BMW
UPDATE

Adra
The AI Data Robotics Association

A United Community of Excellence

- **Single point of contact:** Adra is the EC's primary partner for advancing AI, data, and robotics R&I in Europe

- **Integrated Network**: Connecting AI, Data & Robotics expertise across Europe

- **Multi-Stakeholder Collaboration**: Industry + Research + Academia + Government

- **Research Excellence**: Europe's top minds in ADR technologies

- **Industry Bridge**: Transforming research into market solutions

- **Geographic Reach**: Active presence across Member States

- **Rapid Mobilisation**: Ready expertise for strategic initiatives

AI, Data and Robotics public-private partnership (2021-2030)

European Commission
Public Side

Co-Programmed
Partnership

Adra Association
Private Side

The AI Data Robotics Association

Sovereignty
Secure European autonomy in AI, Data & Robotics

Industry
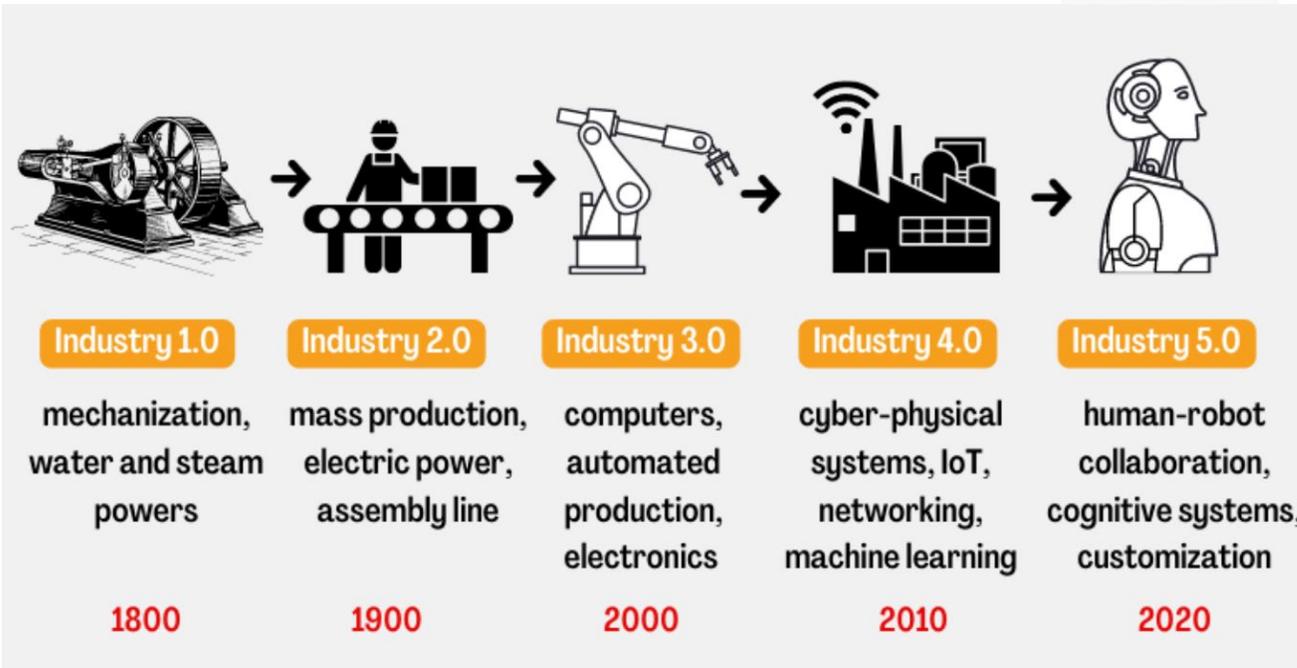Boost competitiveness through digital & green transformation

Research
Achieve global research excellence

Social Impact
Drive solutions for climate, health, energy & security

Industry 1.0 — mechanization, water and steam powers — 1800
Industry 2.0 — mass production, electric power, assembly line — 1900
Industry 3.0 — computers, automated production, electronics — 2000
Industry 4.0 — cyber-physical systems, IoT, networking, machine learning — 2010
Industry 5.0 — human-robot collaboration, cognitive systems, customization — 2020

- **Industry 5.0: From Digitization to Human-Centered Innovation**
- **Alignment with European Value**
- **Frameworks for European Sovereignty**
- **Optimizing AI Systems**
- **Bridging the Machine-to-Human Gap**

Precisely fine-tune models for specific, real-world tasks.
Enable rapid learning from just a few examples.
Deeply personalize user experiences. And critically, **steer AI** towards safe, ethical, and meaningful interactions.

This makes AI development more efficient, more sustainable, and fundamentally more aligned with our values.
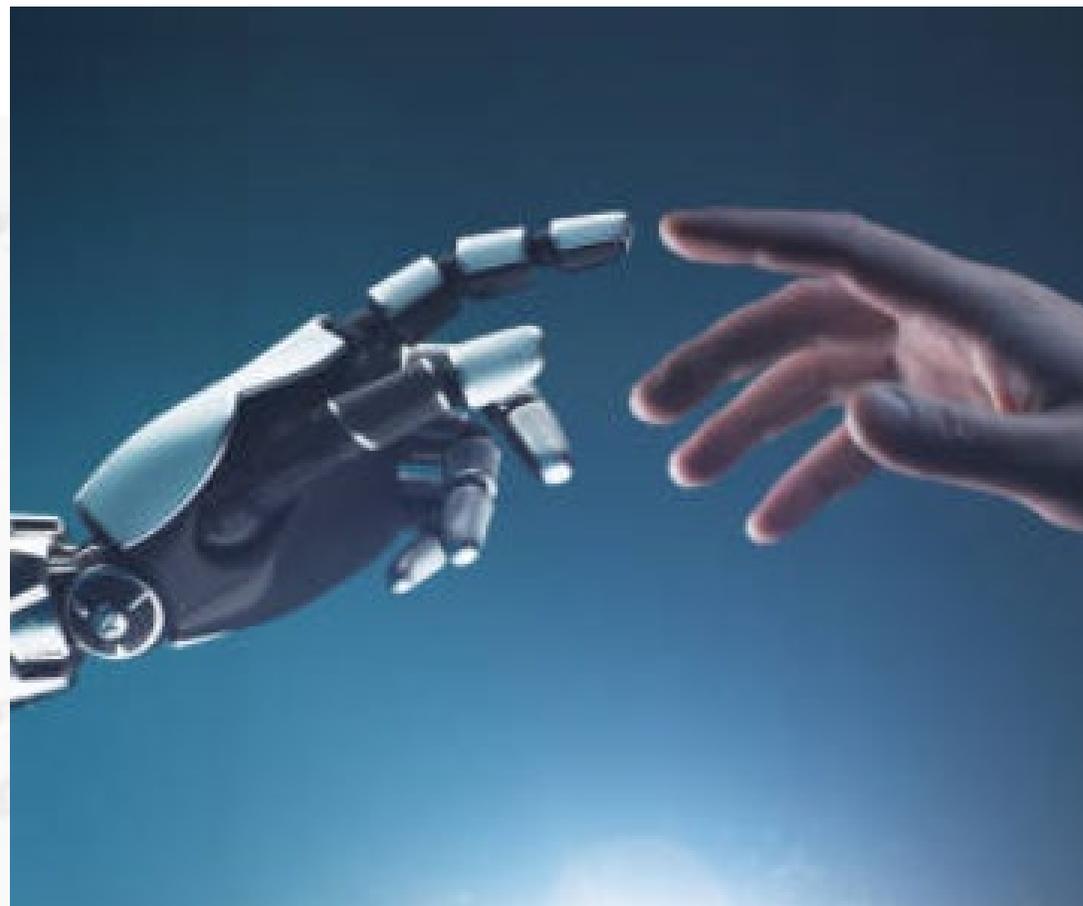
2.2. Robotics

With more than 90.000 industrial robots installed in 2023 and more than 400 service robotics producers, Europe stands at the forefront of the robotics revolution, the "physical AI". Building on excellence in mechatronics, sensors and microcontrollers, the integration of AI will enable EU developers to bring about a range of innovations, from cognitive robots to autonomous drones, with wide ranging impacts in manufacturing, healthcare, agriculture, defence, etc. The EU is particularly strong in industrial robotics, where collaborative robots (also called "cobots") enable safe and efficient human-robot interaction, help ease labor shortages and reduce workers' exposure to tedious or hazardous tasks. However, the further development of robotics through integration of generative AI and the uptake of European solutions are a must if the EU wants to continue leading innovation in this segment.

To support AI uptake in the robotics sector, the Commission will:

- **establish a Catalyst for the uptake of European Robotics**, bringing together developers and user industries to accelerate the development and uptake of European solutions replying to market needs. This will be done in collaboration with the AI Data and Robotics Association[21]. In this context, the Commission will fund the **development of sectoral Acceleration Pipelines for the adoption of AI-powered robotics,** focussing on high-impact use-cases, prioritised in close collaboration with end-user industries, ensuring that innovation aligns with real-world needs.

- **For an AI to become truly robust it needs to encounter physics**

- **The data a robot gathers is grounded in nature and cause and effect.**

- **The physical world is a 'forcing function' for trust.**

- **Ensuring tangible economic and societal value.**

Human-Machine Interaction (HMI) – technical challenges

Understanding Human Behavior - requires advanced machine learning, natural language processing, computer vision technologies

**Real-Time Interaction -** high computational power and efficient algorithms

Multi-Modal Communication – seamlessly integration is a significant challenge

Safety and Ethics - reliable safety protocols and ethical guidelines to prevent harm and ensure respectful interactions

Adaptability - challenging to achieve, especially in dynamic and unstructured environments

Data Annotation and Analysis - automated data annotation is essential for progress in this area

Social Context Understanding – Recognizing social cues and norms, which can vary widely across cultures and situations
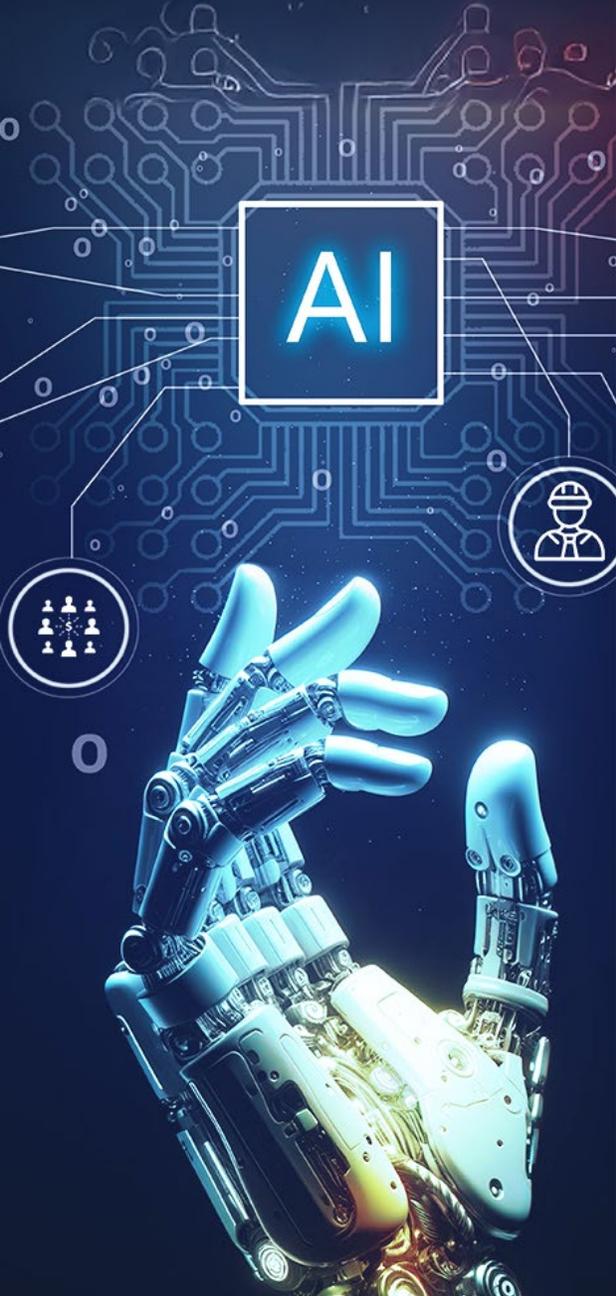
The Virtual Gigafactory: Zero-Risk Agility via Digital Twins

No Production Downtime: Engineers in facilities no longer need to shut down lines to physically prototype switches between battery formats.

AI-Driven Technology: Instead of physical testing, they utilize **AI-driven Digital Twins** to analyze terabytes of historical pressure and temperature data.

Virtual Robotic Training: The system virtually trains multi-agent robotic systems to handle new solid-state chemistries.

Cost & Risk Reduction: All validation and training occur before a single physical machine is purchased.
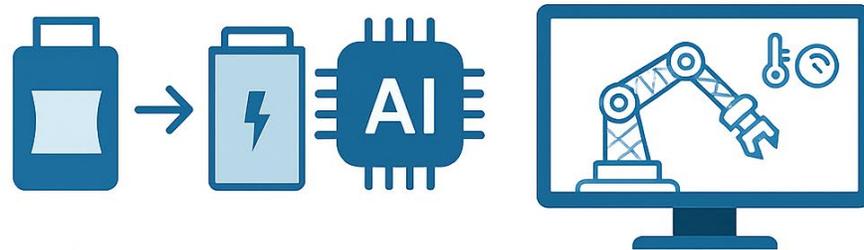
Key Impacts:

Agility:
Seamless transition between cell formats and supply lines.

Efficiency:
Non-destructive testing and zero-downtime retooling

Human-Centric:
Reduces high-pressure physical troubleshooting; elevates engineering roles

"Zero-Defect" Production via Sighted Cobots

•**"Sighted" Automation:** To prevent thermal runaways caused by micrometer-level misalignments, robotics companies are replacing "blind" robots with intelligent systems.

•**Tech Fusion:** By combining **Collaborative Robots (Cobots)** with **AI-driven Computer Vision**, manufacturers can detect microscopic defects in real-time.

•**Intelligent Division of Labor:** The system acts as a safety shield where the Cobot handles materials while the AI instantly pauses operations to flag anomalies.

•**Workforce Elevation:** This approach transforms workers from repetitive machine tenders into strategic **Quality Assurance Analysts**, ensuring zero-defect output and supporting work quality.
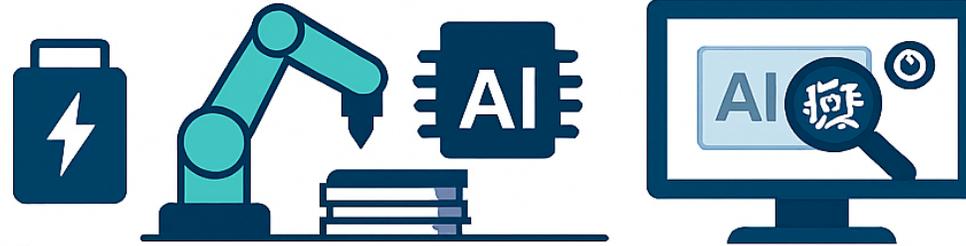
Key Impacts:

Precision:
AI detects sub-millimeter defects invisible to the tired human eye

Safety:
Preventts short-circuit risks at the source (stacking/tab welding)

Human-Centric:
Automates monotony: humans intervene only for complex problem solving

Adaptive Demanufacturing & Material Recovery

- **Securing Supply Chains:** Facilities are transitioning from manual dismantling to fully autonomous Adaptive Demanufacturing to secure Europe's critical raw materials.
- **Data Integration:** Systems scan the EU-mandated Digital Battery Passport to instantly ingest structural blueprints and chemical histories of diverse battery packs.
- **Human-Like Intuition:** Reinforcement Learning guides robotic arms to "feel" their way through crashed or rusted units, dynamically adjusting torque and angle to handle seized bolts and adhesives.
- **Safety & Role Shift:** The process extracts Black Mass while keeping humans out of harm shifting workers to the safe remote orchestration of autonomous lines.
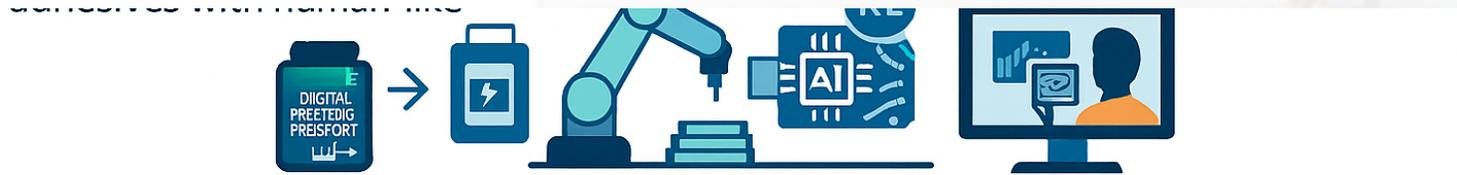
Key Impacts:

Circular Economy: Efficient recovery of lithium, cobalt, and nickel (Black Mass) from non-standard packs

Adaptive Intelligence: AI overcomes physical variability (rust/deformation) that breaks traditional automation

Human Safety: Removes workers from hazardous environments, transforms them into "System Orchestrators"

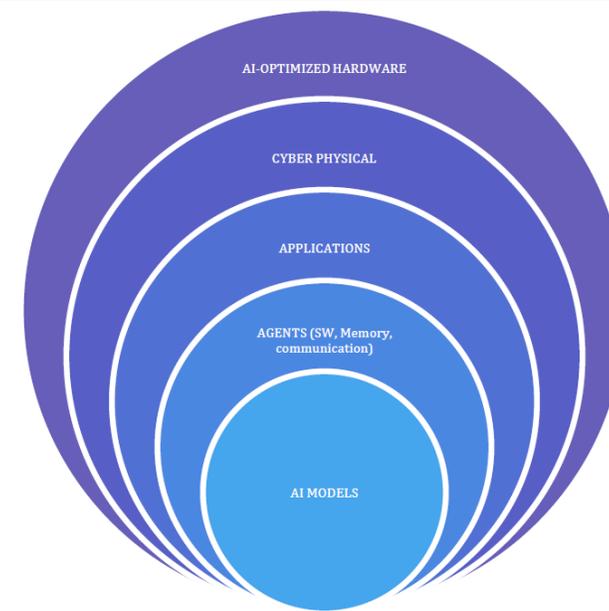# Leveraging Europe's Strengths for Leadership in Physical AI

Overcome the weak investment in market pull by translating Europe's research excellence into market leadership; Strengthening industrial competitiveness and securing technological sovereignty in the next frontier of AI converging with physical systems.

Not just digital transformation but mastering the digital-physical integration, leveraging Europe's Unique Advantage of Deep industrial heritage and world-class manufacturing and robotics base.

- **Create a High-Velocity Innovation Ecosystem:** Integrated and agile landscape where startups, SMEs, large industries, research institutions, work in a seamlessly orchestrated, mutually reinforcing manner.

- **Establish Leadership in Physical AI:** Secure a dominant European position in the strategic application of AI in the physical world, leverage the convergence of AI with robotics and other DeepTech; Ensure these human-centric systems are built on European data and reflect our values.

- **Drive a Fundamental Cultural & Financial Shift:** Move beyond the risk-averse mindsets that have stifled growth. Encourage academia to focus on value beyond research and motivate stagnant private capital to make calculated investments.

Outcomes: Sustainable economic growth and create a positive societal impact by fostering new high-growth industries, creating high-quality jobs, and deploying AI-powered solutions to address critical challenges in climate, health, and security.

AI-OPTIMIZED HARDWARE
CYBER PHYSICAL
APPLICATIONS
AGENTS (SW, Memory, communication)
AI MODELS

Europe's strategic vulnerability

ADRA & EC AI Office Roundtables

"Voice of the Industry End-Users"

While Europe possesses world-class research, we face a critical and widening **"Innovation-to-Leadership Gap."** This is not a one-sided issue; it is a systemic, **bi-directional failure**.

- We do not translate our scientific breakthroughs into market-dominating companies at the required speed. (research results fail market entry).

- Our industries are simultaneously failing to invest in and seek out game-changing innovation.

Current public frameworks in Europe suffer from:

- Fragmentation & Silos/Risk Aversion & Bureaucratic Inertia/Slow Funding Cycles (Mismatch with tech speed)/Flawed metrics

What is holding industry back?

- Industry wants solutions that work/High variability in workflows, product types, and production runs/ Data governance challenges/Solutions lack interoperability and modularity/ Fragile supply chains due to vendor lock-in and single point of failure
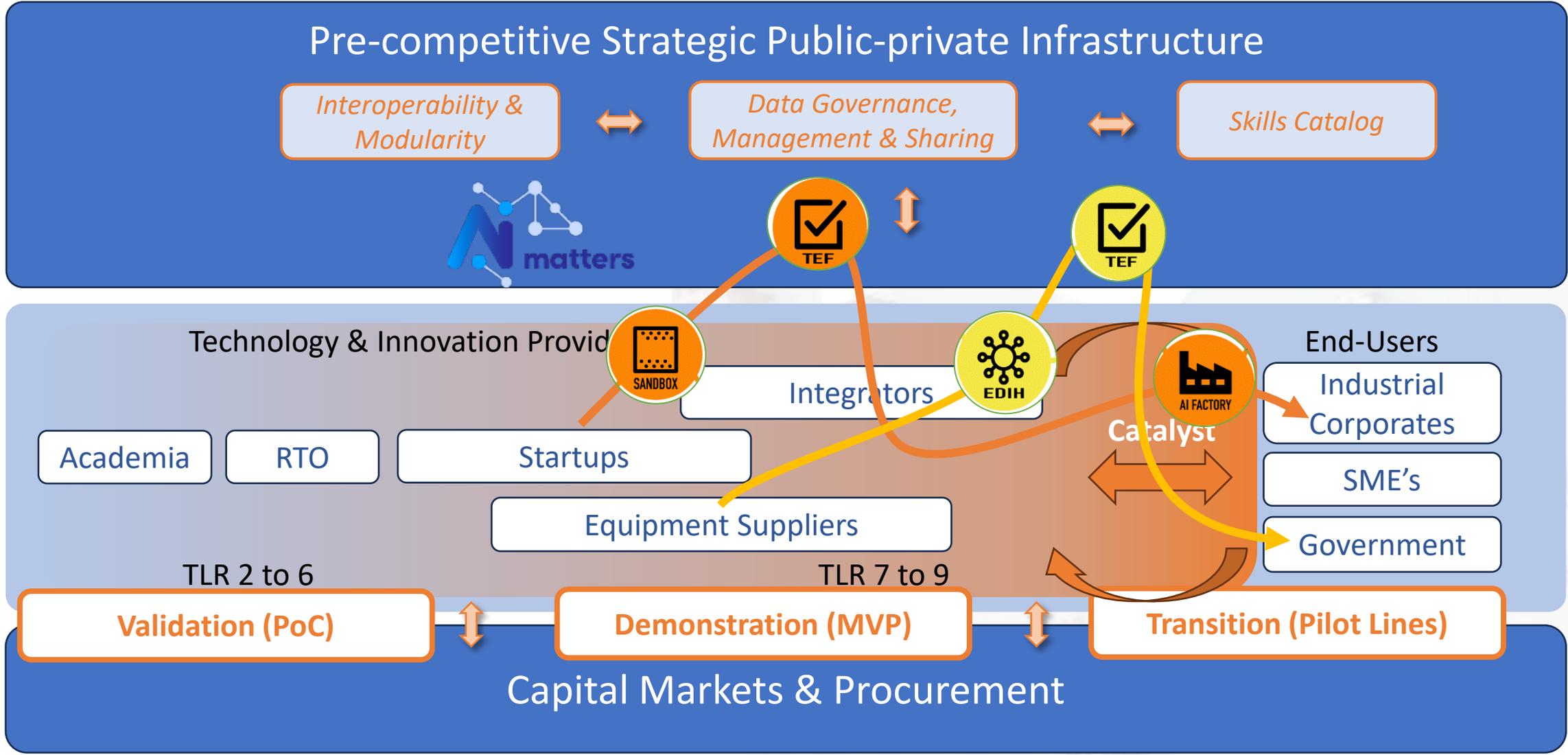
Outcomes

- **Aligning Innovation with Industry Needs**

- **De-risking Technology and Accelerating Validation**

- **Fostering Pre-Competitive Collaboration**

- **Accelerating Market Adoption and Private Procurement**

- **Maximizing Return on Public Investment**

- **Strengthening European Value Chains and Sovereignty**

- **Enhancing Global Competitiveness**

- **Incubating New "Made in Europe" Industries**

GET IN TOUCH

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Data Access & Compliance: Unlock the Data Union Strategy via secure, automated infrastructure.

- **Area 1 (RegTech):** AI tools for automated rule-drafting and reducing administrative red tape.
- **Area 2 (Data Fabric):** Automated curation and synthetic data generation secured by Post-Quantum Cryptography.
- **Goal:** Seamless, compliant cross-border data sharing.

Next-Gen AI Agents: Move beyond chatbots to "Frontier AI" with genuine agency.

- **The "Brain":** Large models (LLMs) that can reason, plan, and use tools autonomously.
- **Memory:** Systems that learn continuously (lifelong learning).
- **Collaboration:** Frameworks for multi-agent teams working together.
- **Goal:** Solve complex, multi-step real-world tasks without constant human hand-holding.

Apply AI – Challenge Boosters: - Spark innovation through high-stakes industry competitions.

- **Topic A:** Healthcare, Manufacturing, Autonomous Driving.
- **Topic B:** Aerospace, Pharma, Telecoms (Generative AI focus).
- **Goal:** Industry defines the pain point; innovators win cash to solve it.

The AI Data Robotics Association
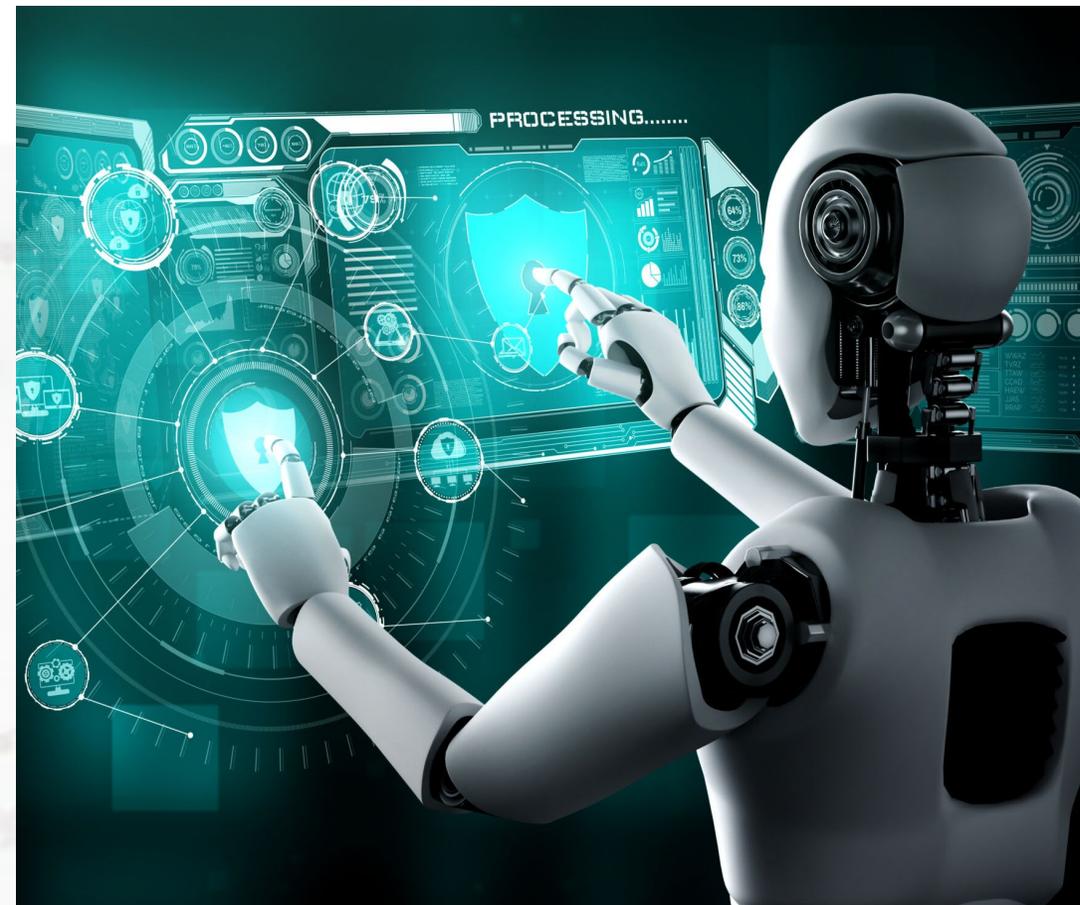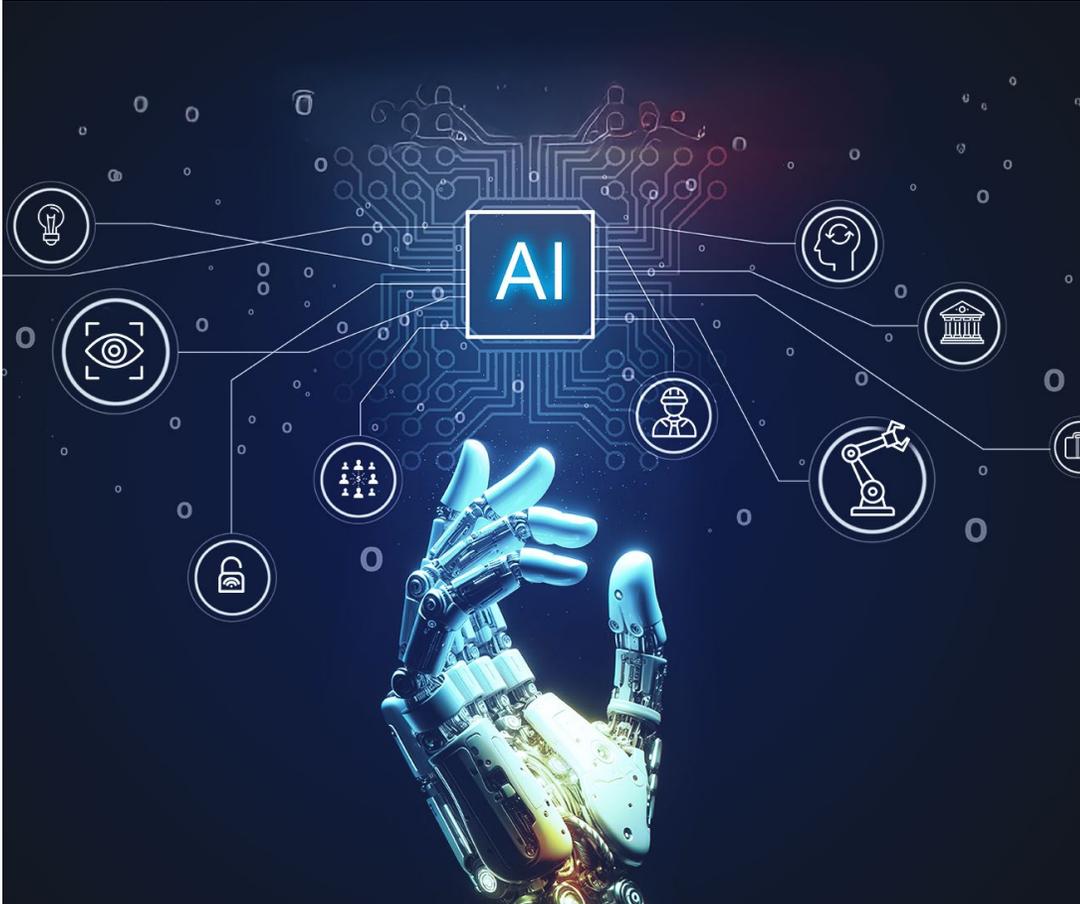
Next-Gen Robotics: - Full lifecycle support—from hardware design to factory integration.

o **Call 1 (Hardware): Agile Platforms.** Modular, soft/flexible robots for unstructured environments.

o **Call 2 (Integration): Adoption Frameworks.** Helping SMEs integrate robots; validated by 3 industrial pilots.

o **Call 3 (Skills): Manufacturing Challenges.** Competition to develop specific skills (e.g., precision picking) using Foundation Models.

AI for Manufacturing: The Smart, Green Factory of the Future (Two-Stage / Blind Evaluation).

o **Call 1: Advanced Manufacturing.** Real-time defect detection & flow optimization to meet the **Clean Industrial Deal**.

o **Call 2: Human/AI Collaboration.** Inclusive design, upskilling, and capturing expert knowledge.

o **Call 3: Process Industries.** Using GenAI to accelerate new material discovery and ensure plant safety.