# EXPAI SmartIndustry

## Explainable AI for industrial efficiency

**To support Industry 4.0, the ITEA project EXPAI Smart Industry (Integrating robot systems, autonomous mobile robots, smart assets into smart control systems, and increasing productivity in production with AI for industrial areas) will provide a flexible, controllable digital environment supported by an explainable artificial intelligence (XAI) platform that will provide trustworthy decision-making through human-understandable explanations and comprehensive visualisation across various industrial domains.**

### Addressing the challenge

The emerging technologies of Industry 4.0 offer new business opportunities but face numerous challenges. Industrial assets like robotic and industrial software systems are increasingly complex, leading to 'black boxes' with limited insight into their internal work, especially when utilising AI for decision-making. This hampers flexible operations and increases maintenance costs. Furthermore, erroneous decision-making during Autonomous Mobile Robot (AMR) operation can cause significant incidents. Moreover, human-robot collaboration processes may also lead to unforeseen accidents. These challenges are not exclusive to AMRs but can manifest across any industrial process, including those involving traditional industrial robots, ultimately undermining the manufacturing industry's competitiveness.
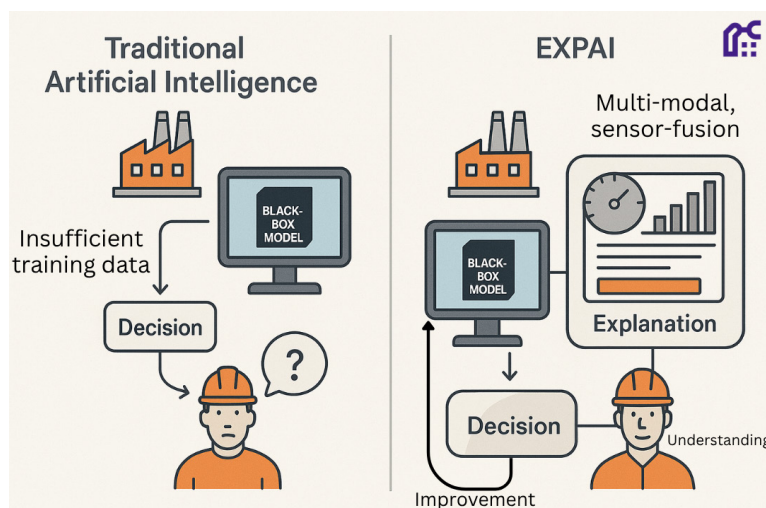
### Proposed solutions

To address these challenges, EXPAI Smart Industry will develop the open EXPAI Platform, which will use XAI to support a controllable, scalable and user-aware digital environment. Novel tools, toolchains and methods will also be created to enable effective, simplified and observable processes across use-cases on quality assurance, and reliable mobile robots through industrial data spaces. Regarding operational losses, the project will introduce prognostic health management algorithms and

applications, using XAI to make these technologies more accessible to industry. Safety and security issues in human-robot collaboration will also be mitigated using XAI-based risk assessment and impact-based risk detection models to verify and validate industrial robotic



systems, AI algorithms and lidar sensor/vision technologies. For energy efficiency, XAI optimisation algorithms will be demonstrated and utilised within decision support systems in the platform. Overall, this will result in advanced solutions for robotic applications, increased manufacturing productivity, and proactive anomaly detection using sensor data from large-scale machines and mobile robot systems.
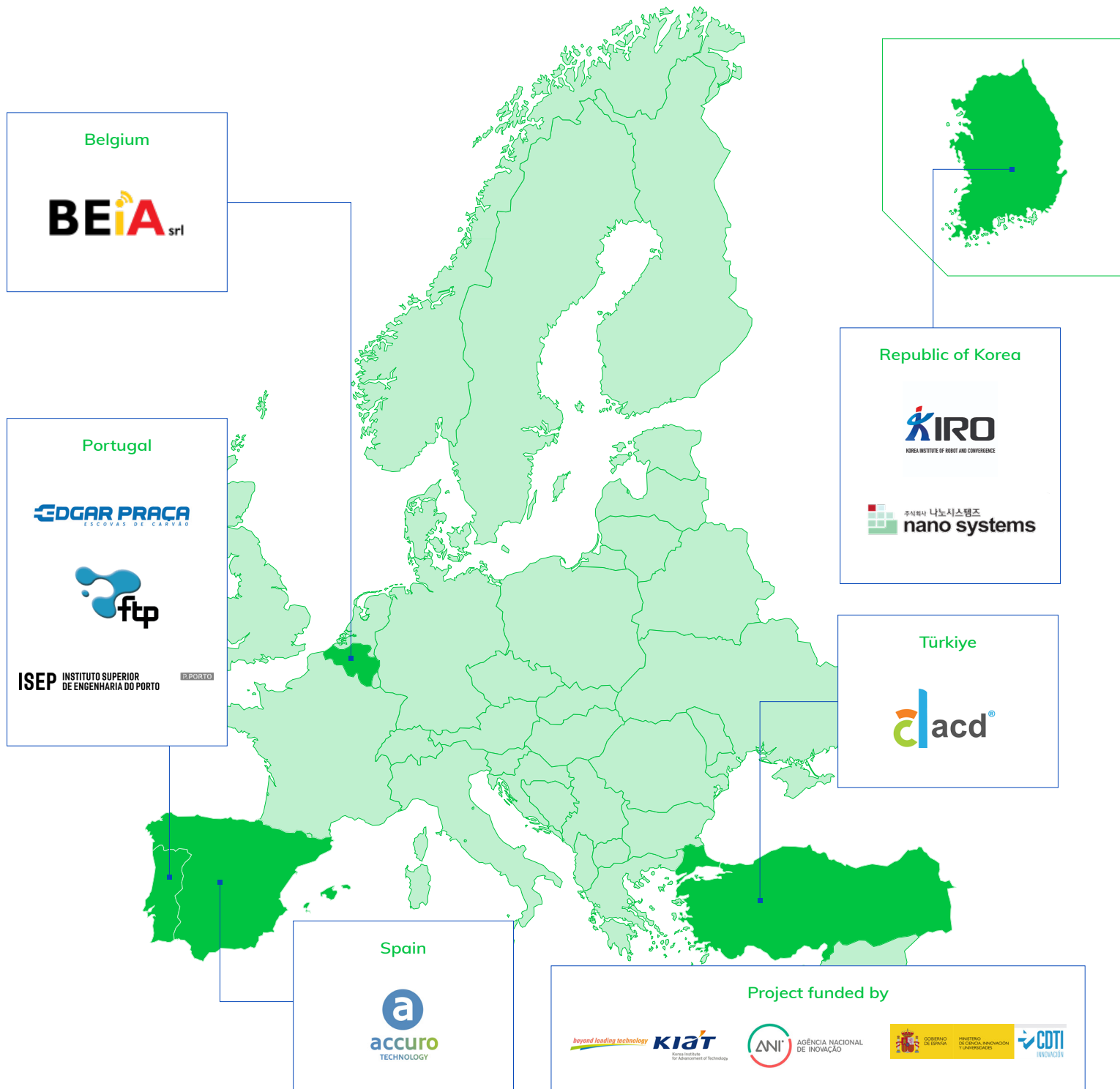
### Projected results and impact

Today, over 85% of costs across a facility's lifecycle are spent on operations and maintenance and as much as 50% of maintenance problems are caused by human factors. Industry 4.0 technologies aim to reduce these issues while boosting productivity – but must be manageable and understandable for serious uptake. This is the ultimate aim of EXPAI Smart Industry, through which users can expect to operate safer and more efficient workspaces. For instance, the project's mobile robots will be able to function independently of human operators for over ten hours, while its

AI and optimisation algorithms are expected to improve material handling and retrieval efficiency by 50% and increase revenue by 5%. Cost savings will be further compounded by the project's energy efficiency AI algorithms, which are expected to improve energy efficiency by 10% compared to initial conditions per application. With such developments, the consortium stands to be more competitive in a number of fast-growing domains and to help Industry 4.0 meet its full potential.

# Project partners

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**Project start**
June 2023

**Project leader**
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**Project website**
https://itea4.org/project/expai-smartindustry.html

**Project end**
June 2027

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