Healthcare Logistics in Industry 5.0

Perceive, Act, Collaborate

RAMBØLL Bright ideas.
Sustainable change.

Give time to warm hands for empathy, problem solving and complex procedures

Industrial Revolutions

1780 — 1.0 Mechanisation

The introduction of industrial production equipment driven by water and steam power.

1870 — 2.0 Electrification

Mass production using electrical energy and assembly lines

1970 — 3.0 Automation

Automated production due to the rise of electronics, telecommunications and computers.

2011 — 4.0 Digitalisation

The use of cyber physical systems on connected devices to automate process further.

2020 — 5.0 Personalisation

The interdependence of man and machine using congnitive computing and human intelligence. Mass customization and personalization for humans.

12,5 hours ⇨ 1,5 hours
Assembly time reduction

258.000 km ⇨ >1.000.000 km
Paved roads in US

Traffic and Enviroment
Coingestion / indivisual mass transportaion

De- and Upscalling
Reduced individual craftmanship /
Maintenance / Engineering

2,5 $ ⇨ 5 $
Workers wage increase 1913-1914

Unionization
Job Rotation / Breaks

Work subdivision
84 discrete carefully planned steps

850 $ ⇨ 300 $
Price of Ford Model T

465 k ⇨ 1,6 mio
Detroit Inhabitants

Waste and Resource Intensification
Demand on Coal, Steel, Rubber and Oil, Early recycling efforts

Industry 4.0   vs.   Industry 5.0

Automation and Efficency   Collaboration, adapability & Sustainability

IoT, Cloud, Cyber-Physical System, AI   Cobots, embodied intelligence, Digital twins

Machine-to-machine – fixed processes   Human in the loop , flexible processes around people and events

OEE, cost per unit, cycle times   Workforce well-being, carbon footprint, robust supply-chain, personalisation at scale
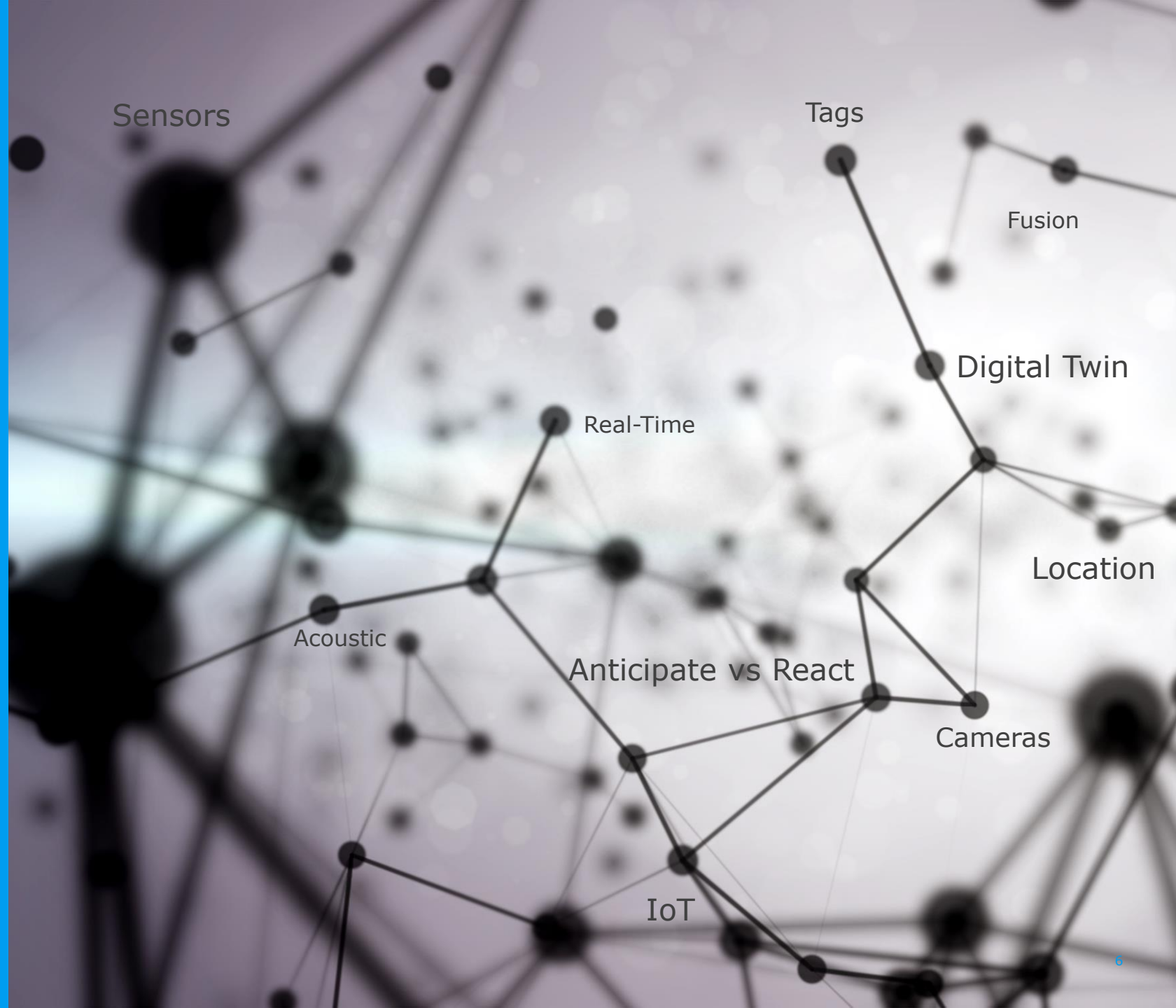
Perceive

We equip the physical and social enviroment with the abilities to senes, recognise and contextualise on what is happening

Four intertwined layers
- Physical States
- Human States
- Process States
- Context States

Turning the Hospital into a living sensor network to lay the foundation for the ACT and COLLABORATE Phases

Perceive (Reality)

We work often with data and knowledge that is

- Historical
- Static
- Often without context
- Colored

Successfully implementing Automation from Industry 4.0

Trying to use Experience, Simulation and digital twins to prepare for flexilibity

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Act

We convert the huge amount of data into physical or digital actions within these topics

- Embodied Intelligence
- Adaptation of processes
- System Orchestration
- Sustainability and Resilience

We create a living production and logistics system that can re-route, re-tool and self correct to achieve mass personalisation , higher resilience and better working conditions

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ACT (Reality)

We do not work with the data we receive in real-time

- Huge amount of data-input
- Cross coordination of ressources
- Impact on the whole system

Operational planning for limited Areas to achieve stabile logistics networks

- Accumulation of wagons in buffer locations
- Analysis of capacity challenges
- Resource allocation
- Planning of flows
- Identifying bottlenecks in the flow
- Identification of system dependencies/influences in the flow

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Collaborate

Humans and autonomous systems share goals, knowledge and authority in real-time to produce results neither could achieve alone

- Intelligent Interaction
- Shared Decision-Making
- Continuous Co-Learning
- Ethical and Organisational Governance

Technology amplifies human judgement and empathy, continously upskill while unlocking productivity gains and still enhancing well-being and trust

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Collaborate
(Reality)

Technology is still seen as a job-taker instead of a job-enhancer

- Unlocking the full potential of human creativity
- Need of collecting, interpreting and adapting data
- Human in command

Preparing Buildings, Systems and Automation Elements for the future to unlock the full potential of Industry 5.0

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Industry 5.0 in Healthcare

What to consider

1. Senors ready Infrastructure

2. Robot-Optimised Circulation

3. Modular "Action" Zones

4. Digital-Twin Backbone

5. Human-Centric Interfaces

6. Flexible Storage & Flow

7. Sustainability Loop

8. Data Ethics & Cybersecurity

9. Workforce & Change Enablement

10. Future-Proof Contracting

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