ROME | FEBRUARY 27, 2026

AI AND WORK:
MANAGING TRANSFORMATION,
MULTIPLYING OPPORTUNITIES
STRATEGIES, TRUST, RULES, SKILLS

IN COLLABORATION WITH **INPS** **INAIL**

ISTITUTO NAZIONALE PER L'ASSICURAZIONE
CONTRO GLI INFORTUNI SUL LAVORO

WORKPLACE SAFETY
AND ARTIFICIAL INTELLIGENCE

INAIL RESEARCH PROTOTYPES

Exhibition at Palazzo Brasini, Conference centre
Via IV Novembre 144, Roma

Table of Contents

Appendix

Introduction

To protect health and safety at work, Inail intends to make the most of the opportunities offered by technological innovation and artificial intelligence. These technologies are capable of profoundly transforming production and organizational processes while simultaneously creating new perspectives for the prevention of occupational accidents and diseases, as well as for prosthetics and rehabilitation.

Thanks also to a network of excellence partners, Inail research has developed innovative projects and tools to intercept workers' needs and successfully counter emerging risks linked to the increasing use of technology in the workplace.

The Institute is collaborating on the event "AI in the workplace: the human-centric vision of artificial intelligence," organized by the Ministry of Labour and Social Policies. Inail will present some of its most innovative projects, exhibited throughout the day on February 27, 2026, in the dedicated space at the headquarters in via IV Novembre, Rome.

Starting from 3:00 p.m., the "Parlamentino" hall in Palazzo Brasini will also host the conference "Occupational Safety and Health and Artificial Intelligence," to further explore the fields of AI application within Inail's activities and the results achieved.

SIDE
Haptic exoskeleton interfaceable with virtual or augmented reality systems

SIDE is a prototype developed by Inail through a research call, consisting of an upper-limb robotic system that can be interfaced with virtual or augmented reality. It was created to test innovative, highly effective training designed to prevent hazards related to activities in confined or suspected contaminated spaces, such as underground, semi-underground, or above-ground tanks, sewage pipes, silos, and wells, classified as high-risk workplaces for workers safety. By virtually replicating force and contact stresses and simulating typical human-environment interactions, SIDE allows for the training of operators and the evaluation of their preparedness in various work scenarios in total safety. The integration of tactile and proprioceptive stimuli, such as those provided by the exoskeleton on the wearer's arm, increases the operator's sense of presence and immersion within the virtual reality. In this way, the learner can more effectively acquire safe behaviours and best practices.

Born from the collaboration between INAIL-DiMEILA, IPCB-CNR, ICMATE-CNR, and IRCCS ICS Maugeri, the SMART-SHIRT (SMART materials and technologies for thermal-stress & physio-monitoring SHIRT) is a highly collaborative wearable prototype designed both for continuous monitoring of thermo-physiological parameter - including heart rate, body temperature, and motor activity - and for an active localized body cooling function.

The sensorized shirt integrates advanced textile materials, inks formulated with nanotechnology, and thermally functional patterns screen-printed onto the fabric, along with a thermoelectric module based on Peltier technology for localized cooling. Furthermore, by processing data through algorithmic models based on artificial intelligence and deep learning, the device can support the activation of personalized cooling strategies and user alerts.

SMART-SHIRT represents a technological demonstrator in the field of advanced wearable devices for preventing risks related to thermal stress, with potential applications in industrial sectors characterized by physically demanding activities or work in critical environments.

HANNES BIONIC HAND AND ARTIFICIAL INTELLIGENCE
Advanced prosthetic system for the treatment of upper limb amputations

The fully active advanced upper-limb prosthetic system integrates the multi-articulated Hannes hand, designed to provide natural and functional movements. Thanks to its adaptive underactuated mechanics, the hand intelligently distributes force and automatically adjusts its grip to the shape and external stresses of various objects, allowing the user to grasp a wide range of items intuitively and securely. Developed through a collaboration between the Inail Prosthetic Centre and the Italian Institute of Technology, Hannes aims to combine robustness, structural simplicity, and practical functional value to support users in regaining essential daily activities. The system is complemented by a motorized wrist capable of pronation–supination and flexion–extension, expanding the possibilities for hand orientation and object manipulation. Another key component is the elbow joint, featuring an energy-recovery mechanism that reduces effort during arm elevation. This design choice makes the prosthesis more comfortable and natural to use, improving daily-life performance even during prolonged use. Overall, the system offers an advanced, ergonomic solution intended to bring prosthetic function as close as possible to natural human movement.

Images: HANNES ARM

EDATS

The EDATS project aims to make upper limb prostheses more intuitive and natural by leveraging the potential of machine learning. When a person imagines moving their "phantom hand," many residual muscles in the stump are still activated. These contractions generate electromyographic signals which, when precisely analyzed, reveal specific patterns linked to each imagined gesture. The pattern recognition algorithms developed in the project learn to identify these patterns and translate them into real movements of a prosthetic hand. The EDATS system uses a bracelet of electromyographic sensors connected to a small electronic board that sends the signals via Bluetooth to dedicate software. This software manages the entire process: it records the signals while the patient mentally performs different movements, trains the recognition model, and verifies its performance through virtual reality, allowing a digital hand to move in real time. The project, already in an advanced stage at the Inail Prosthetic Centre, now aims to expand its capabilities to include more complex actions such as wrist and elbow movements, making the system suitable for more proximal amputations. In parallel, research is exploring the integration of sensory feedback, essential for giving users a more natural and complete perception of the prosthesis.

Images: EDATS

TELEOPERATED ROBOT 3
Teleoperated system enabling interventions in complex situations

Technologically advanced collaborative robots can substitute or assist workers in interventions involving high risk levels due to hazardous conditions (fires, earthquakes, toxic gas emissions, confined spaces, etc.) or the complexity of the operations.

The Teleoperated Robot 3 is an evolution of a previously developed system and aims to ensure greater agility and reliability during deployment, as well as precision and versatility in manipulation, allowing for differentiated operations based on specific needs, also thanks to an ad-hoc device that facilitates the use of different tools.

The project consists of two subsystems: a "field robot" that replicates human actions at the intervention site (locomotion, manipulation, vision, hearing, and tactile capabilities, etc.) based on the required operations; and a remote system that allows the operator to safely manage the intervention, using virtual and augmented reality to provide a faithful reconstruction of the real environment where the robot operates. The field robot features a locomotion system consisting of an electric robotic quadruped and a manipulation system with a mobile tele-manipulated arm. The pilot station, conversely, consists of a haptic arm and a user interface that offers the operator an immersive and intuitive experience for visualizing the habitat.
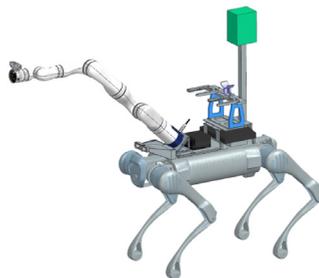
Figure 1 – Haptic device

Figure 2 – Robot + arm (CAD)

DPI SMART
Prevention system integrating sensors and control systems into traditional PPE

The DPI SMART project develops a proactive prevention system for Industry 5.0 aimed at transforming traditional Personal Protective Equipment (PPE) into "active" PPE through sensors, IoT, and algorithms, without compromising compliance certification with European Regulations. The goal is to create a "protection cluster" by integrating sensors and control systems into traditional PPE without altering its original characteristics. The prototype, designed to detect hazards and support preventive interventions, includes four sensorized PPE items equipped with alarms:

• Filtering facepiece: monitors temperature, impacts/movements, and respiratory rate;
• Helmet: monitors temperature/relative humidity, CO_2, impacts, position, solar exposure, and sweat;
• Garment with badge and bracelet: monitors microclimate, impacts/falls, electromagnetic fields for electrical risk;
• Safety shoe with sensors on the ankle and sole: monitors slipping and hot/cold contact through movements, pressure, and temperature.

The PPE units communicate via Bluetooth with a central unit that processes data using dedicated algorithms and with a smartphone App for management and monitoring. The added value lies in an economical approach that is immediately industrializable and transferable to real-world contexts.

ARTIFICIAL INTELLIGENCE APPLIED TO ISI PROJECT EVALUATIONS

Established in 2010, the Isi call for proposals is a structural instrument of prevention policies, providing non-repayable funding to companies that adopt technological, organizational, and management solutions to improve health and safety standards in the workplace. Since 2017, Inail has invested in digitalization and the process model has been revamped, introducing the standardization of eligible intervention types, the traceability of every status change in the application, and the breakdown of technical-administrative project evaluations into elementary individual checks, alongside the online submission of expert reports and the digitalization of numerous other documents. Significant changes have also been made to the way the Institute interacts with users through a fully digitalized model, including requests for clarification or additional documentation to support the evaluation process.

This has laid the groundwork for introducing advanced solutions supported by algorithms and Artificial Intelligence models, thanks to the activation of complex analyses that allow for the collection of information, rules, and relationships. The innovations introduced allow AI models to be applied to the evaluation of grant requirements for applications, following the evaluative paths of technical professionals and administrative officers and proposing solutions based on an extensive database within the system and similar previous cases. AI-assisted evaluation for certain requirements is already available in a testing phase for select expert users.

The further objective is to create an "Observatory" to collect the best experiences and transform them into "Standard Cases" for the benefit of users, providing a range of funding solutions approved by the Isi Call for specific manufacturing processes. The potential of AI allows for the preparation of information sheets—actual use cases—for each type of project. Ultimately, this involves extracting positive experiences from the knowledge base to present potential eligible solutions to companies; prospectively, this wealth of knowledge can be used to support companies during the application phase to improve the quality of the projects submitted.

PROCESS MODEL:
ISI TECHNICAL EVALUATION AND INNOVATION
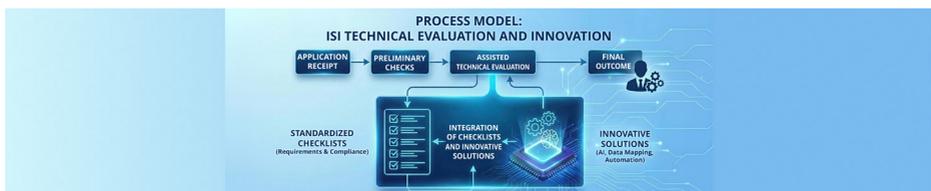
LINGUISTIC MEDIATOR
Digital tool to facilitate communication between people of different languages and cultures

The linguistic mediator is a digital tool that facilitates communication between people of different languages and cultures and Inail operators, ensuring mutual understanding, equitable access to information, and improving the quality of services provided by the Institute. The tool supports the translation of voice and written messages in 13 languages (Arabic, Bengali, Chinese, Croatian, French, Hindi, English, Romanian, Slovenian, Spanish, German, Ukrainian, and Urdu), which can be expanded based on the specific needs of local offices. Created to overcome linguistic and cultural barriers, the linguistic mediator can be activated upon request by the citizen or the operator during in-person or remote meetings to manage complex situations requiring effective communication.

The tool is currently available at seven local offices (Caltagirone, Catania, Monfalcone, Roma Laurentino, Roma Tuscolano, Trento, and Trieste), which are piloting it to evaluate its effectiveness and identify potential areas for improvement prior to large-scale implementation.

ESOPIA - OPERATIONAL EXPERIENCES AND ARTIFICIAL INTELLIGENCE
Repository for the collection and analysis of industrial plants safety documents

EsOpIA is a cognitive research platform consisting of a documentary repository that allows Inail to collect documentation regarding industrial plant safety, and an entity-relationship ontological model that uses AI algorithms to extract information from documents.

The objective is to share operational experiences related to near misses and accidents governed by Legislative Decree 105 of 2015 ("Seveso" sector, control of major-accident hazards), to support the proactive prevention process through access to a structured knowledge system.

Thanks to the work of research groups and the support of AI technique - specifically Machine Learning and Natural Language Processing - it is possible to perform natural language queries, search for similar cases, identify frequent accident patterns, visualize causal relationships, and uncover relevant information, particularly regarding near misses.

Currently, EsOpIA includes over 6,000 records and is the only ontology-based model referring not only to accidents but also to near misses and anomalies. Its two main features are: lists that are not predefined but populated by acquiring data from external databases or extracted from documents, and dynamic lists that are continuously updated.
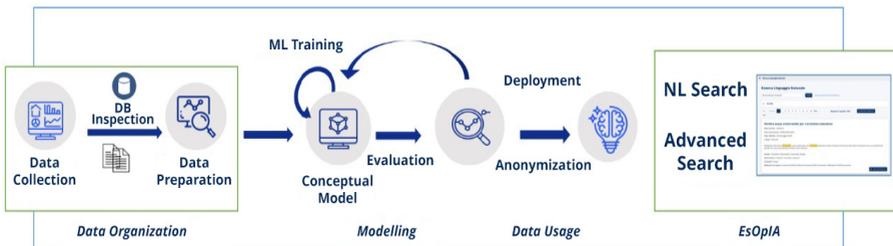

Figure 1 – Sequence of the implementation phases of EsOpIA (cognitive pipeline) recorded in the establishments subject to the decree.
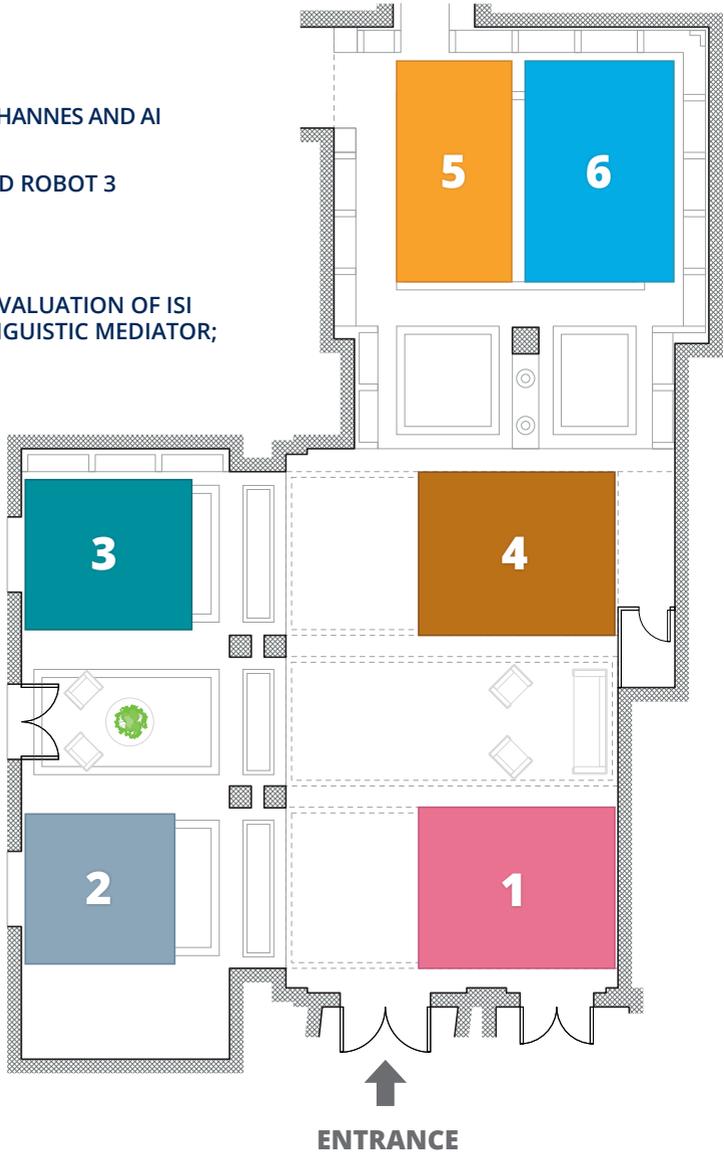

Figure 2 – The application is present in the company intranet

EXHIBITION AREA

Legend

1 SIDE

2 SMART-SHIRT

3 BIONIC HAND HANNES AND AI

4 TELEOPERATED ROBOT 3

5 DPI SMART

6 AI-ASSISTED EVALUATION OF ISI PROJECTS; LINGUISTIC MEDIATOR; ESOPIA

5

6

3

4

2

1

ENTRANCE

THE CONFERENCE CENTRE

The Conference centre, located at the headquarters in via IV Novembre, is housed in a historical building designed by architect and urban planner Armando Brasini between 1928 and 1932. It is the result of renovation and conservative restoration work, followed by furnishing and equipment installation, as well as the reorganization, cataloguing, and transfer of the Institute's library heritage.

Inside the halls of the Conference Centre, artworks from Villa Lemmi and Palazzo Bufalini in Florence have been relocated, alongside monographs and periodicals dating from 1855 to 1999. Most of the catalogued volumes cover technical-scientific disciplines related to health and safety at work, as well as topics in economics, history, literature, and the maritime sector. The collection also includes issues of the "Rivista degli infortuni e delle malattie professionali - a key vehicle for institutional culture, from its first publication in 1914, titled "Bollettino", to the present day - and Inail's entire specialized and informative editorial production in the medical, scientific, technical, and technological fields regarding health, workplace safety, and worker protection.