HARTU
From Automation to Collaboration: Designing Human-Centered Industry 5.0

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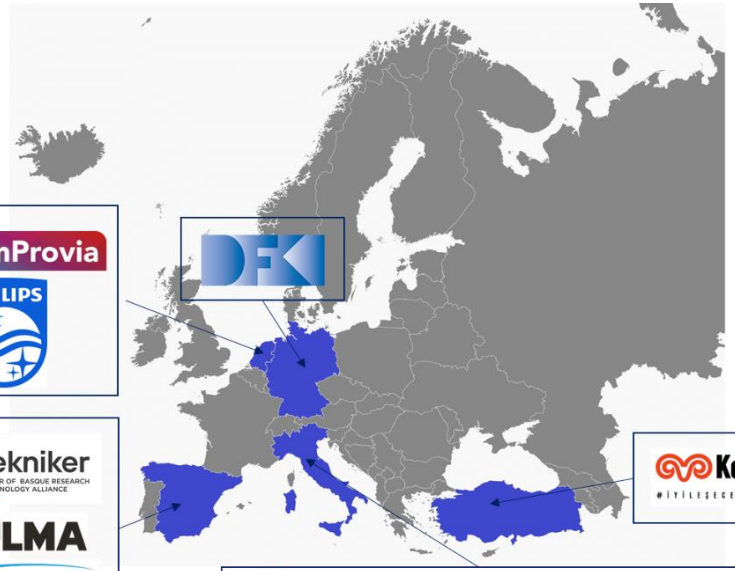
HARTU

Handling with AI-enhanced Robotic Technologies for flexible ManUfacturing

Funded by the European Union

The Manufacturing Partnership Days 2025

HARTU



Partner	Main Role
DFKI	Programming from demonstration; Assembly
FMI	System Integrator
AIMEN	Sensor development; Pose estimation
OMNIGRASP / POLIBA	EA based sensor development; EA based soft gripper
ITRI	Fixtureless assembly
ENGINEERING	Reference architecture; Software quality guidance and assessment
DEEPBLUE	User acceptance and adoption, new skills and compliance with ethics and liability/legal aspects
PHILIPS, TOFAS, ULMA, TCA, INFAR	Industrial end-users
TEKNIKER	Grasping and release processes; Perception (segmentation); Application development tool; Project Coordination

PROJECT DURATION: 01/01/2023 - 31/12/2025

HORIZON-CL4-2022-TWIN-TRANSITION-01-04:
Intelligent work piece handling in a full production line (Made in Europe Partnership) (RIA)

Budget / Funding: 5.926.988 EUR

HARTU

PROJECT IN A NUTSHELL

HARTU is an industry-led research project addressing the main challenges of part handling in the manufacturing lines, including gripping, assembly and placement, using **innovative and AI-enhanced technical approaches.**

The project will apply innovative techniques in industrial case studies to develop tools capable of handling a wide range of products in terms of shape, material and size, enhancing the **flexibility**, **reconfigurability** and **efficiency** of production lines.

OBJECTIVES

Techno-industrial:
Automated grasping

Techno-industrial:
Contact-rich assembly

Techno-industrial:
AI-based visual handling

Techno-industrial:
Electro-active soft grippers

Techno-industrial:
Optimised handling systems

Societal:
Human-AI teaming

Human oversight but…

Uber Self-Driving Crash

Context: 2018, Uber tests autonomous cars in Arizona. One vehicle hits and kills a pedestrian.

Problem:

- AI identified obstacle but misclassified it
- System chose not to brake
- Human supervisor was distracted

(one) Take home message:

Autonomous systems must include reliable human oversight and be designed with safety margins and accountability mechanisms. Safety must be built into the design.

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… keep preserving human dignity and health, and…

Amazon's Warehouse Automation

Context: Amazon introduces robots to improve logistics speed and accuracy.

Problem:

- Increased worker stress and injury
- Constant monitoring by algorithms
- Reduced autonomy and well-being

(one) Take home message:

Automation should enhance, not undermine, human work conditions. Balance between efficiency and well-being is essential.

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… always design for people

Olders and Care Robotics in Japan

Context:
Japan invests in social robots to support aging population.

Problem:
- Low acceptance by elderly users
- Lack of emotional connection

(one) Take home message:
Adoption depends on trust, culture, emotional value, and simplicity, not just functionality. Technological functionality is not enough: empathy, simplicity, and emotional value drive real-world adoption.

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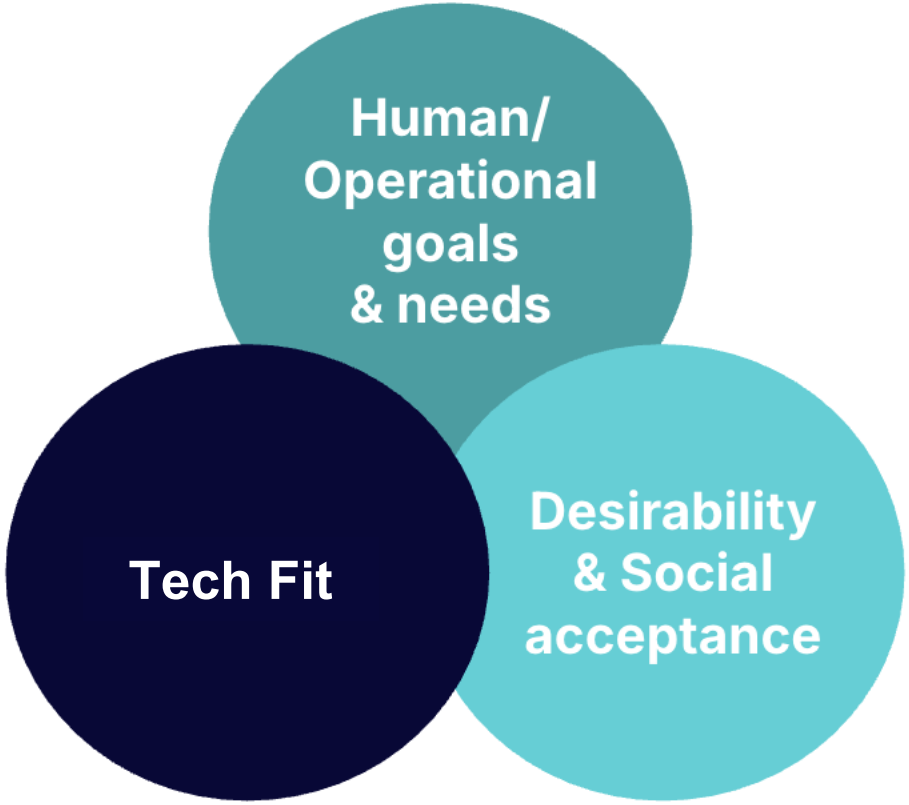
A human perspective while designing automation

Human-centred approach: starting from users' needs in the workplace, strenghts and limitations.

Analysis of how technology changes human activity doing the same job with an automation,e.g. a digital assistant, a robot, is not "doing the same job".



CHALLENGES AND NEEDS

LEARN AND CONTROL CONTACT-RICH ASSEMBLY SKILLS

IDENTIFICATION OF FEASIBLE GRASPING POINTS

RECOGNITION OF DIFFERENT TEXTURES, SHAPES, AND MATERIALS

MONITORING AND LEARNING AI-SYSTEM

CREATION OF VERSATILE AND DEXTEROUS SOFT GRIPPERS FOR DIFFERENT MATERIALS AND PARTS

TECHNICAL STUDIES

COLLECTING USER NEEDS AND REQUIREMENTS

ADAPTING THE WORK PROCESSES TO NEW TASKS AND PROCEDURES

MAPPING COMPETENCIES AND SKILLS REQUIRED TO OPERATE WITH NEW SYSTEMS

USER-RELATED STUDIES

SOLUTIONS

GRASP/RELEASE OPERATION AND PLANNING

VISUAL PERCEPTION

HUMAN-AI TEAMING MODEL

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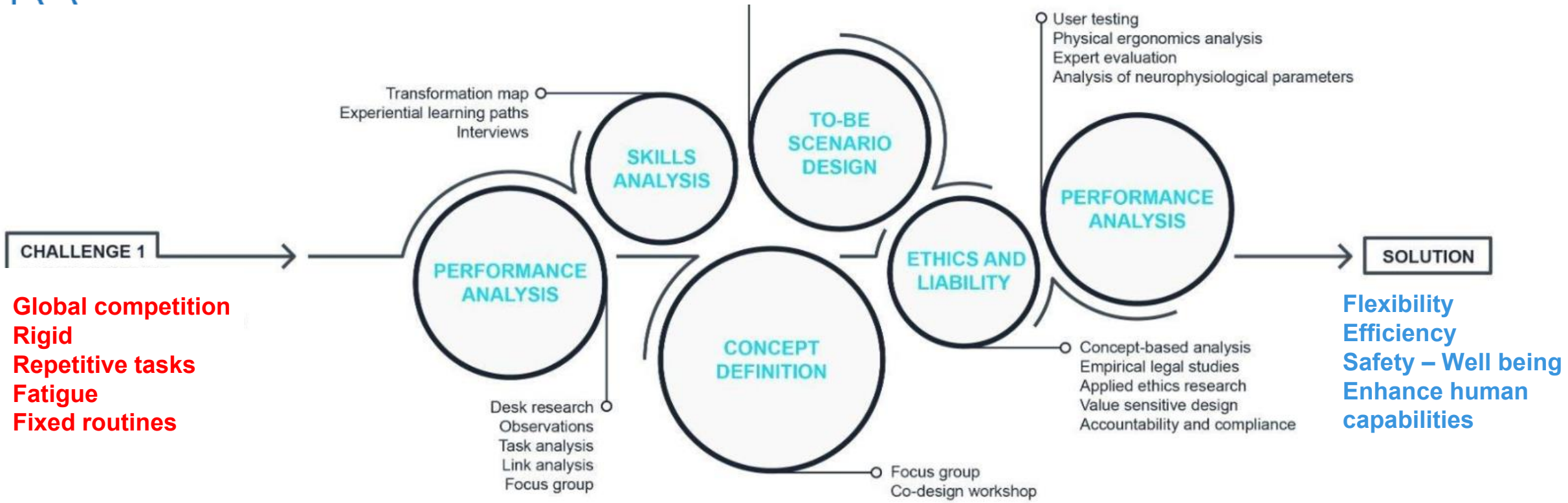
SOFT GRIPPERS WITH ELECTRO-ACTIVE FINGERTIPS

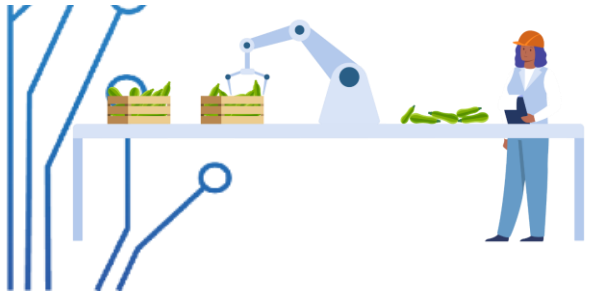
TACTILE/FORCE PERCEPTION

CONTACT-RICH ASSEMBLY OPERATION

INDUSTRIAL APPLICATIONS

A human perspective in HARTU





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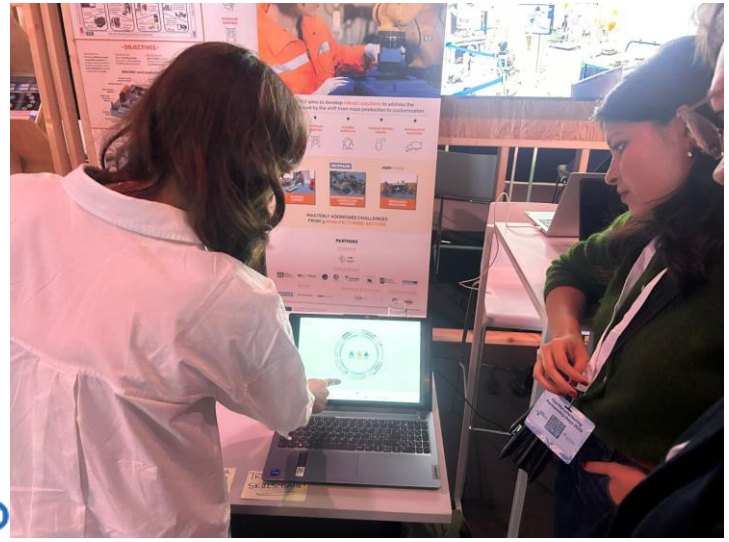
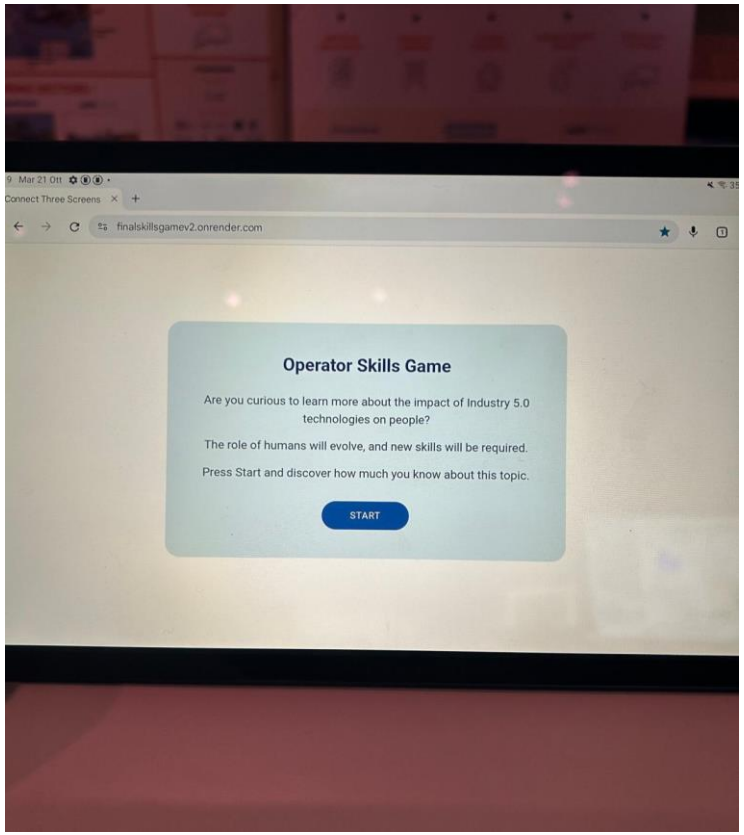
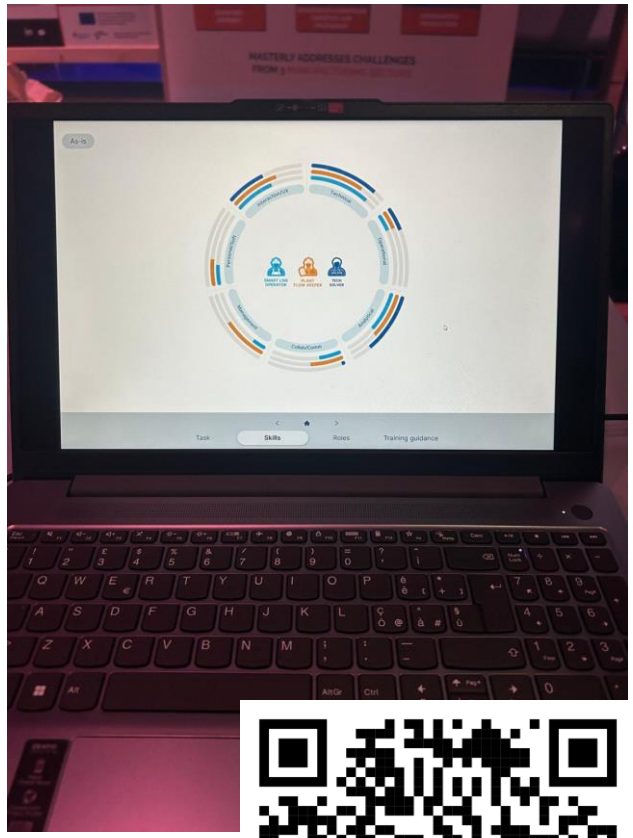
VIDEO

Visit our Booth at EFFRA (first alley)







Thank you for the attention

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