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EARASHI Open Call#1 Description of the 10 Challenges

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EARASHI is an EU project funded by Horizon Europe under GA 101069994

EARASHI Open Call objectives

- Through Financial Support to Third Party for 10 Application Experiments dedicated to the production machines/tools application field, EARASHI will support the industry, especially SMEs, in the uptake of advanced digital eco-responsible technologies (in particular **AI, data and robotics**).

- These technologies will **support workers in their daily activities and improve their working conditions** (safety, health and well-being) leading to a productivity increase.

- EARASHI adopts a **worker-centric** approach by considering worker well-being and health at work (e.g., Musculoskeletal Disorders (MSD) and stress), design thinking methodology of production machines, worker acceptance, and ethics.

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EARASHI Open Call expected outcomes

- **Human Centricity**
  - Decrease the number of workers that perceive stress at work, the number of accidents at work, and the number of workers already suffering from MSD.
  - Increase the number of Robot Operating System (ROS) -users
  - Improve trust in AI, Data & Robotics (ADR) (implementation of ADR in manufacturing)
- **Sustainability**
  - Machine retrofit and refurbishment
  - More Integration of Life-Cycle Analysis
  - Standardized, easy, non-hazardous dismantling processes shortened in time and costs.
- **Economics**
  - 20 products with 1 commercialization plan for the robotic company and 1 for the technology providers.

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EARASHI Open Call#1 - 10 challenges

- **10 challenges**
  - The submitted projects should respond to one of the 10 challenges assessed by EARASHI external advisory board involving pan-European industrials with different profile and involved in various application domain markets.
  - For each challenge, we provide
    - One use-case
    - Associated challenges
    - An example of solutions
    - Proposal of available competencies within EARASHI consortium: building blocks and services
- **Recommendations**
  - It is reminded that every proposal should involve the implementation of one EARASHI building-block (described in the Building block portfolio)
  - The services and their uses are detailed in the Coaching service catalogue

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Open Call # 1

10 Challenges

CHALLENGE 1: Mobile robotic assistance for repetitive tasks

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Related Pain point

#Health

#Hiring

Description of the use case

Repetitive tasks on the production lines face several stakes: time consumption, fatigue, difficult tasks for older people and human error, possibly leading to accidents and absenteeism. Smaller businesses do not invest in a full robotic line and could benefit from a versatile solution which could be implemented anywhere in the factory when and where needed.

Associated challenges

- Trained workers to implement robotic assistance within shopfloors
- Acceptance of workers
- Time required for set up
- Quality Insurance
- Safety of workers, accident and absenteeism reduction
- Risk assessment at the implementation phase
- Human-robot collaboration Engineering
- Flexibility and autonomy leveraging on AI
- Productivity Increase

Example of an existing solution

A company has developed a solution that inserts up to 6 screws in a minute, assisting factory workers with the screwing process.

Available Competences within EARASHI

Building Block

- **BB5** (ikerlan) ROS based control platform
- **BB11** (Flanders Make) Sensors toolbox for autonomy
- **BB21** (Flanders Make) Skill based AI-enabled robot programming
- **BB8** (Flanders Make) Computer Vision
- **BB12** (Flanders Make) Mixed Reality
- **BB1** (c2a) Stress observer
- **BB2** (ST) Montor control SW dvlpt kit
- **BB3** (ST) AI solutions

Service

- Engineering System Integration
- Human centric design
- Business coaching
- Cybersecurity

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CHALLENGE 2: Robotic assistance for heavy duty

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Related Pain point

#Health

#Hiring

Description of the use case

On the same line as repetitive tasks on the production lines, heavy duty often lead to health & productivity issues. In terms of health, musculoskeletal disorders are long term consequences on the heavy duty workers which lead to a decrease in productivity and a low attractivity in hiring. The risk of accidents is also high. A robotic assistance can decrease the risks on the workers and give them more time focus on more added value tasks.

Associated challenges

- Limitations and capabilities of exoskeleton and other cobots technologies
- Reduction of time required for the task achievement
- Safety of workers, accident and absenteeism reduction
- Acceptance of workers
- Quality Insurance
- Human-robot collaboration Engineering

Example of an existing solution

A company has developed a solution based on ants: associating robots cooperating to carry loads basing their cooperation on the number, the size and the weight of the loads.

Available Competences within EARASHI

Building Block

- BB16 Deep learning
- BB10 Explainable AI
- BB11 Sensors toolbox for autonomy
- BB5 ROS based control platform
- BB1 Stress observer
- BB17 Deflectometry
- BB21 Skill based AI-enabled robot programming
- BB6 MBD Simulation
- BB18 Fuzzy logic-based modelling
- BB15 ADAPT

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CHALLENGE 3: Machine/tools for recycling goods, electronics, batteries

Related Pain point #Decarbonization #SupplyChain #Sovereignty

Description of the use case

Recycling practices and recycled materials are more and more implemented in different value chains. Recycled components are often **not competitive**. **Efficient and cost-effective** recycling requires solutions to **sort and separate wastes** as well as recycling processes limiting human intervention and exposition to hazardous compounds.

Associated challenges

- Low uniformity of the different types of wastes, requiring complex algorithms
- Waste recognition efficiency and speed, supported by AI
- Versatile grippers to pick mixed items
- Productivity of automated sorting/recycling systems
- Cost-effectiveness compared to new products/components
- Human intervention limitation

Example of an existing solution

Several recycling companies have implemented computer vision associated with AI to make waste identification more efficient.

Available competencies within EARASHI

Building Block

- **BB8** Computer Vision
- **BB9** Operator guidance recom.
- **BB5** ROS based control platform
- **BB21** Skill based AI-enabled robot programming
- **BB11** Sensors toolbox for autonomy
- **BB1** Stress observer
- **BB18** Fuzzy logic-based modelling
- **BB16** Deep learning based method.

Service

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CHALLENGE 4: Digitalization procedure for production tools & machines for industry 5.0

Related Pain point

#Sovereignty

Description of the use case

Industry 5.0 builds on lessons learnt of Industry 4.0, implementing sustainability, human centrism and resilience in supply chains, and focusing less on the financial benefits. To ensure the shift on the shop floor, the digitalisation needs to be thought of differently and implemented with care.

Associated challenges

- Sustainability description in algorithms/model
- Worker's health and emotional assesments
- Human factor description in algorithms/model
- Accuracy and quality of digitalization models
- Identification of the ideal data flow through various shopfloor systems and production equipment
- Standardized interface(s) for connectivity of assets

Example of an existing solution

A number of solutions offer a digital twin of factories. It is limited to visualisation, how to enter the Human in the digital twin is less clear;

Available competencies within EARASHI

Building Block

- **BB8** Flanders Make — Computer Vision
- **BB13** Flanders Make — Predictive maintenance
- **BB14** — Data operationalization
- **BB7** Ikerlan — Digitization solutions
- **BB20** — Multi-Layer Stream Mapping

Service

- **SERVICE** Engineering System Integration
- **SERVICE** Human centric design
- **SERVICE** Eco-design
- **SERVICE** Cybersecurity

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CHALLENGE 5: Workers' stress monitoring and assistance to limit work-related stress

Related Pain point

#Health

Description of the use case

Modern manufacturing processes are **stressful,** and require maximum concentration. The employee **attention** who is working with the complex equipment should be focused on what is happening, and the **multifunctionality of the control** panels is increasing every year.

Associated challenges

- The right information reaching the right person at the right time, limiting the amount of data
- Worker's acceptance
- Guidance of workers via HMIs
- Adaptative user interface
- Safety of workers, accident and absenteeism reduction
- Mixed Reality
- Automated fatigue and stress assessments

Example of an existing solution

Speech recognition technology will help to transfer many of the required commands into the oral type, which will drastically reduce the risks of emergency messages and increase the efficiency and speed of work.

Available competencies within EARASHI

Building Block

- **BB1** Stress observer
- **BB8** Computer Vision
- **BB12** Mixed reality for operators
- **BB9** Operator guidance recom.

SERVICE Engineering System Integration

SERVICE Human centric design

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CHALLENGE 6: Collaboration between AI and Human supervisors to solve complex problems

Related Pain point #Sovereignty #Hiring

Description of the use case

Today, using AI is a commonplace. It allows companies to use their existing software to analyze the vast amount of data they routinely collected. However, it is today solely focused on machines and tools. There is now a need to implement an AI supervision process applied to the whole process to bring data to all machines and conclusions to the entire product.

Associated challenges

- The right information reaching the right person at the right time
- Model and algorithms accuracy
- Insurance of data quality. Automatic recognition of possibly flawed data.
- How to make AI & Robots the assistant to human operators & not the opposite?
- Automatic generation of alternative solutions for a problem
- Increase in Overall Equipment Effectiveness (OEE)
- Tracking problem issues
- Make AI calculation outcomes accessible and readable to operators

Example of an existing solution

A company has developed a platform to automate what the best human supervisor would do if they were everywhere in a factory.

Available competencies within EARASHI

Building Block

- **BB17** Deflectometry
- **BB10** Explainable AI
- **BB23** Manual Task Recognition
- **BB11** Sensors toolbox for autonomy
- **BB8** Computer Vision
- **BB13** Predictive maintenance
- **BB16** Deep learning based method.
- **BB7** Digitization solutions

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CHALLENGE 7: Human-centric robotic assistance for assembly work cell

Related Pain point

#Health

Description of the use case

The assembly of **small systems** causes **posture problems** leading to **mental and physical fatigue** as well as **musculoskeletal pain** in the long term. Complexity and dexterity make **humans essential assets** for these manufacturing processes. Collaborative solutions are needed to improve working conditions and efficiency.

Associated challenges

- Detection of when and where the operator has issues
- Safety of workers, accident and absenteeism reduction
- Acceptance of workers
- Human-robot collaboration Engineering
- Human tasks reduction
- Bringing the right item at the right place at the right time
- Sensibility of Algorithms in Robots

Example of an existing solution

Cobots that will handle the right items to the operator to limit its movements.

Available competencies within EARASHI

Building Block

- **BB23** Manual Task Recognition
- **BB1** Stress observer
- **BB12** Mixed reality for operators
- **BB15** ADAPT
- **BB18** Fuzzy logic-based modelling
- **BB8** Computer Vision
- **BB9** Operator guidance recom.
- **BB21** Skill based AI-enabled robot programming
- **BB5** ROS based control platform
- **BB2** Montor control SW dvlpt kit
- **BB3** AI solutions

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SERVICE Human centric design

SERVICE Cybersecurity

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CHALLENGE 8: Automation for the optimization of intra-factory logistics

Related Pain point

#Sovereignty

#SupplyChain

Description of the use case

Improvements and automation in intralogistics would allow the **optimization of the incoming flow for machines and work cells**, and more globally optimize operations at the shopfloor level, including stocks and ERP management. Such solutions would **support operators** in supplying the machines or accessing the right tools to achieve their tasks.

Associated challenges

- Items and good flow optimization
- Algorithms/model for flow optimization
- Fleet management
- Reduction of operator travel/movements
- Simultaneous Localization and Mapping algorithms
- Handling systems optimization

Example of an existing solution

4.0 work cells equipped with multiple connected and ergonomic objects. Guaranteeing optimal quality, traceability and productivity of operations.

Available competencies within EARASHI

Building Block

- **BB11** Sensors toolbox for autonomy
- **BB8** Computer Vision
- **BB5** ROS based control platform
- **BB15** ADAPT
- **BB4** IIoT connectivity

SERVICE Engineering System Integration

SERVICE Cybersecurity

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CHALLENGE 9: Enhanced digital planning to optimize the execution of the tasks of production operators

Related Pain point #Health #Hiring

Description of the use case

With the increase of robotic assistance on the shopfloors and digitization of production lines, factory workers are often confronted with working several machines. Enhanced digital planning need to provide real time data to factory workers and directly update the machines tasks to increase productivity.

Associated Challenges

- Impact of customer requests on planning
- Worker acceptance
- Worker feedback collection and implementation in algorithms
- Optimization of production according to different companies' divisions requirements. Connexions between MES and ERPs
- Increase in Overall Equipment Effectiveness (OEE) and productivity

Example of an existing solution

A company has developed solutions that provide instant visibility and intuitive decision support enabling companies to become more agile by exploiting supply chain complexity.

Available competencies within EARASHI

Building Block

BB9 Operator guidance recom.

BB14 Data operationalization

BB11 Sensors toolbox for autonomy

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SERVICE Cybersecurity

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CHALLENGE 10: Gamification of work tasks via the use of digital technologies (AI, Drone, AR…)

Related Pain point

#Hiring

Description of the use case

In times where recruiting is becoming challenging, manufacturers have to adapt their workplaces, make them more attractive, the work more engaging, and the time spent on the shop floor more impactful. Studies have shown a positive effect of gamification (smartphone based) on factory workers motivation and willingness to embrace their tasks. Companies with highly engaged employees tend to outperform those without engagement by 20%.

Associated challenges

- Gamification in a non fully digitized environment / Gamification as a driver for digitization
- Workers acceptance
- Training time reduction
- Increase in Overall Equipment Effectiveness (OEE) and productivity
- Workers' motivation stimulation
- Personalization of gamification for operators, depending on work task

Example of an existing solution

Some companies already develop gamification solutions to efficiently meet missions objectives and return on investment.

Available competencies within EARASHI

Building Block

- BB21 FLANDERS MAKE — Skill based AI-enabled robot programming
- BB12 FLANDERS MAKE — Mixed reality for operators
- BB8 FLANDERS MAKE — Computer Vision
- BB9 FLANDERS MAKE — Operator guidance recom.
- BB6 ikerlan — MBD Simulation

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