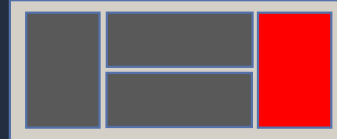


Fig. 2. Current automation system architecture.

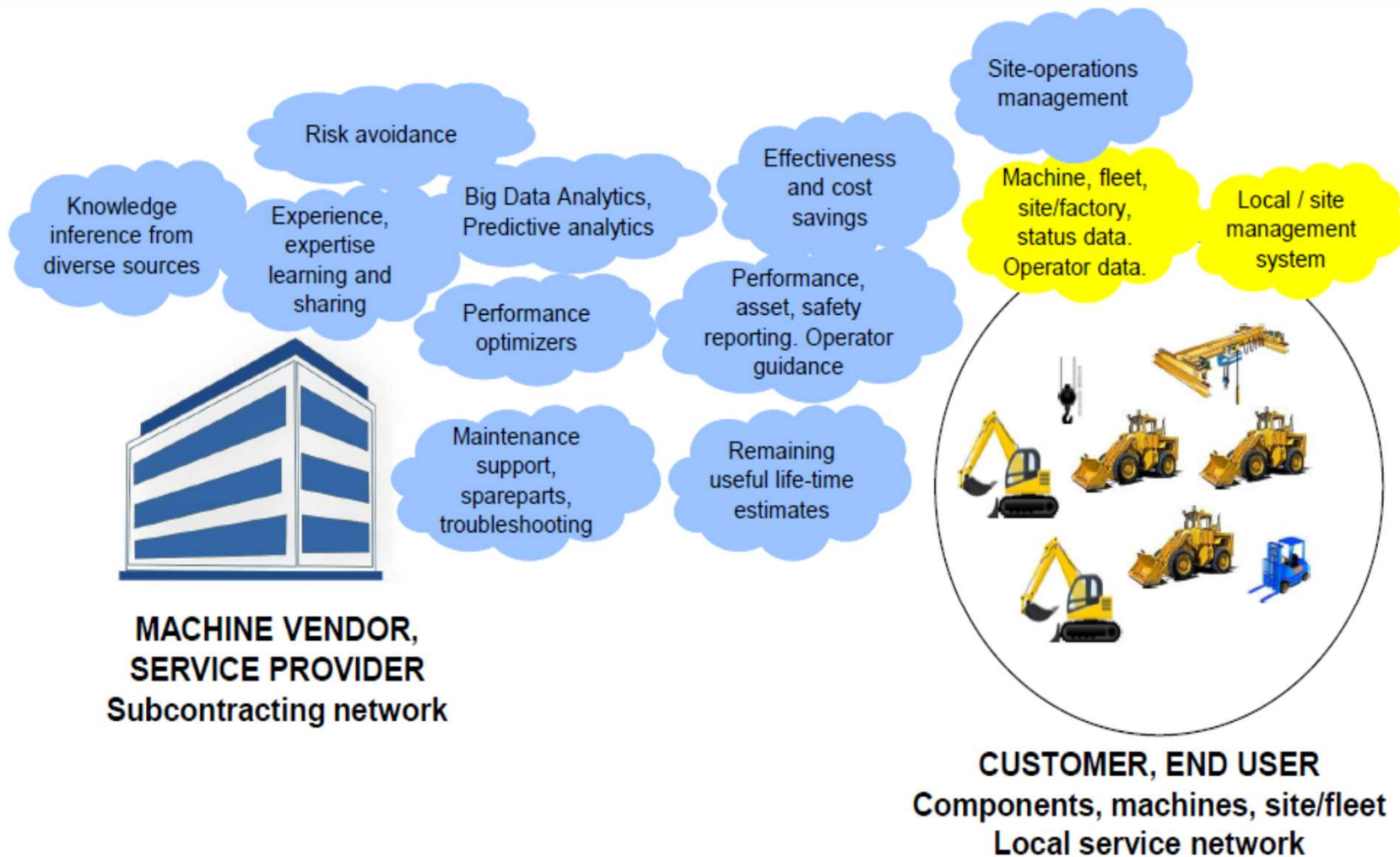
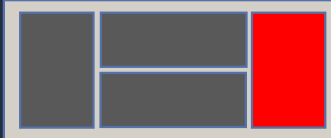
Flagship Concepts



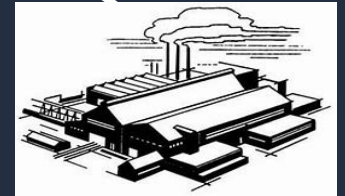
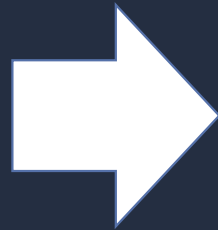
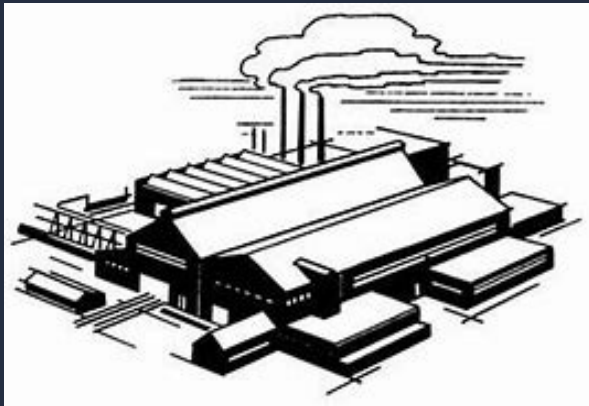
Flagship: Virtual Commissioning



Flagship: Industrial Service Business



Flagship: Modular Factory

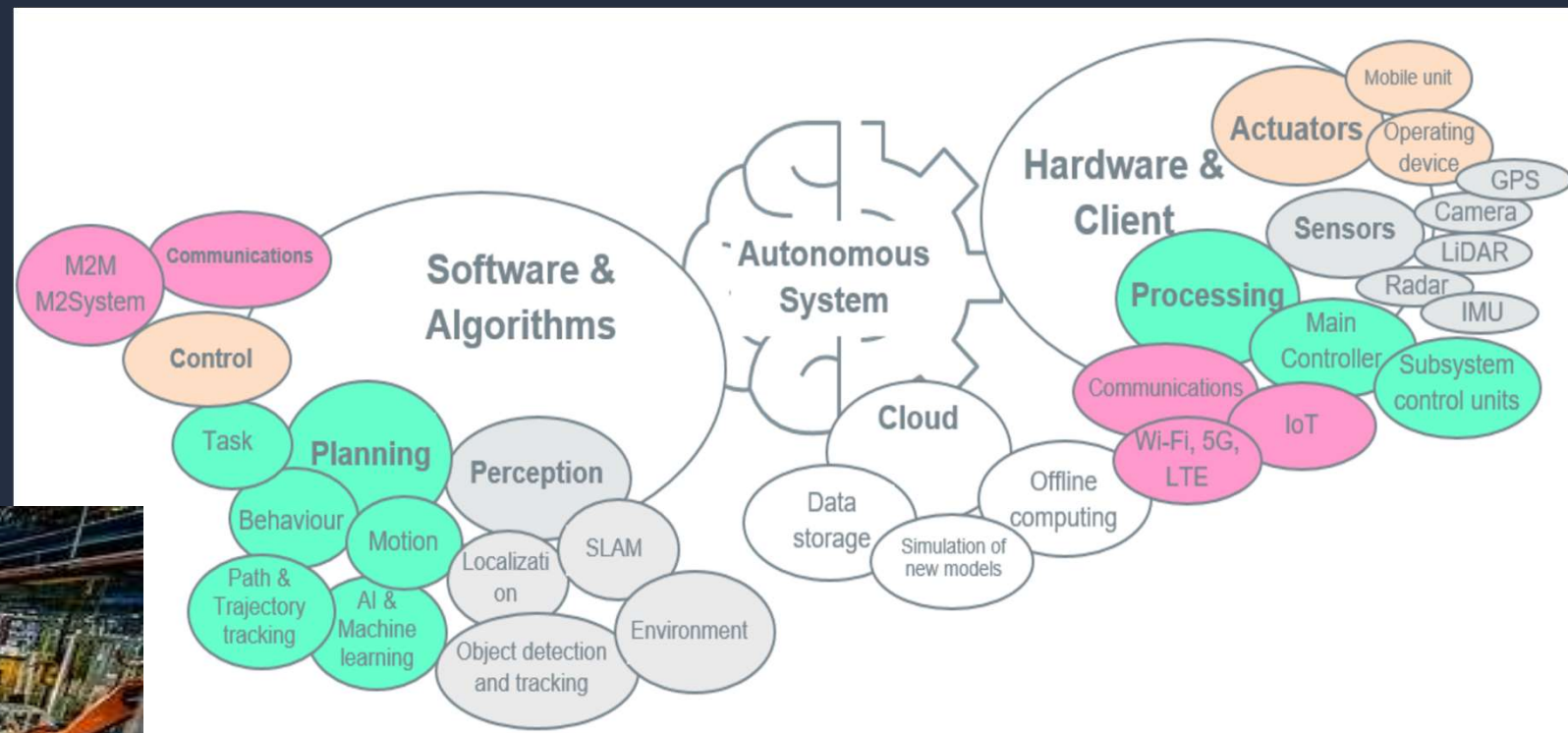




Flagship: Manufacturing as a Service



Flagship: Autonomous production



Flagship: Autonomous worksite



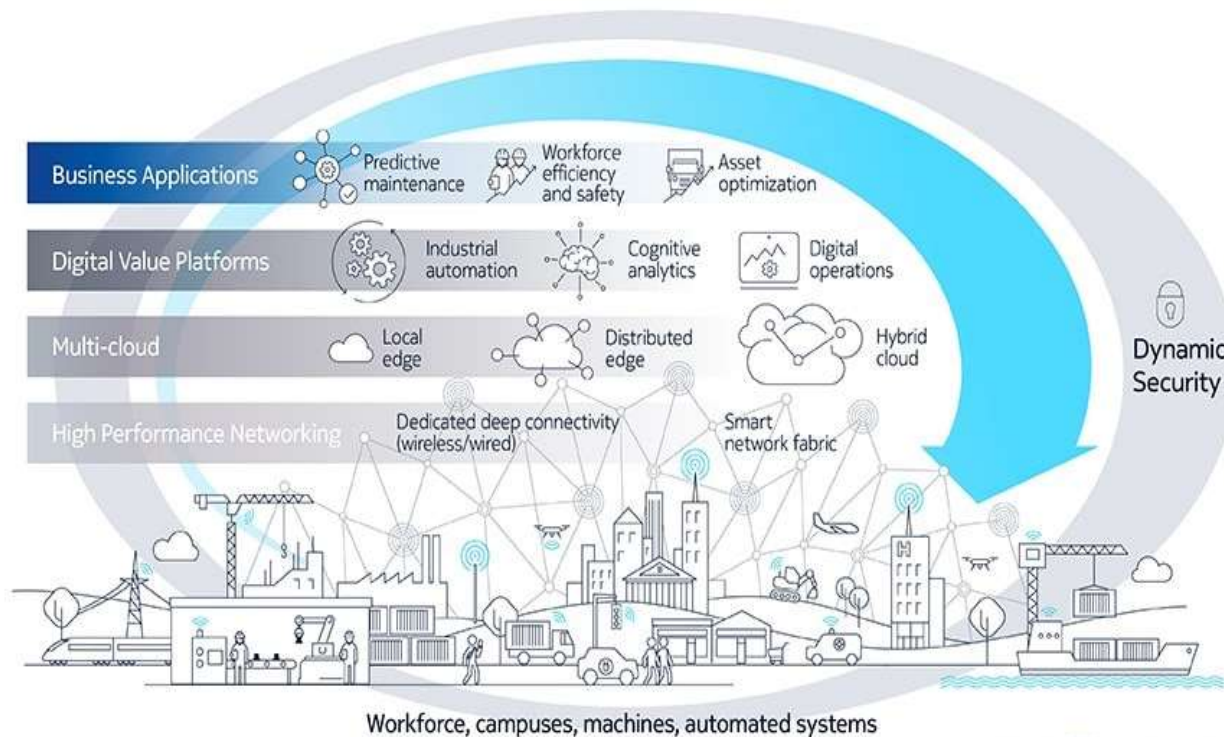
**Flagship: Human-Machine Joint Intelligence,
semi-autonomous production.
Best of machines – Best of people**



Flagship: Embedded – Edge – Cloud, 5G

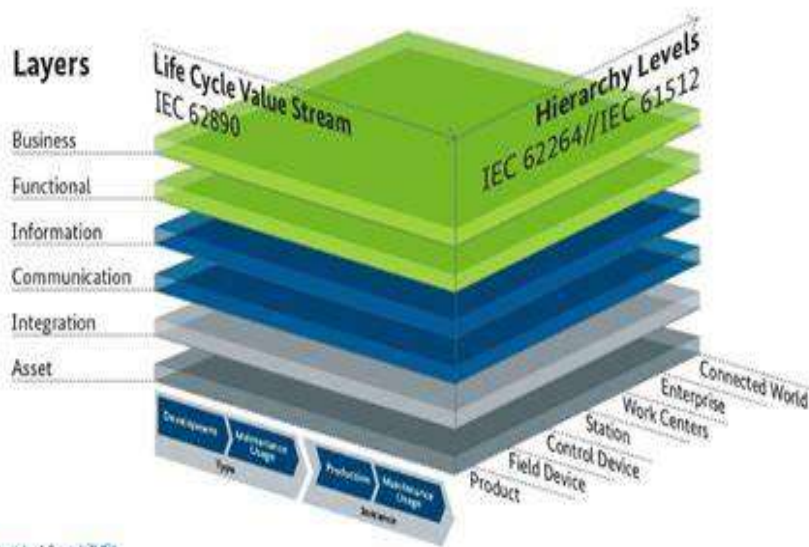


The Nokia Bell Labs Future X for industries architecture



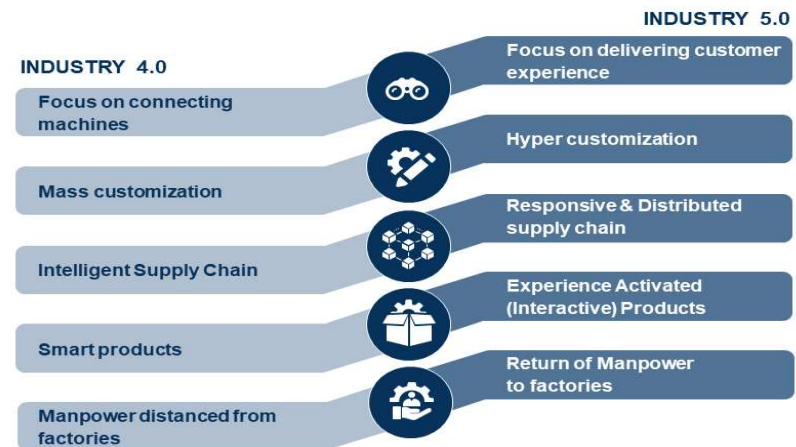
NOKIA Bell Labs

Flagships: Industrie4.0 – Industry5.0



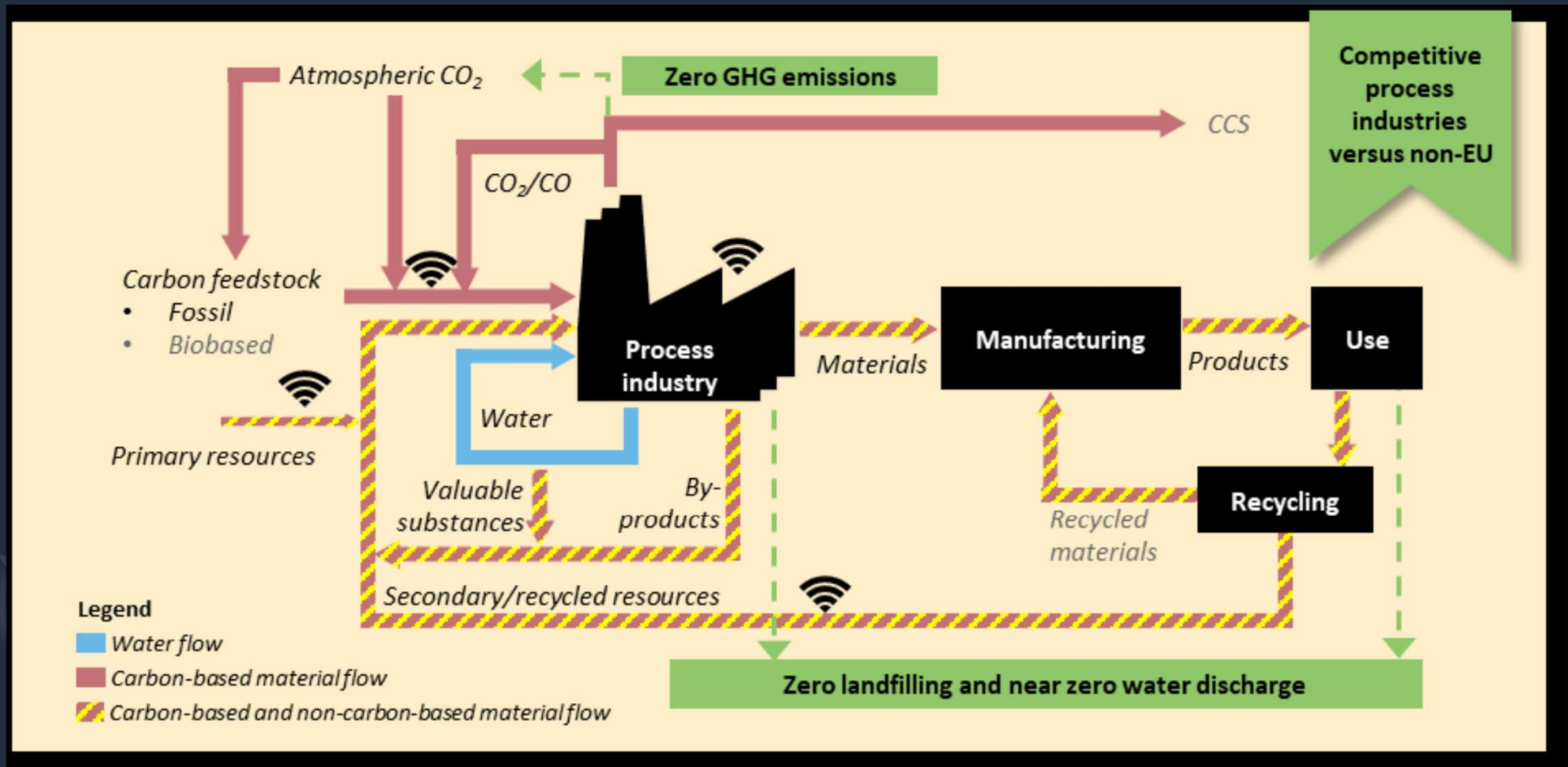
© Plattform Industrie 4.0 und ZVEI

Highlights of Industry 5.0 compared to Industry 4.0



FROST & SULLIVAN

Flagship: Carbon free/neutral production





Enabling technologies

- Artificial Intelligence
- Digital twins, mixed or augmented reality, telepresence
- Design and Architecture
- Software Engineering
- Quality, Reliability, Safety, Cybersecurity and Trust
- Digital platforms
- Edge and cloud computing, 5G
- Responsive/agile and smart production
- Sustainable production
- Autonomous technologies, robotics
- Technologies for Industrial service business: lifecycles, remote operations and teleoperation



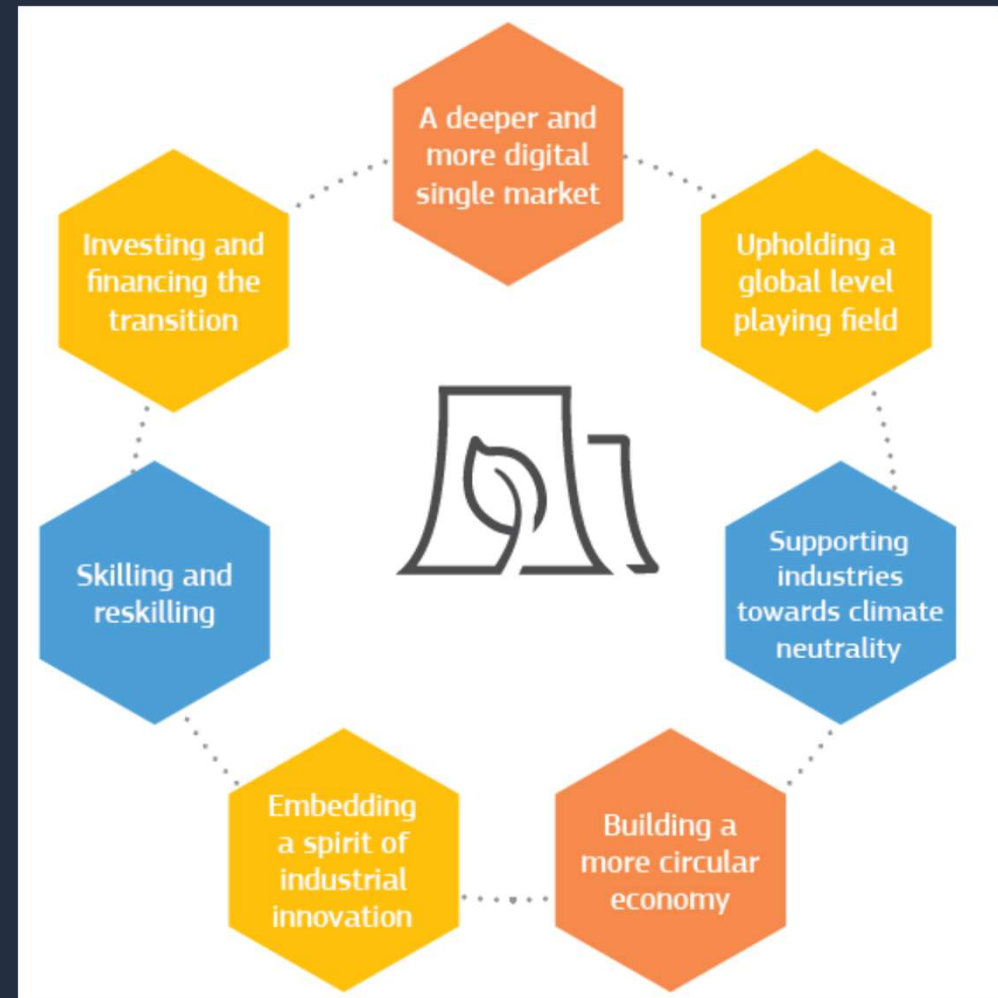
Digitalization of Industries and European research

More than 50% of public funding for VTT, comes from EU!

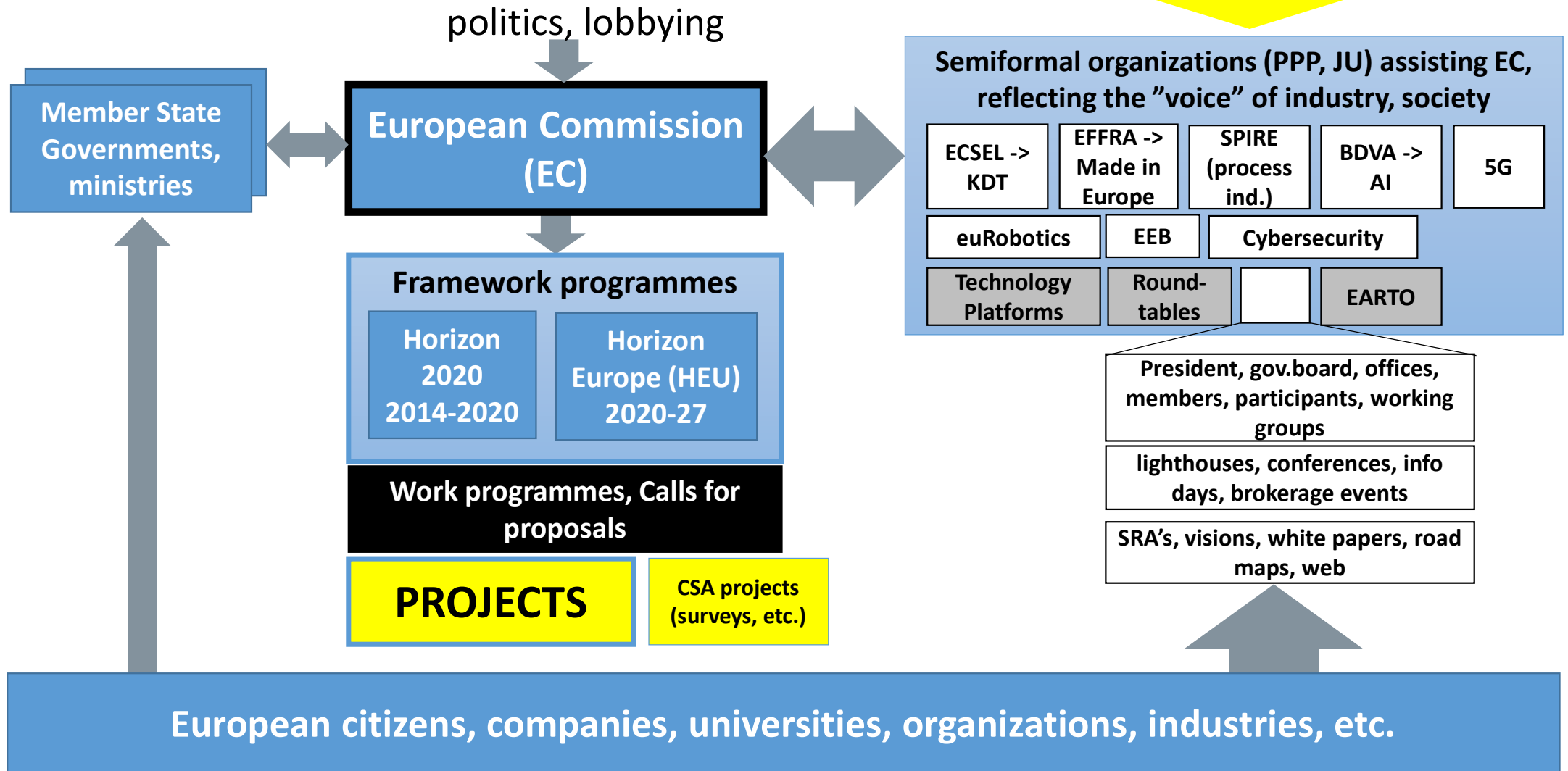


There are a number of roadmaps, visions, projects, surveys, white papers that discuss the digitalization topics (per 2019)

- EC official documents
 - A New Industrial Strategy for Europe, 2020
 - The European Green Deal, 2019
- EFFRA Roadmaps + Factories of the Future in Horizon Europe (2021-2027) (2019)
- Manufuture Vision 2030 (2019)
- World manufacturing forum report (2018)
- ECSEL SRIA (2021)
- CPS Roadmaps (Platforms4CPS, Road2CPS and CPSoS) (2018)
- European Roadmap for Industrial Process Automation, 2nd version (2018)
- Eureka Smart Advanced manufacturing Technology Roadmap (2018)
- Big data: European Big Data Value Strategic Research and Innovation Agenda, BDVA, 2017 +
- HiPEAC Vision
- Industrie 4.0 Roadmap




Participating in EU research



Essentials of successful EU project



• Impressive, winning proposal

- Good match between company needs and projects call text
 - Read workprogrammes
 - Web pages, info days, local info events
 - Often easy to find several matches
 - Good consortium
 - Find good partners, good coordinator, experienced domestic partners (VTT, universities, certain companies)
 - Existing business partners
 - Go to PPP, JU events, info days
 - Good proposal
 - Good coordinator
 - Experienced proposal writing
 - Be a significant partner = you can do more what you want!
 - Become an evaluator, to learn self-assessment!
- 

• Good performance in projects

- Finns are always good! Even first-timers.
- Make good demos
- Make yourself heard, become social
- Meet or network to European companies at the project meetings
- Good performance is always a base for a next project
- Have/develop your exploitation plan



Thank you! Bon voyage!

Olli Ventä, Dr.Tech, senior citizen

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