The Cluster Conference 2023, Södertälje Science Park, May 9-10

Smart Production Logistics from Data to Service
several cases in production logistics

Yongkuk Jeong and Erik Flores-García

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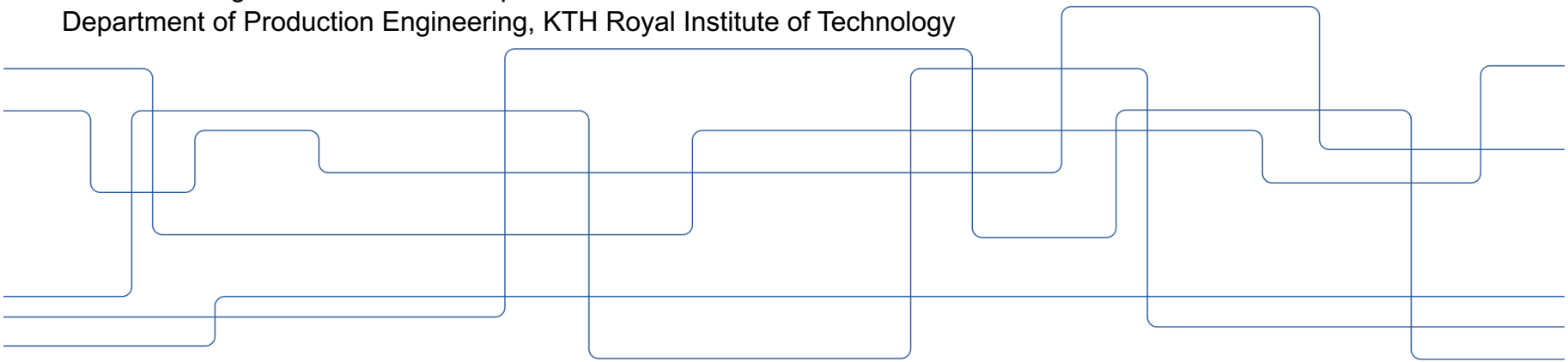

Industry 4.0

CPS

Digital twin

IoT

Smart Production Logistics

Digitalization

Industry 4.0

CPS

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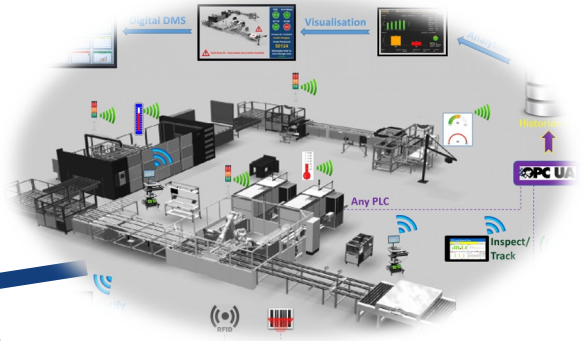
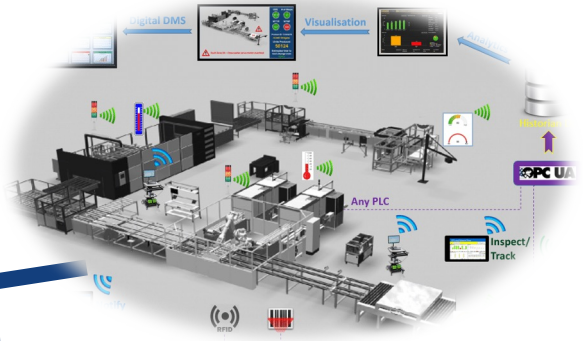
Smart Production Logistics

Digitalization

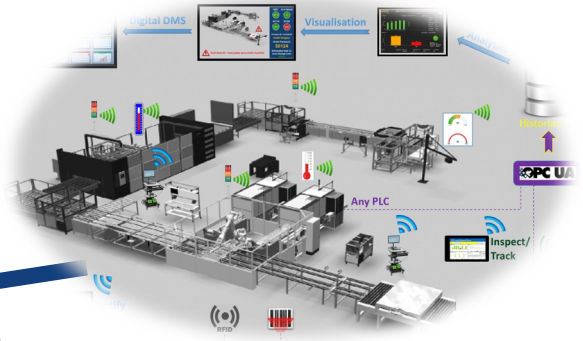


Digital services



Digital services

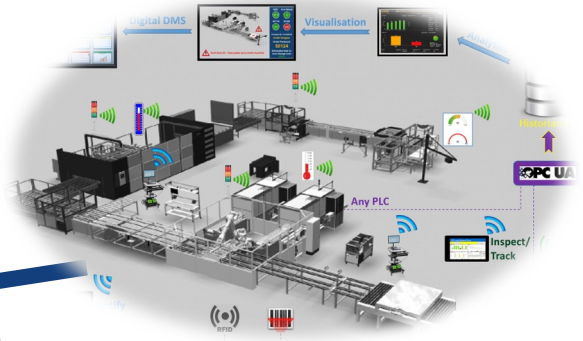
Interface/Protocol



Digital services

Interface/Protocol

Middleware

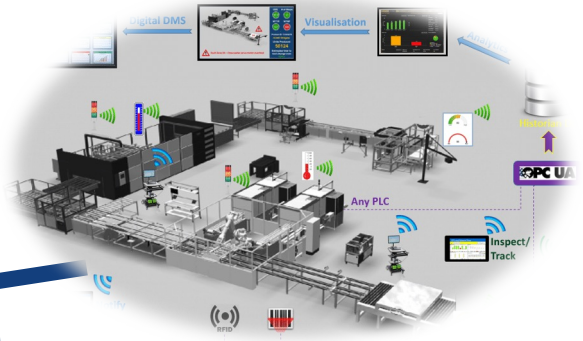


Digital services

Interface/Protocol

Middleware

Database/Connection

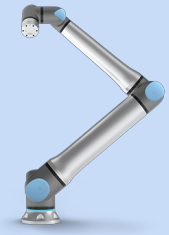


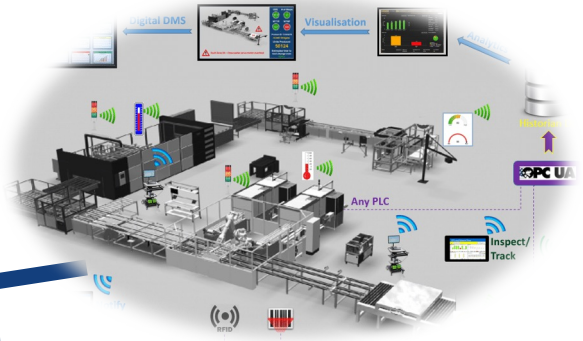
Digital services

Interface/Protocol

Middleware

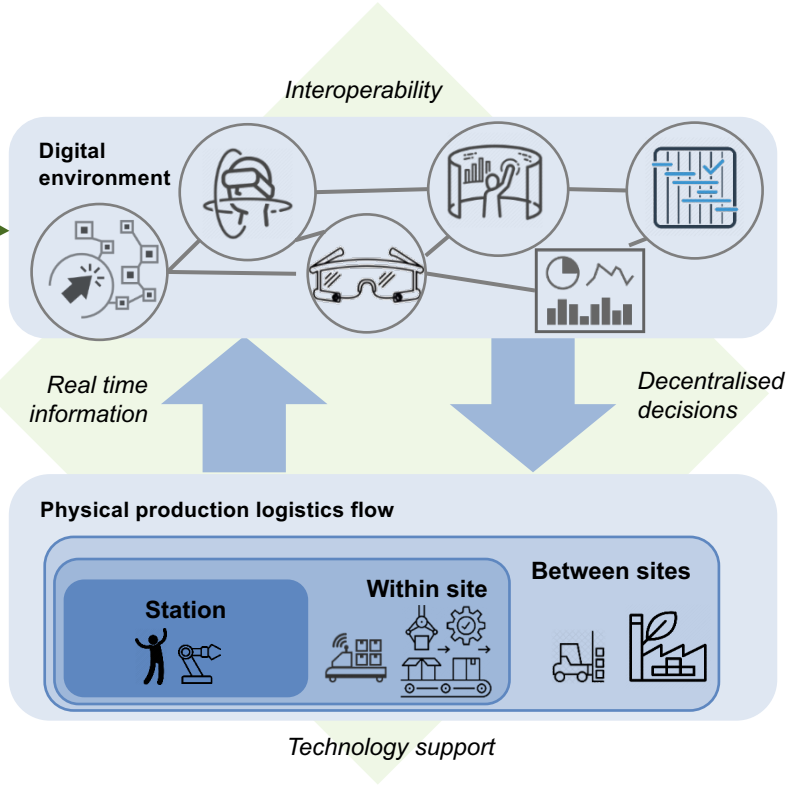
Database/Connection





The team on Production Logistics focus digitalisation for sustainability

Set of services:
From **visionary simulation** to real time **operative monitoring**

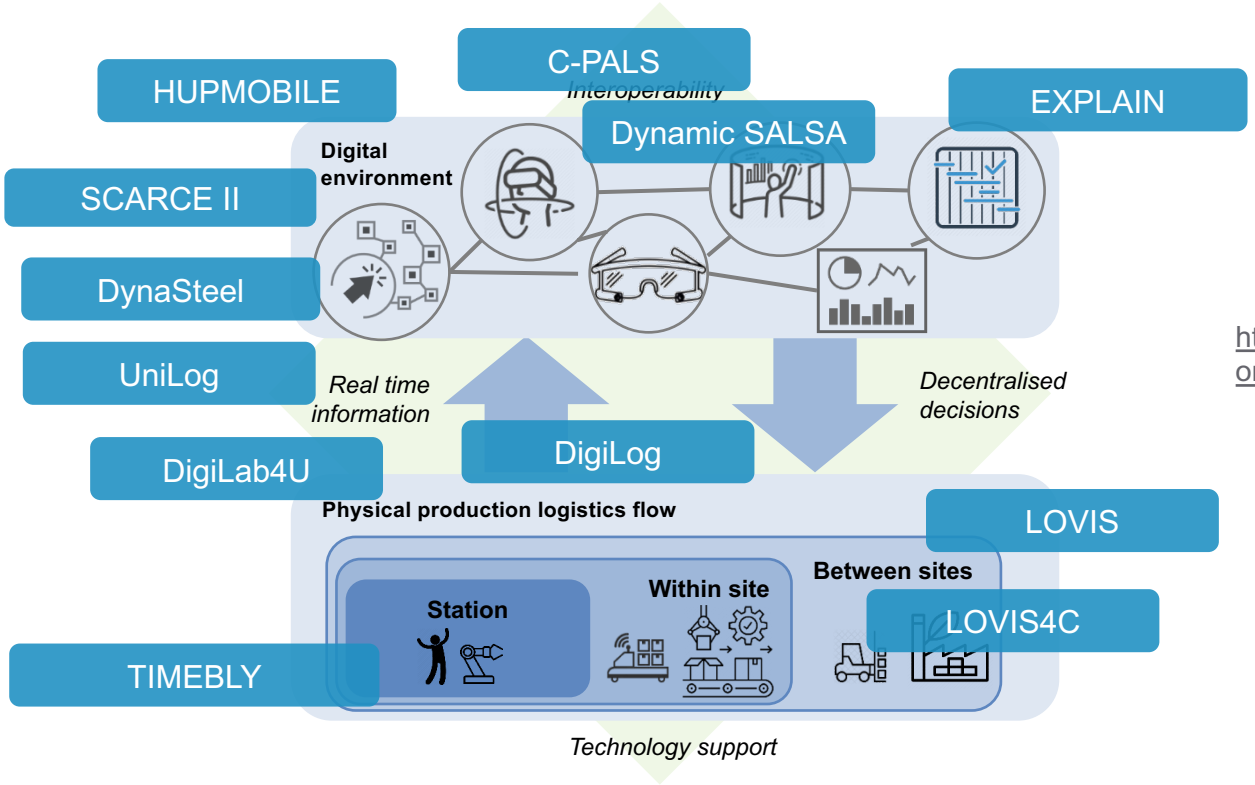


Connected technologies (IIoT)
RTLS, sensors, robots, AGVs, etc

Creating business value in terms of:

- **Increased efficiency, resilience and sustainability**
- **Enables new sustainable production systems**

The team on Production Logistics focus digitalisation for sustainability



https://www.kth.se/ipu/research/ongoing-projects

Externally funded projects with Production Logistics staff involved

C-PALS (lead)

- Intrasite material supply.
- Modelling and optimization for adaptive scheduling and planning

LOVIS (lead)

- Production Logistic Visibity
- Intra- and inter-site material supply.
- Framework and dashboard solutions

SCARCE II (part)

- Digital tools for supplier – OEM interaction
- Disruption avoidance and performance improvement

DigiLab4U (part)

- Independent networking of laboratory infrastructures
- Connecting online (remote, virtual, hybrid, augmented) lab education

TIMEBLY (part)

- Data collection and time management of manual operations
- Materials handling and assembly

EXPLAIN (part)

- Explainable and Learning production & logistics by Artificial Intelligence

HUPMOBILE (part)

- Optimization and management of mobility of people and goods in freight and cargo logistics.

RESPIRE (part)

- Rethinking the management of unexpected events for resilient and sustainable production

Externally funded projects with Production Logistics staff involved

DYNASTEEL (lead)

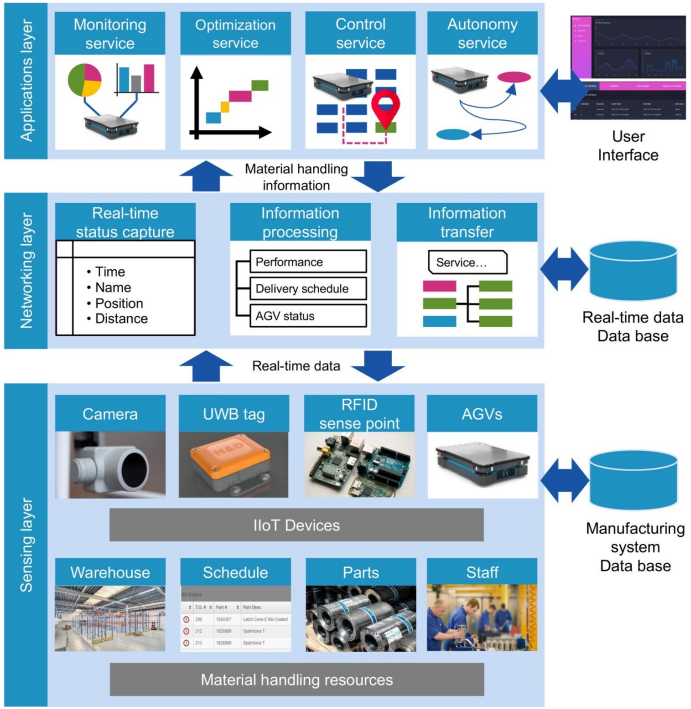
- Digital technologies and data analysis to increase visibility and enable dynamic scheduling of internal transport in steel mills

DYNAMIC SALSA (lead)

- Dynamic scheduling technologies
- Smart assembly and logistics for the automotive sector
- Vision systems and digital twins

IIoT-enabled digital servitization in SPL

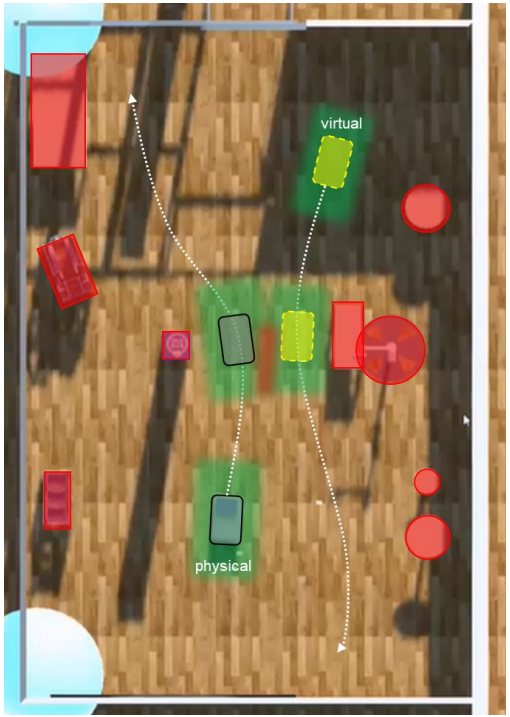
- User interface for digital services
- Application layer
  - Monitoring service
  - Optimization service
  - Control service
  - Autonomy service
- Networking layer
  - Real-time data
  - Information processing/transferring
- Sensing layer
  - IIoT devices, resources
- Database
- Connection



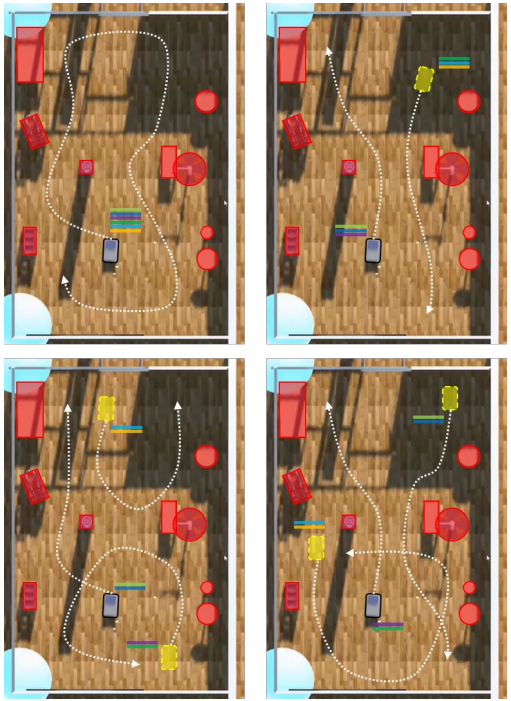
*Proposed architecture for Industrial Internet of Things-enabled digital servitization in smart production logistics

*Flores-García, E., Jeong, Y., Liu, S., Wiktorsson, M., & Wang, L. (2022). Enabling industrial internet of things-based digital servitization in smart production logistics. *International Journal of Production Research*, 1-26.

Digital twin applications



(a) safety distance/radius - optimal route test



(b) fleet management - optimal delivery task assignment

Paradigm shift

- from **technology-centric** approach to **value-driven** approach

Image source: Kuka

Industrial Transformation

Image source: Kuka

Industry 5.0?

*"Industry 5.0 – or Society 5.0 – aims to solve **social problems** with the help of integration of physical and virtual spaces that would be **achieved by Industry 4.0**."*

(Skobelev & Borovik, 2017)

Human-centric

*"Industry 5.0 recognizes the power of industry to achieve societal goals beyond jobs and growth to become a **resilient provider** of prosperity, by making production **respect the boundaries of our planet** and placing the **wellbeing of the industry worker** at the center of the production process"*

(European Commission, 2021)

Resilient

Sustainable

Industry 5.0 reference model

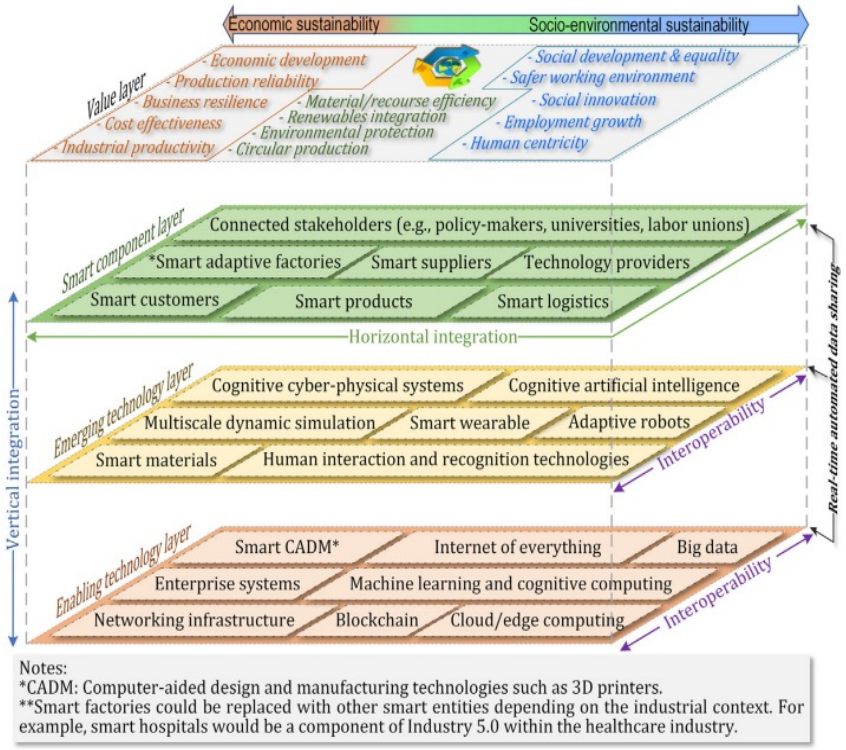
Economic sustainability **Socio-environmental sustainability**

Value layer

Smart component layer

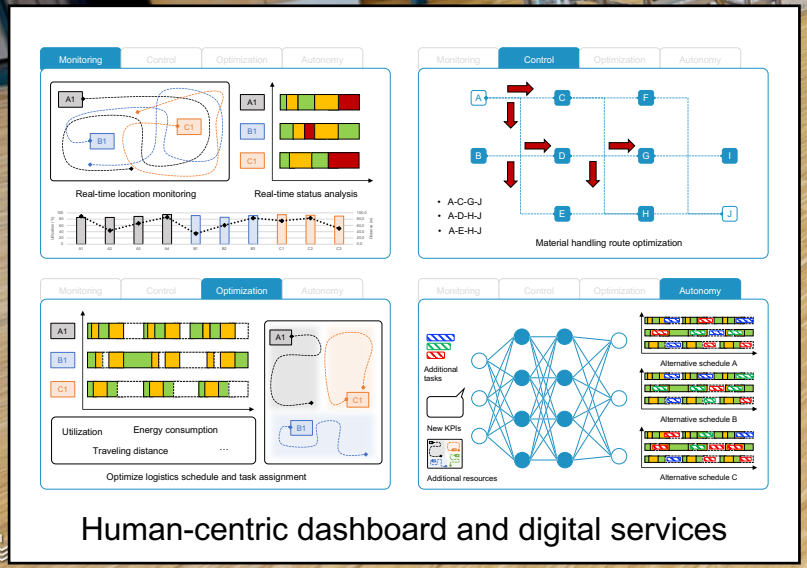
Emerging technology layer

Enabling technology layer



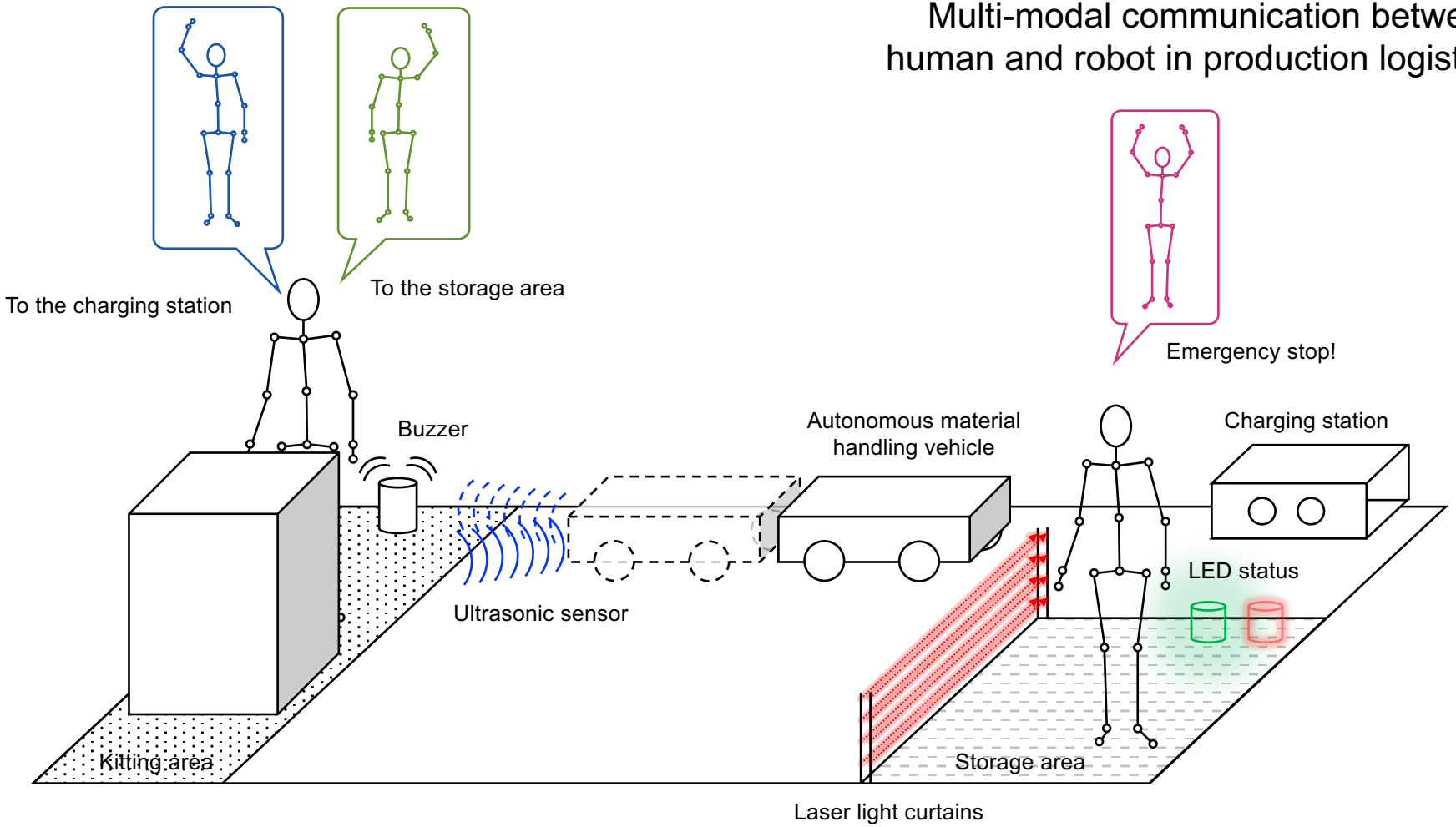
(Mukherjee et al., 2023)

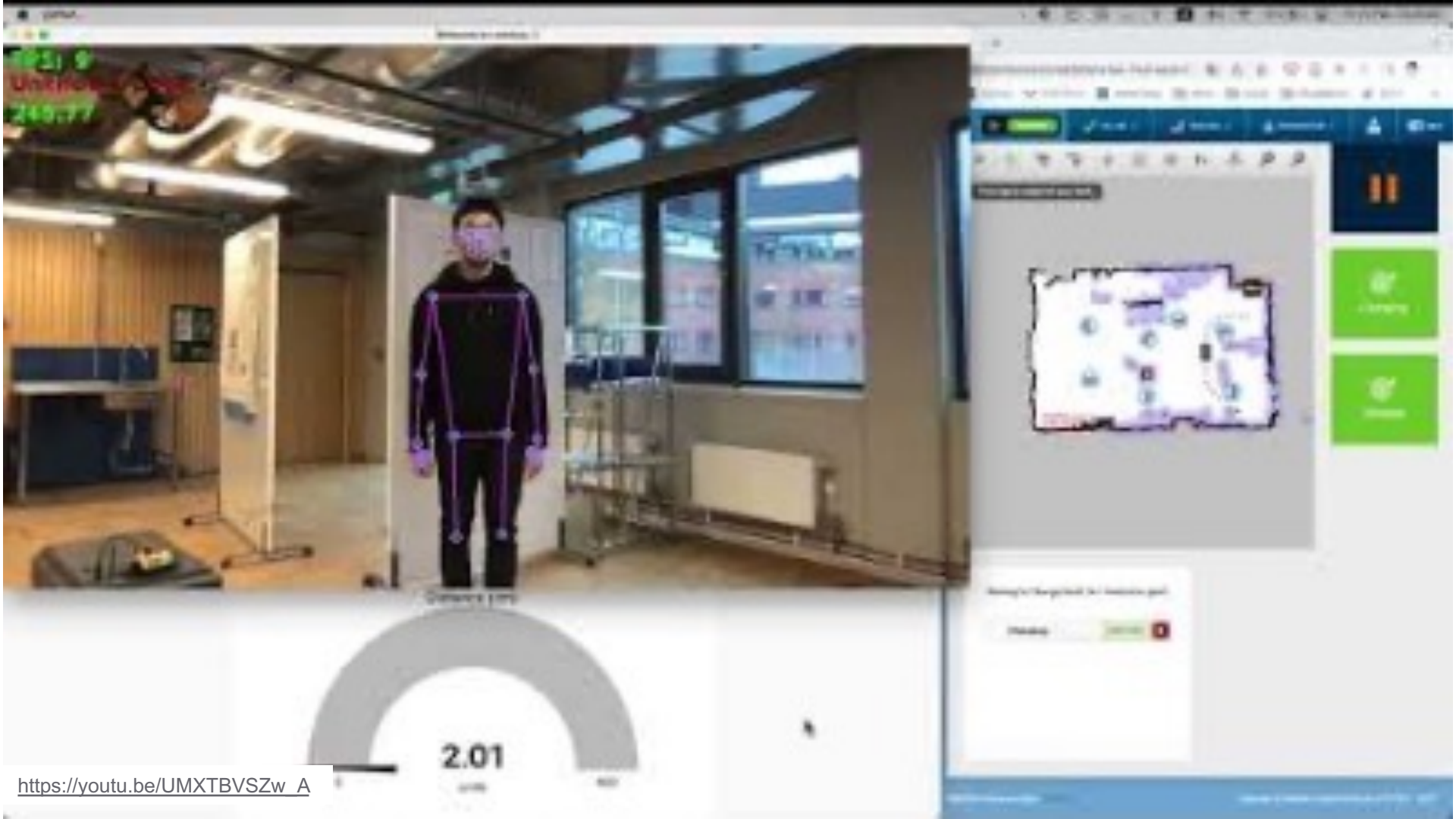
Human-centricity in Smart Production Logistics



Human-centric dashboard and digital services

Multi-modal communication between human and robot in production logistics





https://youtu.be/UMXTBVSZw_A

Next steps

- Increase automation in material handling
- Cost effective solutions for brownfield manufacturing sites
- Adapt dynamically to changes in the factory floor
- Smart product-service-software systems
- Adopt a value-driven approach

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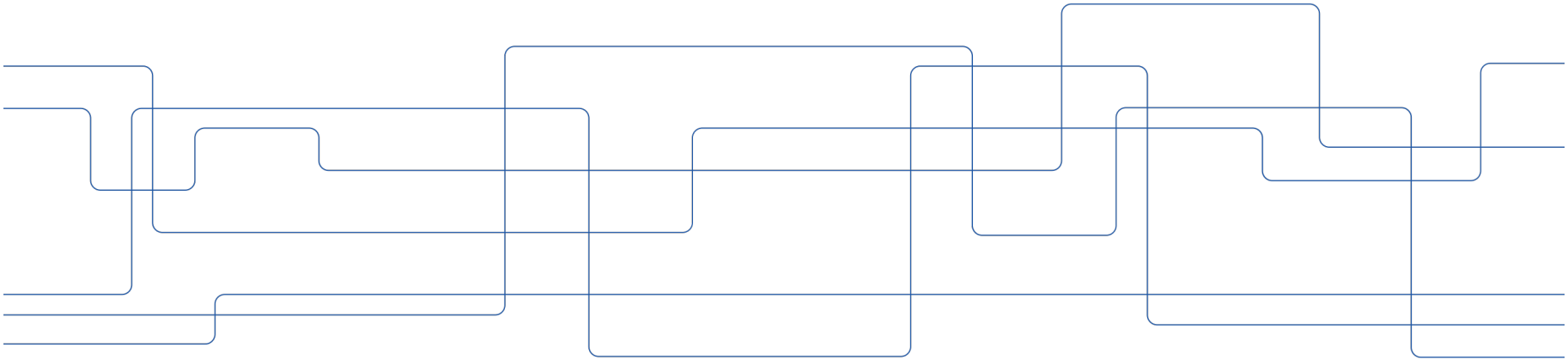
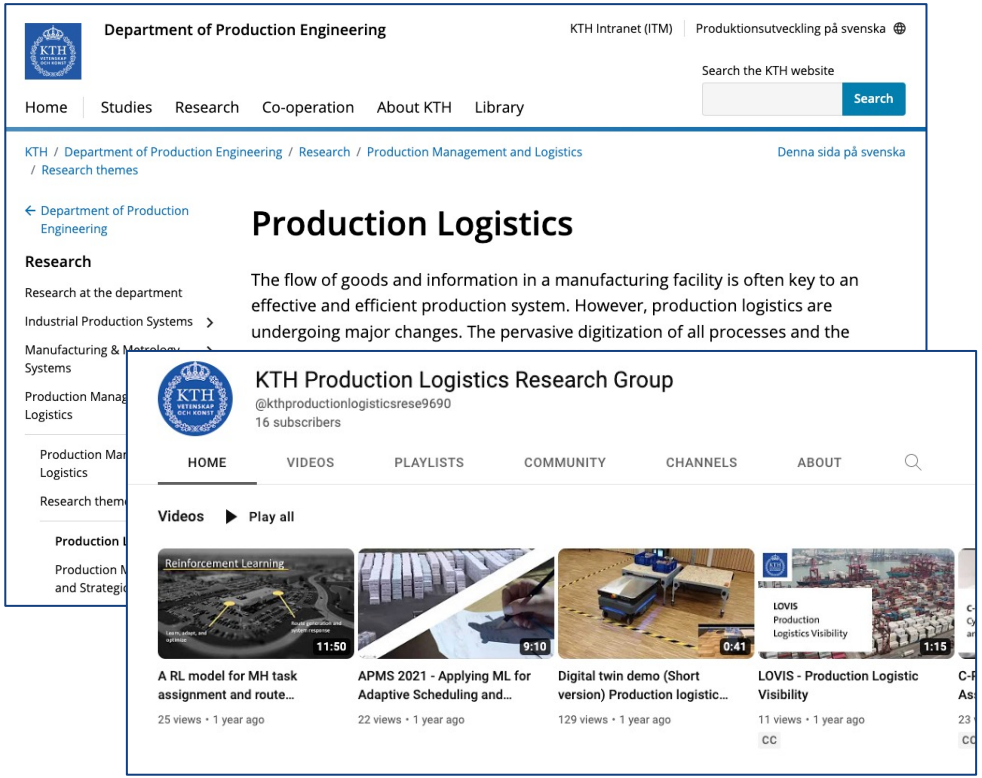
Would you like to know more?

Visit out website!



KTH Production Logistics Research Group



Web page

YouTube Channel

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Any questions?

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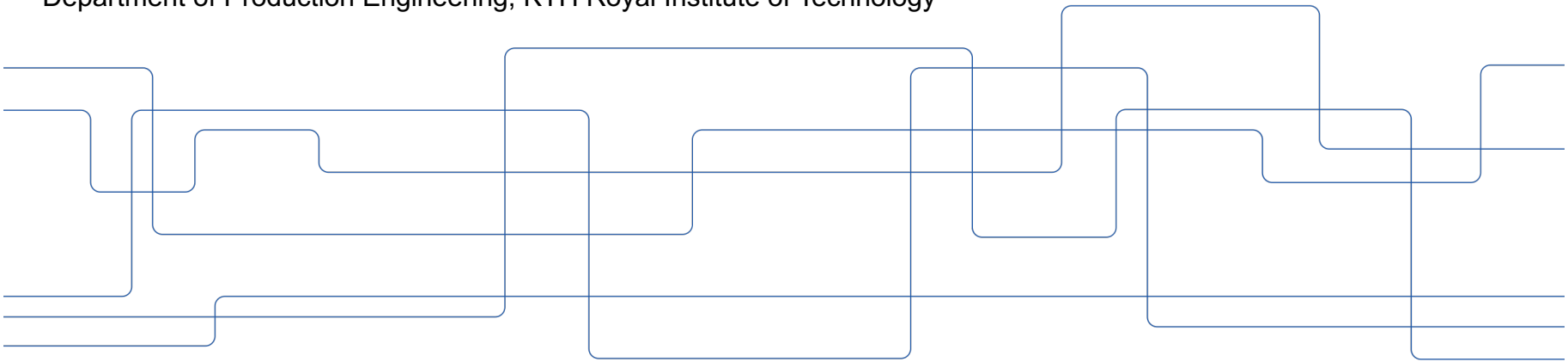
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