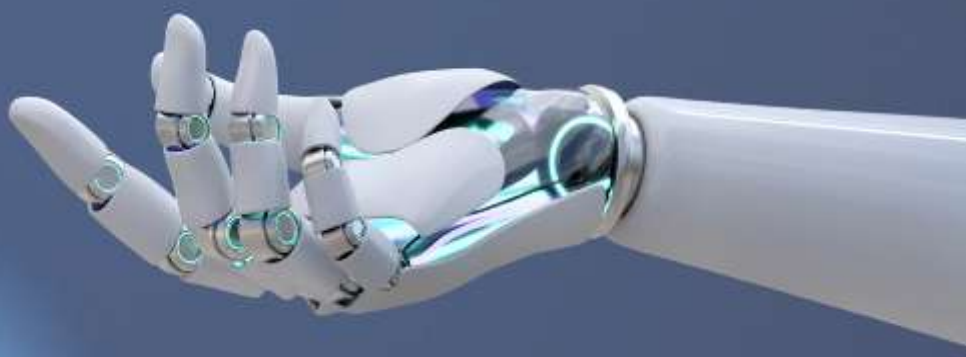
Annex 1.2 JARVIS OC2 Guidelines for Applicants, Technical Description: External Pilots



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DOCUMENT SCOPE

This document provides a full set of information regarding the **JARVIS OC2: External Pilots, Technical Description.** All associated Annexes should be read prior to the submission of a Proposal:

Required before the submission stage:

- Annex 2.2 JARVIS OC2 Proposal Template: External Pilots– Applicants should fill the template and submit it in the platform
- Annex 3.2 JARVIS OC2 F6S Application Page: External Pilots – This document is provided as supportive material, so that the applicants can prepare their answers for the F6S platform offline before the final submission on the platform.

Required at the contracting stage once selected:

- Annex 4.2 JARVIS OC2 Consortium Declaration of Honour: External Pilots
- Annex 5.2: JARVIS OC2 SME Declaration: External Pilots
- Annex 6.2 JARVIS OC2 Declaration of Financial Stability: External Pilots

Required after the submission stage once the proposal has been selected for funding:

- Annex 7.2 JARVIS OC2 Sub-Grant Agreement: External Pilots

CONTACTS

The JARVIS Consortium serves the following support:

- Contact e-mail: oc@jarvis-project.eu
- Contact e-mail for the submission platform: support@f6s.com
- Open Call 2 Documents_External Pilots: https://jarvis-project.eu/open-calls/open-call-2/

The language of communication is English, any email or communication in other languages will not be addressed.

GLOSSARY

Abbreviation	Explanation
NASA-TLX	NASA Task Load Index
SWAT	Subjective Workload Assessment Technique
SUS	System Usability Scale
ISA	Instantaneous Self-Assessment
SMC	Smart Mechatronics Control module
MSP	Multi-sensory perception module
HIPAP	Human intention perception and prediction module
TPM	Task planner module
IDT	Intelligent Digital Twins module
OFO	OpenFlow Orchestrator
RCM	Robot Control Module
DOF	Degree of freedom
SLAM	Simultaneous Localization and Mapping
TSDF	Truncated Signed Distance Function
NBV	Next Best View
HAR	Human Action Recognition
ROS	Robot Operating System
UE5	Unreal Engine 5

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1 INTRODUCTION

1.1 What is JARVIS?

This Open Call is part of the **JARVIS** European research project, funded under the Horizon Europe Programme. **JARVIS** focuses on advancing Human-Robot Interaction (HRI) in industrial environments in a human-centric manner. The project aims to develop and validate intelligent robotic solutions supporting agile manufacturing as well as inspection and maintenance operations in complex industrial settings. The JARVIS objectives are:

- Develop AI enhanced means of interaction for seamless human-robot communication, control and programming
- Develop socially interactive robots
- Ensure security, privacy and safety towards trustworthy AI
- Develop cognitive and intelligent mechatronics for advanced HRI, dynamic scene modeling and understanding
- Implement HRI in large scale pilots
- Boost companies, in particular SMEs and start-ups, to adopt industrial HRI solutions

Overall, JARVIS aims to develop a reusable set of technologies that enable AI-driven multimodal interaction: a) involving interfaces for physical and remote information exchange, robot control and programming, b) providing social skills to a variety of robots to achieve seamless user-centric interaction that extends human ability for complex tasks and c) demonstrating scalability of application and ability to achieve economies at scale.

The JARVIS technologies are developed and validated through four industrial pilot environments representing different sectors, including automotive manufacturing, aeronautics production, nuclear decommissioning, and offshore energy operations.

To further expand the adoption and applicability of the JARVIS modules, the project includes this **External Pilots Open Call** (OC). This OC track aims to demonstrate the applicability of **JARVIS** technologies in new industrial contexts and application domains beyond the four core pilots of the project.

In the **External Pilots track**, the applicant solution constitutes the core system, and applicants are invited to integrate one of the JARVIS modules into their system in order to enhance the capabilities of their developed technologies. The applicants' solutions may include robotic systems, perception solutions, interaction technologies, or other advanced industrial automation components that can benefit from the integration of JARVIS modules to improve human-robot interaction, usability, and system performance. Projects funded under the External Pilots track are expected to reach TRL7, demonstrating system validation in an operational environment at the premises of the use case provider, who shall participate as a member of the applicants' consortium.

1.2 JARVIS Consortium

The **JARVIS** consortium brings proven expertise in robotic solutions for advanced Human-Robot Interaction in agile manufacturing and inspection & maintenance applications. Building upon knowledge from previous projects and insights gained in the **JARVIS** project, consortium partners—including technical providers and research institutions—will mentor the selected for funding projects. Below is a brief overview of the organizations leading this mentoring process.

LMS Laboratory for Manufacturing Systems & Automation (Coordinator)	**LMS** is a leading European laboratory, specializing in robotic applications in industrial and collaborative environments, human-robot interaction (HRI), autonomous task planning, virtual and augmented reality and AI development for real world shopfloors. LMS has proven experience in coordination, technical contribution and management of EU-funded projects (Project coordinator: THOMAS, SHERLOCK, ODIN and CONVERGING, Node leader in AI Testing and Experimentation Facilities of AI-MATTERS, Project manager in X-act and ROBO-PARTNER). LMS is the coordinator of the **JARVIS** project, leading user-centric design for Human-Robot Interaction, Robot behavior adaptation to human needs and social interaction, and learning of social skills for the robots by observation.
tecnalia MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE	**TECNALIA** is the largest center of applied research and technological development in Spain, a benchmark in Europe and a member of the Basque Research and Technology Alliance. We collaborate with companies and institutions to improve their competitiveness, people's quality of life and achieve sustainable growth. We do it thanks to people who are passionate about technology and committed to building a better society. We work with an increasingly strategic business relationship model based on trust, collaboration, and a shared technological approach, whereby our main scopes of action are: smart manufacturing, digital transformation, energy transition, sustainable mobility, health and food, urban ecosystem and circular economy. We are the first private Spanish organization in contracting, participation, and leadership in the European Commission's Horizon Europe programme and we are ranked fourth in European patent applications.
cea	The French Alternative Energies and Atomic Energy Commission (**CEA**) is a key player in research, development and innovation. The mission of the CEA-List institute, a smart digital system specialist, is to combine scientific excellence in high-fields like robotics and artificial intelligence.
Tampere University	Tampere University (**TAU**) is one of the most multidisciplinary universities in Finland. We bring together research and education in technology, health and society. The university is known for its excellence in teaching and research, and it collaborates with hundreds of universities and organizations worldwide. Our community consists of 21 000 students and over 4000 staff members from more than 80 countries.
KUKA	**KUKA** is a global automation corporation with sales of around 3.3 billion euro and roughly 14,000 employees. The company is headquartered in Augsburg, Germany. In the JARVIS project, KUKA primarily focuses on workplace perception, developing AI-based algorithms capable of transforming raw data gathered from heterogeneous sensors into meaningful information. To

	enhance human-robot collaboration, the scene, such as a robotic cell, should be represented not only by a point cloud but should also contain semantic information. To achieve this, KUKA will tackle the problem of scene understanding and the detection of discrepancies or misplacements of parts. This can also contribute to preventing collisions between robots and humans. This development is evaluated through industrial use cases, particularly in the aeronautics industry by manufacturing passenger aircraft seats, and in the automotive industry by assembling hybrid car battery packs.
netcompany intrasoft	Netcompany-Intrasoft (**INTRA**) is a leading European IT Solutions and Services Group with strong international presence and expertise, offering innovative and added-value solutions of the highest quality to a wide range of international and national public and private organizations. Netcompany-Intrasoft's expertise and strength lie in its proven capacity and successful track record in undertaking and delivering, complex, mission – critical projects. Netcompany-Intrasoft's professionals have developed the ability to combine their technical expertise with thorough understanding of each customer's individual business needs. The company consists of a highly skilled, efficient and flexible human resources base, with an international culture. Netcompany-Intrasoft is a company that understands research & innovation as key enabler for future growth and new business creation. Netcompany-Intrasoft has its own Research & Innovation Development (RID) Department that actively contributes to the development of innovative research prototypes.
Collins Aerospace	**Collins** Aerospace, an RTX business, is a leader in integrated and intelligent solutions for the global aerospace and defence industry. Our 80,000 employees are dedicated to delivering future-focused technologies to advance sustainable and connected aviation, passenger safety and comfort, mission success, space exploration, and more.
SINTEF	**SINTEF** is one of Europe's largest research institutes, with multidisciplinary expertise within technology, natural sciences, and social sciences. SINTEF is an independent foundation which, since 1950, has created innovation through development and research assignments for business and the public sector at home and abroad. SINTEF Digital's Mathematics and Cybernetics team is playing a role in shaping the JARVIS project requirements and specifications. Additionally, SINTEF is the primary technical partner for the offshore energy production use case. Lastly, SINTEF will monitor and provide guidance for the third-party projects utilizing the JARVIS use cases.
Teaching Factory	Teaching Factory Competence Center (**TF-CC**) is oriented on providing training and innovation services to the manufacturing industry. TF-CC focuses on enabling the knowledge exchange between academia and industry and on creating added value for the services and products of manufacturing companies, by promoting innovative technology and research activities performed by academia. For this scope, TF-CC provides a set of Training Services and Innovative Technical Services to their customers aiming to interdisciplinary learning, research & experimentation and to exploit of research results towards industrial applicability in pilots.

1.3 External Pilots Track Scope

In the **JARVIS** Open Call 2 "**External Pilots track**", JARVIS will invest a total of **€650,000** to support third parties in the development and validation of innovative solutions that integrate JARVIS technologies in new operational contexts. The call targets micro-consortia composed of technology providers and use case providers, ensuring that the proposed solutions address concrete industrial or public sector needs and can be validated in operational environments.

- Objective 1 – **Demonstration of JARVIS Technologies Applicability in New Industrial Contexts**: Demonstrate the applicability of JARVIS modules in new industrial or operational contexts beyond the original project pilots by integrating them into the systems and workflows of the applicants' consortium.
- Objective 2 – **Stimulation of Industry Engagement in HRI Validation**: Stimulate the engagement of industry players in testing and validating innovative Human-Robot Interaction solutions by inviting teams of technology developers and use case providers to participate in the call.
- Objective 3 – **Operational and User-Centric Validation**: Expand the testing base of JARVIS technologies by validating their performance, usability, and acceptance in real operational environments with industrial or public sector end users.
- Objective 4 – **Market-Oriented Innovation and Solution Development**: Support the development of innovative products, services, or system solutions addressing concrete industrial or public sector challenges through the integration of JARVIS technologies.

1.4 Key characteristics

The **External Pilots Track** of the second JARVIS Open Call provides funding of up to **€130,000 per project** for the development and validation of innovative Human-Robot Interaction (HRI) solutions integrating JARVIS modules within external operational environments. The call will support **five projects**, each implemented over a **ten-month period** by micro-consortia composed of **2 to 3 organisations**, mandatorily including **a technology provider (startup/SME)** and **a use case provider**, and optionally **a research and technology organisation (RTO) or a second technology providers**.

Selected projects will follow a structured development process consisting of three sprints:

- **Requirements Sprint** – detailed definition of the system architecture, integration approach with the selected JARVIS module, demonstration scenarios, validation strategy, and performance indicators.
- **Development & Deployment Sprint** – implementation of the proposed solution and integration of the selected JARVIS module within the applicant system, including initial testing and refinement of interfaces.
- **Integration & Validation Sprint** – deployment and validation of the integrated solution in the operational environment of the use case provider, assessing technical performance, usability, and operational value.

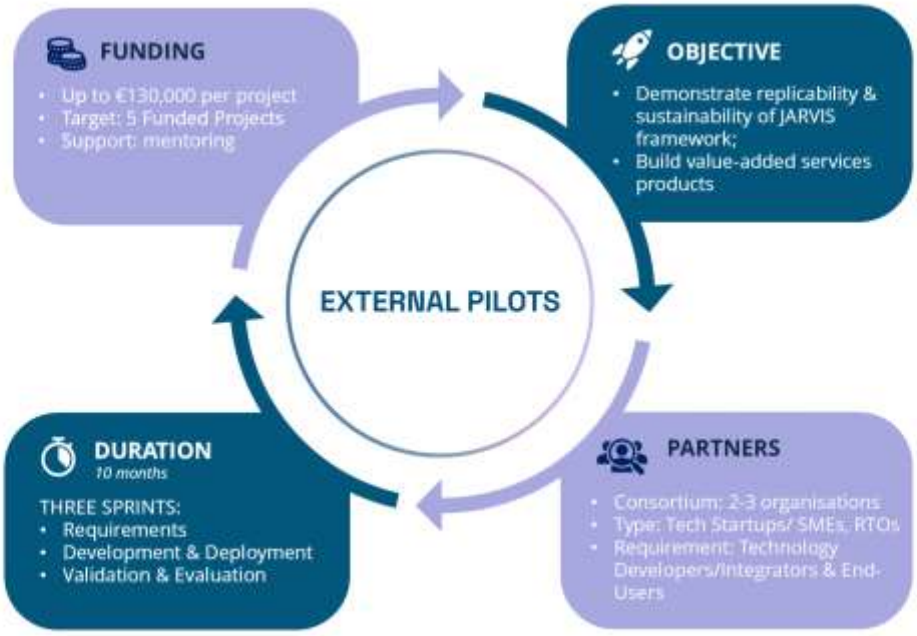

Figure 1. External Pilots OC2 Track Overview

1.5 Expected contribution

The projects selected for funding are expected to:

- **Implement an operational pilot solution reaching TRL7**: Develop and deploy a pilot solution integrating one JARVIS module in order to address a specific industrial or public sector challenge defined by the use case provider in compliance with the challenges and technical directions of the this Open Call Track.
- **Ensure active involvement of use case providers**: Engage end-users throughout the pilot implementation, including participation in testing activities and user studies assessing the effectiveness and usability of the proposed solution.
- **Perform technical and user-centric evaluation**: Evaluate the integrated solution from both technical and user perspectives, generating insights on system performance, usability, and operational value.
- **Demonstrate scalability and sustainability potential**: Provide a clear perspective on the potential replication, scalability, or continued use of the developed solution beyond the duration of the Open Call.

The following sections of this guide present the technical challenges of the JARVIS **External Pilots** Open Call and provide information on the technological scope, integration requirements, and expected solution capabilities in order to support applicants in preparing proposals aligned with the objectives of the JARVIS project.

2 ELIGIBILITY CRITERIA

2.1 Who can apply?

This call is addressed to micro-consortia composed of **minimum two (2) and maximum three (3) legal entities.** The structure must balance technical innovation with real-world industrial application.

All participating entities must be legally established in an EU Member State or a Horizon Europe Associated Country and must hold a valid VAT number (or equivalent national tax identifier) at the time of application.

2.1.1 OC1 Beneficiaries Participation

Entities successfully funded under JARVIS Open Call 1 (OC1) are eligible to apply for the current Open Call, provided they comply with the cumulative funding ceiling established by the JARVIS Grant Agreement.

- Cumulative Funding Cap: The maximum total financial support a single legal entity can receive across all JARVIS Open Calls (OC1, OC2, and any subsequent calls) is €200,000.
- Budget Calculation: Applicants who received funding in OC1 must ensure that their requested budget in the current call, when added to their previous OC1 award, does not exceed the €200,000 limit.
- Compliance: Proposals requesting a budget that would cause the entity to exceed this cumulative cap will be deemed ineligible and will not proceed to the evaluation stage.

Example: If an entity was awarded €120,000 in OC1, their maximum requested budget for the current call cannot exceed €80,000.

2.1.2 Consortium Structure & Roles

To be eligible, the consortium must cover three functional roles: **technology developer, technology integrator,** and **Use case provider**. These roles may be fulfilled by **two or three participating organisations**, provided that the technology developer and use case provider are represented by distinct entities.

The Mandatory Core (Minimum 2 Entities)

Every application must include at least these two distinct partners:

- **Lead Partner: Technology Developer (Mandatory)**
  - **Profile:** Must be a technology startup or small and medium-sized enterprise (SME).
  - **Role:** The primary innovator, lead developer, and main technology exploiter.
  - *Note: In a two-partner consortium, this entity also performs the "Technology Integrator" role.*
- **Partner 2: Use Case Provider (Mandatory)**

- **Profile:** Industrial company and infrastructure owner capable of providing the operational environment where the proposed solution will be tested and validated.
- **Role:** Provides the operational testbed, defines the use case and operational requirements, and participates in the validation of the proposed solution in a real industrial context. The Use Case Provider acts as a key solution adopter, demonstrating how the developed technology can improve existing operational or production processes.

Note: A single SME/Startup may fulfill the role of both Developer and Integrator if they possess the proven technical capacity; however, the consortium must always include at least one distinct **Use Case Provider** entity to ensure the pilot's validity.

The Optional Third Partner (Maximum 3 Entities total)

A consortium may choose to add a third distinct entity to specialize in integration:

- **Partner 3: Technology Integrator (Optional)**
  - **Profile:** A Technology Startup, SME, or Research and Technology Organisation (RTO).
  - **Role:** Dedicated to the seamless integration of JARVIS components into the pilot environment, supporting the Developer and End-User.

2.1.3 SME Eligibility

SMEs and Start-ups will be considered eligible only in the case that they have been established at least one year before the submission of the application.

Micro, small and medium-sized enterprises (SMEs) are considered eligible ONLY if complying with the EU definition by the Commission Recommendation 2003/361/EC and in the SME user guide. In summary, the criteria which define an SME are:

1. The headcount in the Annual Work Unit (AWU) is less than 250.
2. Annual turnover less or equal to €50 million OR annual balance sheet total less or equal to €43 million.

Startups that do not have yet annual turnover or balance sheets are also considered eligible given that they fulfil the criteria (a) and (b) at submission time.

In addition, the following conditions apply:

- The applying SMEs should not:
  - have convictions for fraudulent behaviour, other financial irregularities, or unethical or illegal business practices.
  - have been declared bankrupt or have initiated bankruptcy procedures.
  - Be under liquidation or an enterprise under difficulty accordingly to the Commission Regulation No 651/2014, art. 2.18
  - Be excluded from the possibility of obtaining EU funding under the provisions of both national and EU law, or by a decision of both national or EU authority
- Proposals must ensure that there is no risk of double funding. The fundamental principle underpinning the rules for public expenditure in the EU states that no costs

for the same activity can be funded twice from the EU budget, as defined in Article 111 of Council Regulation (EC, Euratom) No 1605/2002 of 25 June 2002 on the Financial Regulation.

2.1.4 Eligible Countries

Entities legally established in any of the following countries (hereafter collectively identified as the "Eligible Countries") are eligible:

- The Member States (MS) of the European Union (EU), including their outermost regions.
- The Overseas Countries and Territories (OCT) linked to the Member States.
- Horizon Europe associated countries (Association to Horizon Europe is governed by the Horizon Europe Regulation 2021/695): according to the updated list published by the EC.

2.1.5 Eligible Challenges

The Applicants must apply to one of the 5 eligible challenges listed in Section 4.

2.1.6 Proposal submission

Proposals must be submitted electronically, using the **JARVIS** Online Submission Service accessible via the F6S platform at https://www.f6s.com/jarvis-oc2-external-pilots/apply

Proposals submitted by any other means will NOT be evaluated.

2.1.6.1 Multiple submission

This call is competitive. Multiple applications are not allowed.

- **ONLY ONE** proposal per team will be accepted.
- An entity can be granted **ONLY once**.

To ensure a fair distribution of funds and efficient use of evaluation resources, each legal entity may participate in only one (1) proposal across both simultaneous JARVIS Open Calls (Co-development and External Pilots).

Execution Rule: If an entity is part of multiple submissions, all proposals involving that entity will be automatically declared ineligible.

2.1.7 Language

English is the official language for **JARVIS** Open Call. Submissions done in any other language will be disregarded and will not be evaluated.

English is also the only official language during the whole execution of the **JARVIS** programme. This means that it is mandatory that the submission of deliverables is done in English to be eligible.

2.1.8 Conflict of interest

To avoid conflicts of interest, applications will not be accepted from persons or organisations who are partners in the **JARVIS** consortium or who are formally linked in

any way to partners of the consortium. Please check the list of partners: https://www.jarvis-project.eu/partners/

Applicants shall not have any actual or/and potential conflict of interest with the **JARVIS** selection process and during the whole project. The winning applicants will be required to declare that they know of no such potential conflicts of interest by submitting **Annex 4.2 JARVIS OC2 Consortium Declaration of Honour: External Pilots** during the contracting sprint.

All suspected cases of conflict of interest will be assessed case by case. Applicants must take all measures to prevent any situation where the impartial and objective implementation of the project is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest ('conflict of interests').

2.1.9 Confidentiality and deadline

Submission to the **JARVIS** Open Call 2 for **External Pilots** is open between the **1st of April 2026 at 00:00 CET** (Brussels time) and the **10 of July 2026 at 17:00 CET** (Brussels time). Only proposals submitted before the deadline will be accepted.

After application submission, editing is not possible. If the applicant discovers an error in the proposal and provided the call deadline has not passed, the applicant may request the Open Call **JARVIS** team to re-submit the proposal (for this purpose please contact us at **oc@jarvis-project.eu** with a message titled: RESUBMISSION REQUEST). However, **JARVIS** is not committed that resubmission in time will be feasible in case the request for resubmission is not received by the Open Call **JARVIS** team at least 48 hours before the call deadline.

After the call closure, no additions or changes to the received proposals will be considered, whereas the online form will be automatically disabled at the indicated deadline day and hour. Any information regarding the proposal will be treated in a strictly confidential manner.

3 JARVIS OC2 EXTERNAL PILOTS TRACK CHALLENGES

3.1 Overview of Challenges

The JARVIS OC2 External Pilot challenges invite applicants to develop and demonstrate advanced human–robot interaction solutions addressing key industrial needs in industrial environments. The challenges reflect the core technological pillars of the JARVIS project, focusing on agile manufacturing operations (Challenges 1 and 2) and inspection and maintenance scenarios (Challenges 3 and 4). Each challenge defines a concrete industrial problem space and provides indicative technical directions to guide applicants in proposing innovative yet practically deployable solutions that combine robotics, AI, and human-centred interaction. Moreover, this open call allows applicants to propose novel use cases in emerging or strategic domains within challenge 5, where human-robot interaction and collaboration can achieve added value in complex tasks.

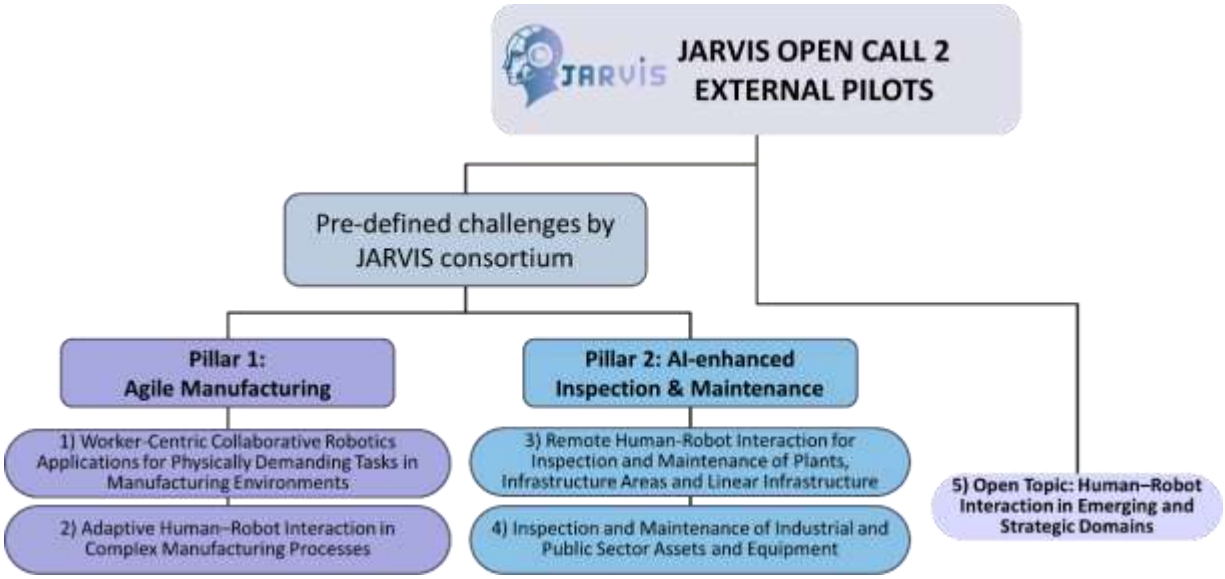

Figure 2. JARVIS Open Call 2 (OC2) Challenges

3.1.1 Requirements

The requirements below apply to all of the 5 JARVIS challenges

- **Target TRL:** The proposed solutions shall target **TRL7** by the end of the 10-month external pilot programme, demonstrating system validation in an operational environment.
- **Existing Pre-conditions:** Applicants shall demonstrate their ability to deploy the proposed solution on site for testing or to establish a representative testbed environment. Evidence of the intended deployment environment (e.g., photos, videos, or documentation of the use case provider premises) shall be provided in the proposal. The applicant consortium must utilize **their own robotic platform** to demonstrate TRL7 maturity at the end of the programme.

- **User Studies:** User studies shall be conducted during the external pilot programme to evaluate operator acceptance and usability of the proposed third-party solution and the selected JARVIS module.
- **Business Case and Cost–Benefit Performance:** Proposals shall include a clear description of the expected **business value and cost–benefit performance** of the proposed solution, demonstrating its potential market relevance and added value.
- **Security, Privacy and Safety:** Proposed solutions shall consider **security, privacy, and safety aspects**, ensuring that risks to users are minimized both in terms of physical safety and digital data protection.
- **Use of Open Source Technologies:** Applicants are encouraged to use **open-source technologies where appropriate**, in order to accelerate development, reduce costs, and support interoperability with existing systems.
- **Deliverables:** Each Sprint shall include **at least two deliverables**:
  - A **technical progress report** describing the work performed, the achieved milestones, and the progress towards the defined KPIs.
  - A **dissemination-oriented output** supporting the promotion of the external pilot solution, such as a one-pager, demonstration video, or other dissemination material.

The following sections present the five challenges of the External Pilots Open Call 2 track.

3.1.2 Challenge #1

Title: *"Worker-Centric Collaborative Robotics Applications for Physically Demanding Tasks in Manufacturing Environments"*

Many industrial operations such as heavy part handling, overhead assembly, sustained fastening, large component alignment, and manual surface processing remain physically demanding. While full automation is often impractical or unsustainable due to variability, spatial constraints, and process sensitivity, robotic systems can provide physical augmentation to reduce musculoskeletal strain without removing human agency.

This challenge seeks solutions where robotic systems act as active physical partners, sharing loads, stabilizing components, or augmenting muscular effort, while preserving human supervision and decision authority.

Proposals must include a structured human-centred design and an outline of planned socio-technical evaluation. This outline shall cover participatory co-design, workforce impact assessment, and measurable preservation of operator agency.

Fully autonomous manufacturing processes without continuous physical human involvement are out of scope and will be scored 0 under the "Concept & Innovation" criterion.

Applicants shall demonstrate solutions incorporating at least two of the following characteristics:

- Explicit load sharing between human and robotic system
- Continuous human-robot co-manipulation of the same object
- Active force assistance or gravity compensation provided by the robotic system, either as a collaborative manipulator or as an active exoskeleton
- Adaptive impedance or admittance control based on human effort
- Active exoskeleton systems functioning as collaborative robotic agents
- Real-time ergonomic risk estimation coupled with dynamic modulation of robotic or exoskeleton assistance levels

The following technical directions are provided as indicative paradigms to clarify the scope of the challenge and illustrate the type of solutions that are considered relevant. Applicants are not restricted to these approaches, but proposed systems should demonstrate equivalent levels of direct physical augmentation, shared control, and measurable ergonomic impact.

1. Direct Physical Co-Manipulation and Load Sharing:

- Continuous co-manipulation of heavy or bulky parts with measurable load redistribution
- Human-robot load sharing based on force sensing or joint torque estimation
- Impedance/admittance control enabling transparent physical collaboration
- Context-aware stiffness modulation during precision positioning
- Active gravity compensation for overhead or sustained tasks
- Bi-directional force interaction models (i.e., physically coupled control schemes in which human-applied forces influence robot motion and robot-generated forces influence human motion)

2. Active Exoskeleton-Based Augmentation

- Active exoskeletons considered as robotic collaborative agents
- Adaptive torque assistance based on muscle activity or posture
- Sensor-driven support modulation per task sprint
- Task-aware assistance scheduling
- Integration of exoskeleton state into shared human-robot control
- Dynamic adjustment of augmentation based on fatigue indicators

3. Ergonomic Risk Monitoring and Closed-Loop Mitigation:

- Continuous biomechanical load estimation
- Real-time ergonomic risk scoring
- Closed-loop modulation of robotic assistance
- Trigger-based increase of lifting support
- Automatic stabilization during high-risk posture

4. Intention-Aware Shared Physical Control

- Human effort estimation using force/torque sensing, EMG signals, or other objective real-time biomechanical indicators
- Adaptive motion amplification or damping based on detected operator effort and task context
- Predictive physical assistance during fine micro-positioning or precision alignment sprints
- Dynamic redistribution of mechanical load between human and robotic system during shared manipulation

5. Assisted Teleoperation with Physical Feedback

- Teleoperation with haptic feedback for load/collision awareness
- Semi-autonomous load stabilization
- Predictive micro-adjustment during fine assembly

Relevant use cases: Applicants are required to provide a concrete industrial use case, a demonstration and validation environment, and access to appropriate personnel for conducting user studies. The use case must originate from industrial manufacturing environments, including production lines, assembly cells, fabrication areas, and factory intralogistics operations such as part handling, kitting, and material positioning. Applications outside core industrial manufacturing contexts, e.g. agriculture, healthcare, construction, cultural heritage settings, are not considered within scope and will be thus scored with 0 under “Concept & Innovation” criterion.

Integration of JARVIS Modules

Applicants shall propose a core solution that directly addresses the objectives of the selected challenge and clearly aligns with the suggested technical directions.

The core functionality described in the proposal, including robotic systems, wearable devices, exoskeletons, teleoperation platforms, or other augmentation technologies, must be developed and provided by the applicant consortium.

Applicants shall select one JARVIS module and integrate it into their core system with the objective of extending and enhancing the proposed solution. The selected JARVIS component must act as a complementary enabler that strengthens contextual awareness, interaction capabilities, orchestration, or adaptive behaviour. It shall not replace, replicate, or constitute the primary functionality of the applicant's system. Proposals that rely on a JARVIS module as their core functionality will be scored 0 under the "Technology Implementation Approach" criterion.

One of the following JARVIS modules must be selected for this challenge:

- **OFO (OpenFlow Orchestrator)** for enabling task-sprint orchestration and parameters configuration supporting adaptive robotic behaviours across physically demanding task stages. The applicant consortium shall define the parameters of interest e.g. assistance parameters, or control modes, while OFO manages workflow transitions and coordinates system resources to implement the corresponding execution adaptations.
- **TPM (Task Planner Module)** for dynamic allocation and sequencing of physically demanding subtasks between human and robotic system, supporting balanced load sharing and coordinated co-manipulation workflows. Task models and optimization criteria including ergonomic criteria shall be defined by the applicant consortium. TPM generates an adaptive task schedule based on these inputs. The execution of the generated schedule, including robotic control and human–robot coordination logic, shall be implemented and managed by the applicant's system.
- **MSP (Multi-Sensory Perception)** for object detection and pose estimation to support object-aware manipulation
- **HIPAP (Human Intention Perception and Prediction)** for pose estimation tracking or gesture recognition. The output of this module is the joints and links of human skeleton.
- **HRIM (Human-Robot Interaction Module)** for low-friction activation, modulation, or deactivation of robotic assistance modes during physically demanding operations.
- **TDM (Teaching by Demonstration Module)** for programming robotic motion based on task demonstrations carried out by non-expert human operators.

Proposals must clearly describe:

- The role of the selected JARVIS module
- The expected data and control interactions between the module and the core system at a conceptual level
- The type of information exchanged and its purpose
- The expected functional improvement enabled by the integration

All integrations shall be implemented using ROS2-compatible communication mechanisms. Applicants must ensure that their proposed system architecture is capable of interfacing with ROS2-based components.

At proposal stage, detailed sequence diagrams are not required. However, applicants must provide a clear high-level architecture scheme illustrating their own system modules and the intended data and control exchanges with the selected JARVIS module.

The selected JARVIS module must be meaningfully integrated into the overall system architecture and demonstrably contribute to the collaborative use case scenario. Superficial, loosely defined, or purely nominal integrations will be considered inadequate and will be penalized under the "Technology Implementation Approach" criterion.

Detailed interface definitions and message specifications will be finalized during Sprint 1 following project onboarding.

For further details on the modules refer to section 4.2

3.1.3 Challenge #2

Title: "*Adaptive Human–Robot Interaction in Complex Manufacturing Processes*"

Many industrial operations such as remanufacturing, inspection-driven rework, customized assembly, repair, and high-variability production require continuous operator assessment, interpretation of part conditions, and dynamic coordination with robotic systems. These processes are characterized by uncertainty, non-standard geometries, fluctuating recovery strategies, and frequent reconfiguration.

While physical assistance may be required in some cases, the primary challenge in these environments is cognitive complexity. Operators must manage decision ambiguity, attention switching, coordination with automation, and time pressure in shared human–robot workspaces.

This challenge seeks adaptive human–robot interaction systems that actively support operator decision-making, reduce cognitive workload, enhance situational awareness, support skill retention and expertise development in high-variability production environment while enabling fluid collaboration and preserving human supervision and decision authority.

Proposals must include a structured human-centred design and an outline of planned socio-technical evaluation. This outline shall cover participatory co-design, workforce impact assessment, and measurable preservation of operator agency and clear definition of decision and responsibility boundaries in shared human–robot workflows.

Fully autonomous systems that remove the human from decision-making are out of scope and will be scored 0 under the "Concept & Innovation" criterion.

Applicants shall develop and demonstrate solutions incorporating at least two of the following characteristics:

- Monitoring of operator cognitive workload, stress, or attention state using non-intrusive methods, directly coupled with adaptive behaviour of a robotic platform
- Adaptive robotic task execution or automation pacing modulated in real time based on detected cognitive conditions
- Human-in-the-loop decision support mechanisms integrated into robotic task execution during uncertain or variable process stages
- Context-aware visual, auditory, or multimodal interaction mechanisms embedded in the human–robot system to reduce decision ambiguity and support coordinated robot actions
- Dynamic redistribution of subtasks between human and robotic system based on workload, expertise, or task complexity
- Multi-operator coordination mechanisms in shared human–robot environments, where robotic assistance adapts to team workload and interaction context

The following technical directions are provided as indicative paradigms to clarify the scope of the challenge and illustrate relevant solution approaches. Applicants are not restricted to these approaches, but proposed systems must demonstrate measurable cognitive support impact and fluid human–robot interaction:

1. Cognitive Monitoring and Adaptive Assistance

- Adaptive pacing or modulation of robotic assistance based on cognitive state

- Real-time estimation of operator workload, stress, or attention indicators using non-intrusive sensing approaches
- Context-sensitive presentation of process information
- Intelligent escalation mechanisms in high-complexity or high-uncertainty scenarios

2. Context-Aware Multisensory Interaction and Robotic Behaviour Modulation

- Adaptive visual and auditory guidance mechanisms directly linked to robotic task execution and state feedback
- Progressive information presentation synchronized with robot action sprints to prevent cognitive overload
- Multimodal perception of operators and task context used to modulate robotic motion, automation level, or assistance behaviour
- Gesture or voice interaction enabling low-friction command input that alters robotic task execution or support parameters
- Context-sensitive activation or modulation of robotic support modes based on operator state and task progression

3. Human-Validated Adaptive Robotic Task Execution

- Predictive generation of alternative robotic execution strategies, including motion paths, tool selection, and parameter configurations
- Digital preview or simulation of planned robotic actions prior to physical execution
- Interactive operator validation or modification of proposed robotic execution strategies
- Execution gating mechanisms ensuring that robotic task initiation or transition occurs only after explicit operator confirmation

4. Implicit and Low-Friction Human–Robot Communication

- Interaction mechanisms requiring minimal cognitive overhead
- Demonstration-based configuration for rapid adaptation
- Lightweight confirmation or correction interfaces
- Minimal-step instruction paradigms
- Integration of wearable sensing into adaptive interaction logic

Relevant use cases: The proposed use case must originate from industrial manufacturing environments characterized by process variability, decision complexity, and active human–robot collaboration. Examples include inspection-driven rework, remanufacturing operations, repair and reprocessing tasks, high-variant assembly, adaptive quality control, dynamic production reconfiguration, and multi-operator coordination in shared robotic workspaces.
Applications outside core industrial manufacturing contexts, e.g. agriculture, healthcare, construction, cultural heritage settings, maritime operations, are out of scope and will be scored 0 under the "Concept & Innovation" criterion.

Integration of JARVIS Modules

The core functionality described in the proposal, including the robotic platform, cognitive monitoring mechanisms, adaptive interaction frameworks, perception systems, decision-support components, or human–robot coordination logic, must be developed and provided by the applicant consortium. The proposed system must include an active robotic platform whose behaviour is adaptively modulated based on operator state, task context, or decision validation mechanisms.

Applicants shall select one JARVIS module and integrate it into their core system with the objective of extending and enhancing the adaptive human–robot interaction capabilities of the proposed solution. The selected JARVIS module must act as a complementary enabler that strengthens robotic contextual awareness, cognitive-state–driven adaptation, interaction

mechanisms, task orchestration, or workload-aware behaviour modulation. It shall not replace, replicate, or constitute the primary functionality of the applicant's system. Proposals that rely on a JARVIS module as their core functionality will be scored 0 under the "Technology Implementation Approach" criterion.

One of the following JARVIS modules must be selected for this challenge:

- **OFO (OpenFlow Orchestrator)** for enabling contextual resource orchestration at different abstraction levels, for example task-level or action-level, as defined by the applicant. OFO supports adaptive parameter configuration across manufacturing stages. The operational context, including cognitive workload indicators, task status, or environmental state, shall be generated and interpreted by the applicant's solution. Based on this interpreted context, OFO manages workflow sprint transitions and coordinates system resources to implement the corresponding execution adaptations.
- **TPM (Task Planner Module)** for adaptive task sequencing, workload-aware task redistribution, and mixed-initiative planning between human operator and robotic system. The task workflows, optimization criteria, operational constraints, and workload indicators shall be defined and provided by the applicant consortium. TPM generates an adaptive task schedule based on these inputs. The execution of the generated schedule, including robotic control and human–robot coordination logic, shall be implemented and managed by the applicant's system.
- **MSP (Multi-Sensory Perception)** enabling object detection and pose estimation to support object-aware modulation of robotic behaviour. The interpretation of detected objects and the implementation of decision validation or adaptive interaction mechanisms shall be developed by the applicants' solution.
- **HIPAP (Human Intention Perception and Prediction)** for real-time human pose tracking or gesture recognition, supporting low-friction interaction and adaptive robotic behaviour based on operator motion, which will be implemented by the applicants.
- **HRIM (Human-Robot Interaction Module)** for voice-enabled interaction supporting human-validated robotic task execution and minimal-effort command input.
- **TDM (Teaching by Demonstration Module)** for demonstration-based robotic task configuration and rapid adaptation of robotic execution strategies in variable manufacturing scenarios

Proposals must clearly describe:

- The role of the selected JARVIS module
- The expected data and control interactions between the module and the core system at a conceptual level
- The type of information exchanged and its purpose
- The expected functional improvement enabled by the integration

All integrations shall be implemented using ROS2-compatible communication mechanisms. Applicants must ensure that their proposed system architecture is capable of interfacing with ROS2-based components.

At proposal stage, detailed sequence diagrams are not required. However, applicants must provide a clear high-level architecture scheme illustrating their own system modules and the intended data and control exchanges with the selected JARVIS module.

The selected JARVIS module must be meaningfully integrated into the overall system architecture and demonstrably contribute to the collaborative use case scenario. Superficial,

loosely defined, or purely nominal integrations will be considered inadequate and will be penalized under the "Technology Implementation Approach" criterion.

Detailed interface definitions and message specifications will be finalized during Sprint 1 following project onboarding.

For further details on the modules refer to section 10.1.2

3.1.4 Challenge #3

Title: "*Remote Human-Robot Interaction for Inspection and Maintenance of Plants, Infrastructure Areas and Linear Infrastructure*"

This challenge addresses inspection and maintenance use cases in industrial plants, infrastructure areas, and linear infrastructure where remote human–robot interaction enables non-robotics experts, such as plant operators or inspectors, to effectively deploy, supervise, and control robotic systems without extensive robotics training.

The challenge focuses on adaptive and intuitive remote human–robot interaction that enhances situational awareness, supports decision-making, and ensures safe task execution in unstructured and safety-critical environments. The emphasis is not solely on robotic capability, but on interaction quality, variable autonomy, and effective human supervision under remote operation conditions.

Relevant application domains include, but are not limited to, harbours, subsea installations, power stations, airports, quay walls, municipal infrastructure, railways, tunnels, bridges, dams, waterways, wastewater networks, drinking water systems, pipelines (above ground, in tunnels, or underwater), power lines, and surrounding areas such as railway foundations or vegetation near infrastructure.

Resident robotic systems may also act as first responders during emergency situations, providing remote situational awareness and enabling safe human supervision in hazardous conditions. Robots may operate at variable levels of autonomy depending on task requirements and communication availability, including supervised autonomy and teleoperation modes.

Proposals in which human involvement does not demonstrate clear added value to task execution and system performance will be scored 0 under the "Concept & Innovation" criterion.

Applicants shall propose solutions for one or two of the following areas:

1. **Inspection-Focused Solutions:** Inspection-focused solutions shall propose adaptive remote human–robot interaction mechanisms that prioritize reliable and structured information exchange between a robotic system (composed of a single robot, or multiple robots) and the human operator in complex and safety-critical environments.
   - The principal contribution shall focus on high-quality information provision to the human operator, including structured visual and, if beneficial, auditory cues that enhance situational awareness and enable confident decision-making during inspection missions.
   - Interaction mechanisms shall support efficient remote control and supervision of the robotic platform, including clear feedback on robot state, sensor status, mission progress, and detected anomalies.
   - Solutions shall demonstrate robustness under relevant environmental conditions such as adverse weather, low visibility, communication latency, or partial signal loss.

Mechanisms for error detection, graceful degradation, and recovery shall be clearly described.
- Explicit human override and manual control capabilities shall be provided, allowing operators to directly control or intervene in robotic actions when autonomous functions are degraded or fail.
- Sensor modalities may include EO cameras, infrared imaging, acoustic sensing, vibration sensors, gas sensors, and non-destructive testing methods such as ultrasonic thickness measurement. Sensor development is not expected; sensors should be deployed and integrated within the proposed system.
- Inspection targets may include corrosion, pitting, cracks, gas leakages including diffuse leaks, structural anomalies, and monitoring of overflow risks in municipal environments.

2. **Solutions focusing on Maintenance**: Proposed solutions should address remote human-robot interaction modalities including teleoperation, voice commanding, and operator-supervised task deployment, or multimodal interaction for adaptive levels of autonomy demonstrated in maintenance tasks. Proposed solutions may address maintenance tasks including cleaning, plastering, cutting, deburring, welding, additive repair processes, pick-and-place operations, equipment replacement, manipulation of valves or handles, opening hatches, and similar interventions. The primary focus shall not be on full automation of maintenance tasks, but on advanced remote human–robot interaction enabling safe and efficient task execution.

Relevant robotic platforms include but are not limited to aerial, underwater, surface (on water) and ground vehicles.

Integration of JARVIS Modules

Applicants shall propose a core solution that directly addresses the objectives of the selected challenge. The core functionality of the proposed solution must be developed and provided by the applicant consortium. This shall include the robotic system appropriate for the targeted inspection or maintenance use case, the remote supervision or teleoperation framework, AI-assisted perception or task-support components, and the human–robot interaction interfaces required for structured information exchange and operator control.

Proposals must include a structured human-centred design and socio-technical evaluation plan tailored to inspection, maintenance, and emergency response contexts. This shall cover participatory co-design with non-robot expert users, assessment of cognitive workload and situational awareness during teleoperation or semi-autonomous operation, workforce impact and role transition analysis, and measurable preservation of operator agency under variable autonomy conditions.

The integration of JARVIS modules is intended to extend and enhance the capabilities of the proposed solution, not to replace or replicate its main functionality. JARVIS components should act as complementary enablers that strengthen contextual awareness, interaction, orchestration, and/or adaptive behaviour within the applicant's system.

Applicants shall select **one** (1) of the following JARVIS modules for integration into their system:

- **OFO (OpenFlow Orchestrator)** for contextual orchestration of inspection or maintenance mission workflows and management of transitions between operational stages. OFO coordinates system resources and execution states based on contextual inputs provided and interpreted by the applicant's solution, enabling structured adaptation under variable autonomy and remote operation conditions.
- **TPM (Task Planning Module)** for adaptive task allocation and mission sequencing in remote inspection or maintenance scenarios. TPM generates task schedules based on

workflows, operational constraints, and workload indicators defined by the applicant consortium. The applicant's system remains responsible for execution of the generated schedule and for managing teleoperation or supervisory control.

- **HRIM (Human-Robot Interaction Module)** for voice-enabled operator interaction during remote supervision or teleoperation. HRIM supports structured voice commands, confirmations, and mode switching to enhance efficiency and reduce operator workload during inspection or maintenance operations.

Proposals must clearly describe:

- The role of the selected JARVIS module
- The expected data and control interactions between the module and the core system at a conceptual level
- The type of information exchanged and its purpose
- The expected functional improvement enabled by the integration

All integrations shall be implemented using ROS2-compatible communication mechanisms. Applicants must ensure that their proposed system architecture is capable of interfacing with ROS2-based components.

At proposal stage, detailed sequence diagrams are not required. However, applicants must provide a clear high-level architecture scheme illustrating their own system modules and the intended data and control exchanges with the selected JARVIS module.

The selected JARVIS module must be meaningfully integrated into the overall system architecture and demonstrably contribute to the collaborative use case scenario. Loosely defined integrations will be considered inadequate and will be penalized under the "Technology Implementation Approach" criterion.

Detailed interface definitions and message specifications will be finalized during Sprint 1 following project onboarding.

For further details on the module refer to section 4.2

3.1.5 Challenge #4

Title: ***"Inspection and Maintenance of Industrial and Public Sector Assets and Equipment"***

This challenge focuses on Inspection and Maintenance (I&M) of assets & equipment of industrial and public sector. Applicants shall demonstrate a clear advantage of human-robot interaction (HRI) enabling non-robot experts (e.g., inspectors, maintenance crew, etc.) to efficiently use robots for operations without extensive training. Assets include, e.g., ship hulls, hydro production turbines, pressure vessels, tanks, wind turbines, gas-/ steam turbines, flare-stacks, aquaculture infrastructure (e.g., net cages), generators and specific components on assets e.g., pipe bends, buildings, etc. This challenge also includes I&M of trains and other assets.
Robots are currently typically deployed and retrieved by humans (as opposed to being "resident") and are operated in various degrees of autonomy (including to be teleoperated). Robots can also operate together with humans (e.g., for lifting, screwing, etc.) if necessary.

Applicants shall propose solutions in one or both of the following areas. The primary focus shall not be the development of new sensing or manipulation hardware, but the intelligent and adaptive integration of robotic capabilities with advanced human–robot interaction and AI-driven decision support:

1. **Inspections**: Inspection solutions shall demonstrate how robotic sensing capabilities are combined with AI-assisted perception and human–robot interaction interfaces to improve situational awareness and decision-making.

- Sensors: EO-camera, infrared, non-destructive testing (e.g., Ultrasonic Thickness Measurement).
- Damages: corrosion, pitting, cracks, leakages, building damage (e.g. heat leak, water damage), etc.

2. **Maintenance:** solutions shall demonstrate adaptive human–robot collaboration and intelligent supervision during task execution. Maintenance tasks may include but are not limited to cleaning (using water, sand, chemicals, brushes), plastering, welding, deburring, etc., as well as repair operations.

Robot types can be aerial, underwater, surface (on water) and ground vehicles.

HRI should be a key component in all proposals, and the benefit of and need for proper HRI should be clearly described. A need for HRI could arise from, but not limited to, e.g., operator monitoring and control of fleets of robots, high-risk tasks which require close operator involvement, and simplifying operator effort throughout operations from planning of tasks to evaluation of inspection findings.

Proposals must also describe a structured human-centred design approach and outline how the system will be evaluated in practice. This should include involving end users in the co-design process, considering the impact on roles and skills, assessing cognitive workload, and demonstrating how operator decision-making authority is preserved within inspection and maintenance operations. Proposals in which human involvement does not demonstrate clear added value to task execution and system performance will be scored 0 under the "Concept & Innovation" criterion.

Integration of JARVIS Modules

Applicants shall propose a core solution that directly addresses the objectives of the selected challenge. The core functionality, including the robotic platform, AI-assisted perception or decision-support mechanisms, teleoperation or supervised autonomy framework, and human–robot interaction interfaces, must be developed and provided by the applicant consortium.

The integration of JARVIS modules is intended to extend and enhance the capabilities of the proposed solution, not to replace or replicate its main functionality. JARVIS components should act as complementary enablers that strengthen contextual awareness, interaction, orchestration, and/or adaptive behaviour within the applicant's system.

Applicants shall select **one** (1) of the following JARVIS modules for integration into their system:

- **OFO (OpenFlow Orchestrator)** for contextual orchestration of inspection or maintenance mission workflows and management of transitions between operational stages. OFO coordinates system resources and execution states based on contextual inputs provided and interpreted by the applicant's solution, enabling structured adaptation under variable autonomy and remote operation conditions.
- **TPM (Task Planning Module)** for adaptive task allocation and mission sequencing in remote inspection or maintenance scenarios. TPM generates task schedules based on workflows, operational constraints, and workload indicators defined by the applicant consortium. The applicant's system remains responsible for execution of the generated schedule and for managing teleoperation or supervisory control.
- **HRIM (Human-Robot Interaction Module)** for voice-enabled operator interaction during remote supervision or teleoperation. HRIM supports structured voice commands, confirmations, and mode switching to enhance efficiency and reduce operator workload during inspection or maintenance operations.

Proposals must clearly describe:

- The role of the selected JARVIS module

- The expected data and control interactions between the module and the core system at a conceptual level
- The type of information exchanged and its purpose
- The expected functional improvement enabled by the integration

All integrations shall be implemented using ROS2-compatible communication mechanisms. Applicants must ensure that their proposed system architecture is capable of interfacing with ROS2-based components.

At proposal stage, detailed sequence diagrams are not required. However, applicants must provide a clear high-level architecture scheme illustrating their own system modules and the intended data and control exchanges with the selected JARVIS module.

The selected JARVIS module must be meaningfully integrated into the overall system architecture and demonstrably contribute to the collaborative use case scenario. Loosely defined integrations will be considered inadequate and will be penalized under the "Technology Implementation Approach" criterion.

Detailed interface definitions and message specifications will be finalized during Sprint 1 following project onboarding.

For further details on the modules refer to section 4.2.

3.1.6 Challenge #5

Open Topic: "*Human–Robot Interaction in Emerging and Strategic Domains*"

This challenge invites applicants to propose a novel use case within a domain not explicitly covered by the predefined challenges, provided that the proposal strongly aligns with the objectives of JARVIS and demonstrates measurable added value through advanced human–robot interaction.

The emphasis is on adaptive, context-aware human–robot interaction enabling humans to perform complex, safety-critical, or high-value tasks more effectively. Robotics shall extend human capabilities while preserving human supervision, decision authority, and contextual judgment. Pure automation scenarios without meaningful human–robot interaction will be scored with 0 under the "Concept & Innovation" criterion.

Proposals must demonstrate:

- Clear added value through structured and adaptive human–robot interaction
- Variable autonomy levels depending on task state and environmental conditions
- Context-aware communication and coordination between human and robot
- Measurable improvements in efficiency, safety, quality, or resilience

Indicative application domains may include, but are not limited to:

- Outdoor logistics hubs and port operations involving complex coordination and supervision tasks e.g. supervision of robotic fleets, including aerial drones and coordinated multi-robot systems, under human-in-the-loop control, but excluding generic indoor warehouse automation.
- Construction and built environment operations involving human-supervised robotic systems or active exoskeletons, for on-site assembly, structural inspection, heavy component positioning, façade operations, or adaptive task execution in dynamic and partially structured environments.
- Renewable energy installation and servicing including wind and solar infrastructure, where robotics support human operators in inspection, blade servicing, panel installation, cable routing, or maintenance activities under variable environmental conditions. Emphasis should be placed on the human-robot interaction interfaces.

- Maritime operations, shipbuilding, and offshore activities involving coordinated human–robot interaction for hull inspection, surface treatment, confined-space intervention, component installation, or supervision of robotic systems under harsh marine conditions.
- Circular economy and recycling processes involving robotic assistance for sorting, dismantling, material recovery, and hazardous material handling, where human validation, decision-making, and adaptive supervision remain central.
- Space and extreme environments requiring supervised autonomy and resilient human–robot interaction under constrained communication, delayed feedback, or high-risk conditions, such as inspection, manipulation, or infrastructure deployment tasks.
- Hazardous environment operations, including decommissioning, disaster response, or contaminated site intervention, where robotic systems extend human capabilities while maintaining structured human supervision and adaptive autonomy.

Proposals shall demonstrate operation in an operationally relevant environment at pre-commercial scale and include a structured human-centred design and socio-technical evaluation plan tailored to the selected domain.

For highly challenging or hazardous environments where deployment at the use case provider premises is not feasible, representative mock-ups or testbeds may be used accompanied by sufficient justification. However, access to appropriate end users and qualified personnel for structured user studies and interaction evaluation remains mandatory.

Integration of JARVIS Modules

Applicants shall propose a core solution that directly addresses the objectives of the selected domain and clearly demonstrates added value through advanced human–robot interaction.

The core functionality, including the robotic platform, perception components, teleoperation or supervised autonomy framework, interaction interfaces, and any AI-assisted decision-support mechanisms, must be developed and provided by the applicant consortium.

The integration of a JARVIS module is intended to extend and enhance the orchestration, or planning capabilities of the proposed system. The selected JARVIS module shall not replace or constitute the primary functionality of the solution. Proposals that over-rely on a JARVIS module without a clearly defined and independently functioning core system will be penalized under the “Technology Implementation Approach” criterion.

Applicants shall select **one** (1) of the following JARVIS modules for integration into their system:

- **OFO (OpenFlow Orchestrator)** for contextual mission or workflow orchestration and management of transitions between operational stages based on inputs provided and interpreted by the applicant’s system.
- **TPM (Task Planner Module)** for adaptive task sequencing, mission scheduling, or human–robot subtask allocation. TPM generates execution plans based on workflows, constraints, and contextual indicators defined by the applicant consortium. Execution of the generated schedule remains the responsibility of the applicant’s system.

The selected module must be meaningfully integrated into the system architecture and demonstrated within the proposed domain use case. Superficial, loosely defined, or nominal integrations without measurable functional contribution will not be considered sufficient.

Proposals must clearly describe:

- The role of the selected JARVIS module
- The expected data and control interactions between the module and the core system at a conceptual level
- The type of information exchanged and its purpose
- The expected functional improvement enabled by the integration

All integrations shall be implemented using ROS2-compatible communication mechanisms. Applicants must ensure that their proposed system architecture is capable of interfacing with ROS2-based components.

At proposal stage, detailed sequence diagrams are not required. However, applicants must provide a clear high-level architecture scheme illustrating their own system modules and the intended data and control exchanges with the selected JARVIS module.

The selected JARVIS module must be meaningfully integrated into the overall system architecture and demonstrably contribute to the collaborative use case scenario. Loosely defined integrations will be considered inadequate and will be penalized under the "Technology Implementation Approach" criterion.

Detailed interface definitions and message specifications will be finalized during Sprint 1 following project onboarding.

For further details on the modules refer to section 4.2.

3.1.7 JARVIS Modules Overview

The modules offered by the JARVIS consortium have been designed based on industry requirements and project objectives. These modules are structured into the following pillars:

- **Robot Interaction**: This type of JARVIS modules target at natural direct and indirect human-robot interaction and deal with robot programming, teleoperation, and human-robot communication. They can address a wide range of scenarios, where the human can be present in the same cell with the robot or in a remote and safe area interacting with the robot through teleoperation.
- **User Experience Enhancement**: JARVIS promotes human-centric design of Human-Robot Interaction and complementarily to the modules of the previous pillar, provides user-friendly interfaces enhancing user experience (UX), as well as modules enabling the adaptation of robot behavior to human preferences, needs and intentions, ensuring smooth interactions as if it was among humans.
- **Process Control**: The control and monitoring of the execution of JARVIS use-cases is accomplished through centralized orchestration, which sends execution commands and actions to the distributed resource-controlling modules and receives feedback on the progress of each action. The orchestration system is configured based on the human-in-the-loop principle by providing operators with modules to communicate their input.
- **Cognition and Intelligence**: JARVIS provides modules for enabling robot cognition. The modules include digital twins, perception systems enabling the prediction of human intention, as well as intelligent mechatronics. These modules aim to achieve robot autonomy, quality control and dexterous handling of parts.

More details on the JARVIS moduleset can be found in the next section.

3.2 JARVIS FRAMEWORK

3.2.1 JARVIS modules available for 3rd party integration

From the JARVIS core sub-systems being developed, the following modules can be provided to the approved 3rd parties:

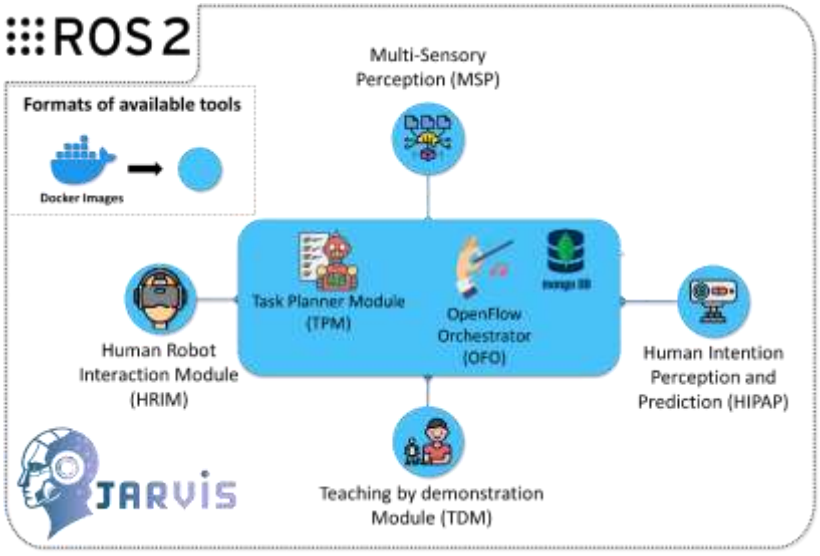

Figure 3. JARVIS modules available to 3rd parties.

1. **Robot Interaction**

- **Teaching by Demonstration Module (TDM):** TDM allows operators without programming expertise to teach robots by demonstration. Tasks performed by the operator are captured, enabling the robot to learn and generalise them to similar scenarios (e.g., varying object positions or orientations). The TDM leverages this operator demonstrations to train robot policies that can easily be deployed on the external pilots' robotic cells with ROS2 by using the standarized LeRobot format for the datasets and trained policies. Enabling fast task setup and adaptation, increasing flexibility and versatility in collaborative robotics.

  Prerequisites:
  - Potential use scenario 1: Teleoperation deployment
  - Potential use scenario 2: Automated robot operation deployment

  The module is made available as a docker image with ROS2 interfaces.

2. **User Experience Enhancement**

- **Human Robot Interaction Module (HRIM):** The Human-Robot Interaction Module (HRIM) enables natural and efficient collaboration between people and robots. It allows operators to interact with robotic systems through voice or augmented reality, maintaining full control and awareness in real time. Using microphones and AR projectors, HRIM provides clear task instructions and live process feedback, as needed by the human. Operators can command the robot through voice commands, and can also query task information, with HRIM acting as an assistant that augments their memory and situational awareness. Its human-centric design and seamless

integration of interaction modalities allow the operator to stay focused on the task, ensuring smooth, intuitive, and adaptive collaboration.

Applicants may integrate HRIM into their solutions using one of the following implementation options, depending on the needs of their use case:

- Option A: AR Projection Interface: interaction through the AR projector only, providing visual instructions, task guidance, and real-time process feedback to the operator.
- Option B: Voice Interaction Interface: interaction through voice commands and queries using the microphone system, enabling hands-free control and communication with the robot.
- Option C: Combined Interaction: integration of both AR projection and voice interaction, allowing multimodal human-robot collaboration and enhanced situational awareness.

Requirements:

- Hardware devices (projector or microphones) should be provided and configured by the Third Parties.

The module is served as an executable with ROS2 interfaces

3. Process Control

- **OpenFlow Orchestrator (OFO):** The OFO module manages the interconnection of production resources and software modules, enabling online orchestration, execution, and monitoring of processes. It incorporates interruption recovery mechanisms to ensure resilient execution. Based on action sequences created from its GUI, OFO issues commands to resource controllers and collects feedback on execution status, propagating results to subsequent actions when required.
  - A demo video of its functionality can be found here.
  - A blog post describing the module can be found here.

  This module is served as a Docker image with ROS2 interfaces and MongoDB integration.

- **Task Planner Module (TPM):** The Task Planner Module (TPM) can generate optimized work plans for both shared human robot workspaces and remote cooperation scenarios. It ensures efficient task allocation and prioritization based on environmental factors, task complexity, and operator preferences, adapting dynamically to real-time conditions. The module utilizes a Reinforcement Learning model to generate optimal workplans based on an input structured JSON model that includes tasks, resources, dependencies and resources metrics over the different tasks (time, cost, ergonomics).

  This module is served as a Docker image with ROS2 interfaces.

4. Cognition and Intelligence

- **Human Intention Perception and Prediction (HIPAP):** The HIPAP module captures pose and posture operator data to support intuitive real-time interactions. Specifically, it performs real-time body tracking to estimate the

operator's skeletal pose, orientation, and movement within the workspace. The module can also detect and classify hand gestures, enabling intuitive, contactless interaction with the system. By continuously monitoring these physical cues, HIPAP ensures accurate recognition of user commands and supports smooth, responsive collaboration. Requirements:

- Indoor environments
- Datasets should be captured by the applicants and provided to the JARVIS modules as ROS2 topics or rosbag files.
- Hardware: RGB or RGB-D sensors to be provided by the Third Parties.
- Hardware configuration: The camera needs to be facing the operator to acquire full uninterrupted frames of the operator, preferably without obstructions between the sensor and the operator.

This module is served as a Docker image with ROS2 interfaces.

- **Multi-Sensory Perception (MSP):** The MSP module utilizes AI-driven vision systems capable of performing robust object classification/pose estimaton and visual analysis in real-world applications. It enables product variant recognition and discrepancy detection, thus supporting robotic processes and quality monitoring. The solution relies on state-of-the-art machine/deep learning models to provide reliable and effective on-site results. Requirements:
  - Indoor environments
  - Annotated datasets with the needed labels/classes should be captured by the applicants and provided to the JARVIS module as as ROS2 topics or rosbag files
  - RGB or RGB-D sensors integrated with ROS2

  This module is served as a Docker image with ROS2 interfaces.

3.2.2 How to expect to use the JARVIS modules

The six JARVIS modules are summarized on the following table:

No.	Module Name	Format	Interface
1	OFO (OpenFlow Orchestrator)	Docker Image	ROS2 and MongoDB
2	TPM (Task Planner Module)	Docker Image	
3	MSP (Multi-Sensory Perception)	Docker Image	
4	HIPAP (Human Intention Perception and Prediction)	Docker Image	
5	HRIM (Human-Robot Interaction Module)	Docker Image	
6	TDM (Teaching by Demonstration Module)	Docker Image	

3.2.3 JARVIS DATA PRIVACY AND SECURITY

With JARVIS focusing on human-robot collaboration and data-driven solutions, security and privacy are main points of focus. This section outlines the philosophy of the consortium to ensure data security, integrity, and privacy throughout the project lifecycle.

3.2.3.1 Data Security

- Encryption of sensitive data
- Multi-factor authentication for access to JARVIS systems.
- Role-based access control to limit data access to authorized personnel.
- Regular security audits and vulnerability assessments.
- Activity monitoring to detect and respond to suspicious behaviour.

3.2.3.2 Data Integrity

- Data validation and verification processes.
- Regular data backups and recovery procedures.
- Version control for datasets and software components.

3.2.3.3 Data Privacy

- Obtaining informed consent from individuals before collecting their personal data.
- Minimizing the collection of personal data to what is strictly necessary for the project's objectives.
- Implementing data anonymization and pseudonymization techniques
- Establishing clear data retention policies.
- In general, alignment with EU GDPR.

3.2.3.4 Third Parties

For the Third Parties, the following security and privacy rules must be followed:

- Assure full compliance to the GDPR and other applicable data protection laws.
- Use suitable data anonymization and pseudonymization techniques to safeguard individual privacy.
- Perform thorough risk assessments for all new components and use cases.
- Clearly and openly demonstrate to users how their data is gathered, utilized, and protected.

4 HOW TO APPLY?

The F6S platform will be the single-entry point for all applications to the JARVIS Open Call for external pilots. The applications must happen via https://www.f6s.com/jarvis-oc2-external-pilots/apply

The templates to the Open Call documents are available here → https://www.jarvis-project.eu/open-calls/open-call-2/.

The project proposals must strictly adhere to the F6S application form, which defines sections, required Annexes, and the overall length. Participants are requested to carefully read and follow the instructions in the form. Additional material, which has not been specifically requested in the online application form, will not be considered for the evaluation of the proposals and may be subject to withdrawal from the evaluation.

Applying to an Open Call takes time and dedication and we would like to make sure that you understand the crucial rules:

- **Be on time**: Make sure you submit your proposal through the F6S platform before the deadline. If you submit the form correctly, the system will send you a confirmation of your submission (please check your SPAM folder as well). Proposals submitted by any other means are ineligible, hence will not be evaluated.
- **F6S application**: The F6S platform allows you to work flexibly on the content, which is automatically saved once you progress filling out the form. All members of your team can have access to the application form and contribute to the work.
- **Be exhaustive**: Have you answered all the sections of the form and uploaded all required Annexes?
- **Every question deserves your attention**: All sections of your proposal must be filled in. Make sure that the data provided is true and complete.
- **Documentation format**: Any document requested in any of the sprints must be submitted electronically in PDF format without restrictions for printing.

NOTE 1: It is strongly recommended to avoid waiting till the last moment of submission. Failure of the Proposal to arrive in time for any reason, including communications delays, or network issues is not acceptable as an extenuating circumstance and will automatically lead to rejection of the submission.

The time of receipt of the proposal as recorded by the submission system will be definitive.

NOTE 2: After application submission, editing is not possible. If the applicant discovers an error in the proposal and provided the call deadline has not passed, the applicant may request the Open Call **JARVIS** team to re-submit the proposal (for this purpose please contact us at **oc@jarvis-project.eu** with a message titled: RESUBMISSION REQUEST). However, **JARVIS** is not committed that resubmission in time will be feasible in case the request for resubmission is not received by the Open Call **JARVIS** team at least 48 hours before the call deadline.

5 HOW WILL APPLICATIONS BE EVALUATED & SELECTED?

The evaluation process is structured into 3 phases, as illustrated in Figure 4.

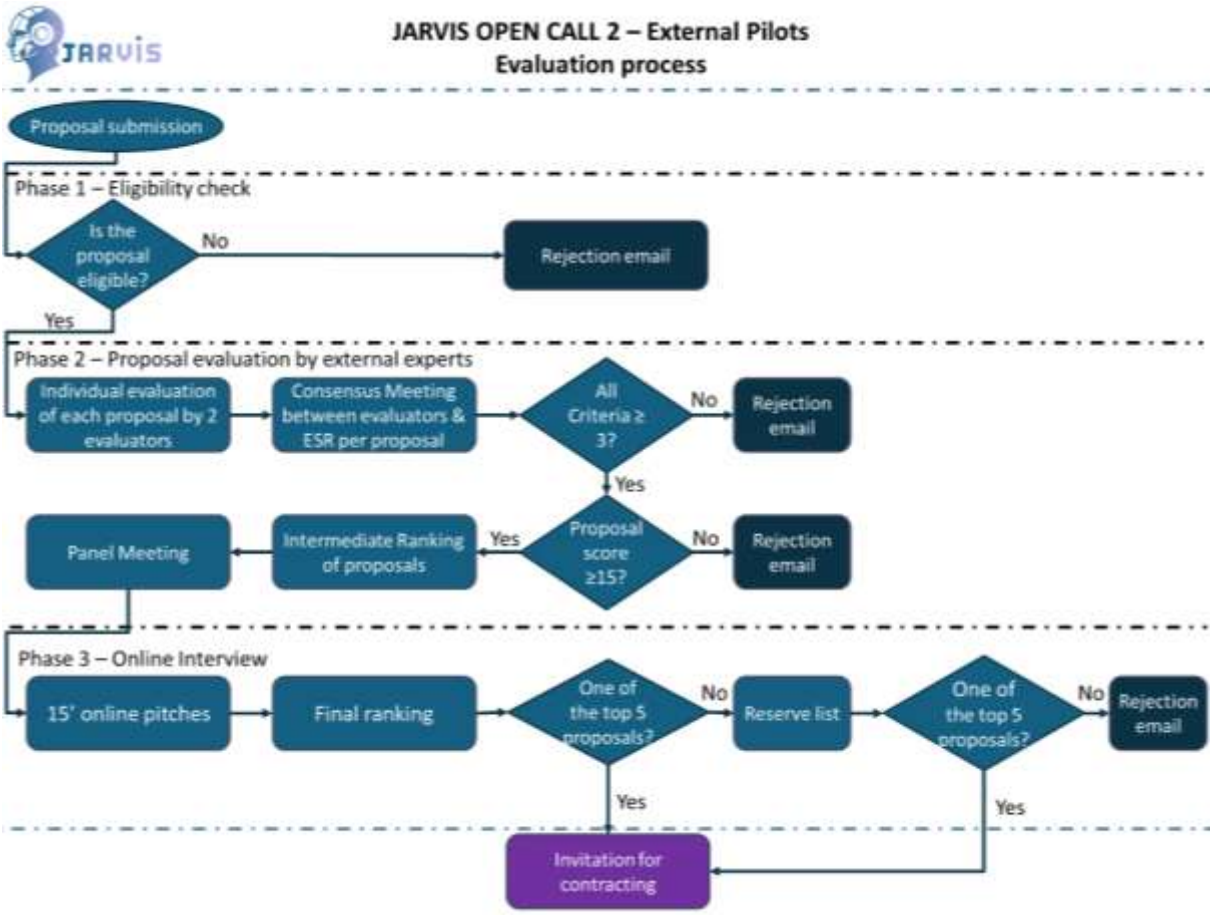

Figure 4. Evaluation process overview

5.1 Phase 1 – Eligibility check

Eligibility to participate in the funding programme is initially verified against the eligibility criteria defined in section 3. This process is carried out by the **JARVIS** Open Call Management Team. A proposal may be declared ineligible or inadmissible at any stage. The check will verify the status according to eligibility criteria listed in section 5 and summarised in the checklist Table 1.

The eligible Proposals will be given to external evaluators to initiate the remote evaluation. The non-eligible applicants will be informed by email. **No additional feedback will be given.** Proposals considered eligible will move on to the external remote evaluation sprint.

Table 1. OC2 External Pilots eligibility criteria checklist.

#	ELIGIBILITY CRITERION	DESCRIPTION	CHECKLIST
1	**Submission Platform**	Proposals must be submitted ONLY through the designated F6S platform.	YES/NO
2	**Submission deadline**	The proposal must be submitted before the official deadline.	YES/NO
3	**Type of Beneficiary**	SME, Startup, RTO, public or private industry acting as solution adopter	YES/NO
4	**SME/Startup status**	Registered at least one year before the application submission.	YES/NO
5	**Geographical eligibility**	All entities are registered in the eligible countries.	YES/NO
6	**Consortium composition**	At least two and maximum three legal entities applied to the call with required profiles of technology developer/and technology integrator, and technology adopter.	YES/NO
7	**Funding**	The maximum available funding of 130 000 euro per project is not exceeded.	YES/NO
8	**Language**	The entire proposal, including all required documentation, must be submitted ONLY in English.	YES/NO
9	**Legal Status**	Entities are legally established with a valid VAT number.	YES/NO
10	**Official Template**	The proposal must strictly follow the provided official Proposal Templates.	YES/NO
11	**Page Limitation**	The proposal must not exceed the maximum page limits.	YES/NO
12	**Completeness**	The application must be complete, including all requested administrative data and obligatory supporting documents requested in the F6S platform.	YES/NO
13	**Thematic Alignment**	The proposed project must be clearly aligned with JARVIS OC2 External Pilots concept.	YES/NO
14	**Exclusion from Funding**	The applying entity is not a Large Corporate (i.e., not qualifying as an SME).	YES/NO
15	**Multiple submission**	No more than one proposal has been submitted by the entity.	YES/NO
16	**Conflict of Interest**	Entities do not represent a conflict of interest with JARVIS Consortium.	YES/NO
17	**EU Sanctions**	Is there any applying entity subject to any EU restrictive measures (sanctions) under Article 29 TEU or Article 215 TFEU?	YES/NO

5.2 Phase 2 – external evaluation of eligible proposals

The external evaluation of proposals will be conducted remotely by independent evaluators selected from a pool established through a call for expressions of interest. Evaluators will be assessed and selected based on their expertise related to the JARVIS Challenges and their experience in the evaluation of research and innovation proposals. The most suitable evaluators for each Challenge will be invited to participate in the evaluation process.

Evaluators will perform their assessments in an individual capacity, and not as representatives of their employer or any other organisation. They are required to act in an independent, impartial, and objective manner.

All evaluators will be required to sign a contract, including a declaration of confidentiality and absence of conflicts of interest, before accessing the proposals and participating in the evaluation process.

5.2.1 External individual proposal evaluation

Each proposal will be assigned to two external independent evaluators. The evaluators will be distributed across the different proposals based on their expertise and sector of activity. They will individually evaluate each proposal based on the criteria listed in the table below and the accompanying assessment dimensions. For each assessment dimension, a score of 1 point will be awarded if the proposal clearly satisfies the dimension, 0.5 points if the proposal partially addresses the dimension, and 0 points if the proposal does not adequately address the dimension or does not address it at all.

JARVIS Open Call 2 External Pilots Track Evaluation Criteria			
#	**Criteria**	**Assessment Dimensions**	**Threshold**
1	Concept & Innovation	• Does the proposal clearly describe the problem, use case context, and operational environment where the solution will be deployed, including pictures? • Does the proposal demonstrate that the proposed solution is innovative compared to current approaches or state-of-the-art technologies? • Does the proposal demonstrate a core technological solution developed by the third-party (TRL 4-5) that will be further developed or adapted within the pilot? • Does the proposal present a meaningful integration of one JARVIS module into the proposed solution illustrated in a modules diagram or conceptual architecture or workflow diagram? • Is the proposed concept technically feasible within the 10-month programme timeframe?	3/5

2	Impact	• Is the market potential and commercialization strategy of the consortium clearly described? • Does the proposal clearly describe the intellectual property ownership or strategy for protecting and exploiting the developed solution? • Does the proposal clearly describe the expected operational benefits for the use case provider and the potential industrial end-users (e.g., safety, efficiency, productivity)? • Does the proposal demonstrate relevance to European industrial competitiveness or cross-sector applicability? • Are there clear economic and societal impacts of the proposed pilot supported by measurable KPIs?	3/5
3	Technology Implementation Approach	• Does the proposal present a realistic implementation plan with clear task content, expected outcome per task, and responsibilities allocated between the third-party consortium members? • Is the interaction between the applicant solution and the JARVIS consortium adequately considered in the task descriptions? • Are the milestones, deliverables and risks adequately defined? • Are the testing and validation procedures in the use case environment clearly described? • Does the proposal demonstrate that the solution can reach TRL7 demonstration in the selected use case environment?	3/5
4	Consortium/ Applicant Team and Use of Resources	• Does the applicant demonstrate technical expertise relevant to the proposed solution? • Does the applicant demonstrate experience in robotics, AI, manufacturing, or related industrial technologies evidenced by scientific papers, videos or other tangible results? • Is the team composition appropriate for the scope of the proposed activities? • Is the proposed budget allocation realistic and consistent with the planned activities and expected deliverables? • Does the proposal demonstrate that the applicant has sufficient resources and capacity (technical, financial, and organisational) to successfully implement the project?	3/5

The independent evaluators will score each one of the four criteria using the assessment dimensions. Each criterion will take values on a scale from 0 to 5 (decimal and centesimal point scores may be given):

- **0 =** Fail: The proposal fails to address the criterion or cannot be judged due to missing or incomplete information.
- **1 = Poor**: criterion is inadequately addressed or there are serious inherent weaknesses.
- **2 = Fair**: proposal broadly addresses the criterion, but there are significant weaknesses.
- **3 = Good**: proposal addresses the criterion well, but shortcomings are present.
- **4 = Very good**: proposal addresses the criterion very well. A small number of shortcomings are present.
- **5 = Excellent**: proposal successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

Each evaluator will record his/her individual assessment of each proposal using a signed Individual Evaluation Report (IER).

5.2.2 Consensus report per proposal

Following the submission Individual Evaluation Reports (IERs) for each proposal the differences between the criterion and overall scores will be examined by the JARVIS Open Call Management Team. If the difference between the individual evaluations is three points or less in the total score, and there is no disagreement regarding the minimum threshold requirements, one of the two evaluators who evaluated the proposal will be designated as rapporteur and will be responsible for preparing the draft Evaluation Summary Report (ESR) based on the submitted individual evaluations. The rapporteur will consolidate the comments and scores into a single consensus Evaluation Summary Report (ESR), which will be shared with the other evaluator for validation and signature.

A Consensus Meeting will be organised when a significant discrepancy is observed between the individual evaluations. This includes cases where:

- the difference between the total scores exceeds three points,
- one evaluator scores the proposal above the overall threshold while the other scores it below, or
- evaluators disagree on whether the proposal meets the minimum threshold of three points in any evaluation criterion.

The Consensus Meeting will involve the evaluators and representatives of the JARVIS consortium acting as observers. The purpose of this meeting is to reach agreement on the final scores and comments to be included in the Evaluation Summary Report (ESR).

If the evaluators are unable to reach consensus, a third independent evaluator will be appointed to conduct a blind review of the proposal. The third evaluator will first submit their independent individual assessment before gaining access to the previous

evaluations. The third evaluator will then lead the preparation of the final Evaluation Summary Report (ESR).

Following the consensus evaluation stage, proposals that have scored less than 3 points in some individual criterion or less than 15 points overall in their ESR, will be rejected and the applicants will be notified with a relevant e-mail including their ESR.

5.2.3 Intermediate ranking & panel meeting

Following the consensus evaluation stage, proposals will be ranked per Challenge based on their final consensus scores. The ranking will be generated automatically according to the evaluation scores and the tie-breaking rules defined below:

- **Rule 1:** The proposals will be ranked per Challenge based on their overall score (sum of criterion 1 to 4 scores).
- **Rule 2:** In case following Rule 1 there are proposals in the same position, priority will be given to proposals that their technology better fit to **JARVIS** scope (Criterion 1).
- **Rule 3:** In case following Rule 2 there are proposals in the same position, priority will be given to proposals that have higher impact and market potential (Criterion 2).
- **Rule 4:** In case following Rule 3 there are proposals in the same position, priority will be given to the application that has better capacity to implement the project. (Criterion 4).
- **Rule 5:** In case following Rule 4 there are proposals in the same position, priority will be given to the application that has a lower funding request.
- **Rule 6**: After applying Rule 5 and if there are proposals in the same position, priority will be given to those addressing gender/accessibility/inclusion impact.

Following the automated ranking, the objective of the panel stage is to validate the ranking results and ensure consistency and quality across the evaluated proposals, acting as a second-level review that complements the standardized evaluation approach implemented through the structured assessment questions defined for each evaluation criterion.

To smooth any human factors in the evaluation process, the evaluators involved in the remote evaluation may participate in a common panel teleconference call organised by the JARVIS Open Call Management Team. The purpose of this meeting is not to re-evaluate the proposals but to confirm the consistency of the ranking results and to identify any potential anomalies in the evaluation outcomes.

The panel discussion will primarily focus on exceptional situations, including:

- proposals with identical final scores that are at the top of the ranking, in order to confirm that the implemented tie-breaking rules indeed lead to the selection of the highest-quality proposals,
- cases where the difference in proposal quality between challenges appears significant,
- situations where the number or quality of eligible proposals within a specific challenge is limited.

In such cases, the evaluators may review the ranking results and the respective evaluation reports and proposal information in order to agree on a final ordering of the proposals

within each challenge, ensuring that the highest-quality proposals are promoted to the next stage of the evaluation process.

The overall objective of this stage is to identify the top-quality proposals per challenge, aiming to select up to two proposals per challenge to be invited to the next evaluation stage. However, this distribution may be adjusted if the quality of proposals differs significantly across challenges or if there are not enough high-quality proposals within a challenge.

The final outcome of the panel stage will be a short list of proposals that will proceed to the next phase of the evaluation process. Representatives from the JARVIS module developers will be invited as observers to the panel meeting.

5.3 Phase 3 – online interview

The objective of the interview is to better understand the proposal, particularly its quality and excellence, the expected impact and exploitation potential, quality of the workplan, and quality of the applicants. Any complementary material that can support the presentation of the project is acceptable during the interview.

Interviews will be carried out by a selection of the internal evaluators from the **JARVIS** Consortium. Members of the **JARVIS** team directly involved in the selected challenge that each proposal is addressing will participate in the interview and respective final evaluation process.

Interviews are expected to last approximately 30-45 min. One participant per applicant entity shall participate in the meeting. The applicants are expected to prepare and present a presentation (approximately 15 minutes) and answer any questions regarding their proposal from the internal evaluators.

If at any time during the interview the applicants do not commit to what was included in the submitted proposal, the proposal will be automatically disqualified. If after the interview process the JARVIS internal evaluators still have questions, the applicant may be requested to provide additional information in writing.

At the end of the evaluation phase, five proposals will be invited for contracting (1 per each challenge, if applicable). The other proposals that were invited to the interview stage will remain on a reserve list in case one of the selected proposals fails to sign the Sub-Grant Agreement (Annex 7.2).

5.3.1 Final ranking and selection

After the online interview process, all proposals will be ranked according to the average scores obtained from (1) the external remote evaluation and (2) the online interviews.

Five proposals will be selected (1 per each challenge, if applicable).

All eligible Proposals will receive an acceptance or rejection letter together with an Evaluation Summary Report (ESR). Proposals not having passed to the online interview stage will receive a report with results of the external remote evaluation. Proposals that passed to the online interview will receive a report with information from both the remote evaluation and interview stages.

5.4 Redress process

Within 3 working days of the delivery of an ESR or a rejection letter considering the proposal as non-eligible, a proposer may submit a request for redress if s/he believes the results of the eligibility checks have not been correctly applied, or if s/he feels that there has been a shortcoming in the way his/her proposal has been evaluated that may affect the final decision on whether to enter the **JARVIS** Consortium or not. In that case, an internal review committee will examine the request for redress. The committee will review the complaint and will recommend an appropriate course of action. If there is clear evidence of a shortcoming that could affect the eventual funding decision, it is possible that all or part of the submitted proposal will be re-evaluated.

6 WHAT HAPPENS AFTER SELECTION?

6.1 Administrative check

Selected applicants will be invited to the contracting sprint, where administrative and financial details and documents are verified and validated. The steps of this phase are:

1. Inclusion of comments (if any) provided in the Evaluation Summary Report as part of the Sub-grant Agreement (SGA).
2. Validation of the entities based on the provision of the following documentation:
   - Formal proof of the entities' legal existence and tax activity.
   - Consortium Declaration of Honour, signed by the legal representative of each consortium partner.
   - SME declaration, signed by the SMEs' applicants.
   - Bank Account Information.

6.1.1 Additional considerations

- A valid VAT is mandatory.
- Deadlines for document submission will be provided and will normally be concluded within two weeks.
- Failure to complete the signatures in time will result in rejection.

6.2 Contracting

Each third-party project will sign the Sub-grant Agreement (SGA) under the 'lump sum model'. This will imply that the Open Call will provide the financial support to the third parties upon delivery of the expected output.

- The SGA will include, as an annex, the Proposal Template submitted by the funded project as Implementation Plan. This document establishes, among others, the KPIs and Deliverables that will be taken into account when evaluating the Third Party(ies) performance at the milestones review, as well as the budget for the project.
- A template of the Sub-Grant Agreement is provided in Annex 7.2. The SGA template is non-negotiable and cannot be modified during the contracting process or at later stages of the programme. The only section that may be updated is the annex containing the Implementation Plan, in order to incorporate adjustments resulting from the Evaluation Summary Report or other project-specific elements agreed between the Third Party and the JARVIS consortium. The template itself may only be updated by the JARVIS consortium in case of administrative or legal updates.
- Signing of the Sub-grant Agreement between JARVIS Consortium represented by the JARVIS coordinator handling the FSTP budget [LMS] and the Consortium Leader.
- Signed documents must be provided as original hard copies signed in blue ink and sent to the address of the JARVIS project coordinator.

Failure to comply with any of these criteria will lead to automatic termination of the contracting sprint.

7 ACTIVITIES DURING THE FUNDED PROGRAMME

7.1 Programme Sprints

Each selected External Pilot will participate in the **10-month JARVIS programme**, structured into three consecutive development phases referred to as Sprints. Funded projects must implement their activities according to this structured programme, with work distributed across the three mandatory Sprints.

The programme is designed to support the **progressive maturation of the proposed solution**, starting from detailed requirement definition and system architecture design in cooperation with the JARVIS consortium, progressing through development and prototype deployment, and concluding with full system integration and validation in an operational environment.

Payments will be made in **three instalments (25% + 40% + 35%)** following the lump sum funding mechanism. Each instalment is paid after the successful completion and review of the deliverables and results associated with each Sprint. The third instalment will be executed after the final set of deliverables is delivered and approved by the JARVIS consortium, as well as once the JARVIS consortium will receive the final payment from the European Commission.

Table 2. 10-Month JARVIS programme

10-MONTH JARVIS PROGRAMME for EXTRENAL PILOTS (up to €130 000)			
Name	**Sprint 1**	**Sprint 2**	**Sprint 3**
Duration	2 months	6 months	2 months
Goal	**Requirements**	**Development & Deployment**	**Integration & Validation**
Means of verification	**1. Sprint 1 Report** describing adopter requirements, system specifications, baseline technologies, and roadmap to the final demonstrator. Includes finalized case-specific KPIs and baseline values. **2. Dissemination material** one-pager dissemination material describing the project	**1. Sprint 2 Report** describing developed functionalities, achieved progress, and next steps towards TRL7. **2. Video demonstration** of the system prototype operating in a relevant environment. **3. Dissemination activities:** at least 2 social media posts (e.g., LinkedIn).	**1. Final Report** summarizing results, validation outcomes, and exploitation potential. **2. Video demonstration** of the system prototype operating in an operational environment (TRL7). **3. Dissemination activities:** at least 2 social media posts (e.g., LinkedIn).
Payment	25%	40%	35%

LMS will be the only organization responsible for making the payments: funds will be secured in a dedicated account at a trusted bank. Payments will be made after the verification of the bank account details (IBAN) of the Third Party(ies).

7.1.1 Sprint 1 - Requirements

Sprint 1 is the starting point of each project and lasts two months. Within this sprint, beneficiaries must finalize the implementation plan, including key requirements and roadmap for the development and deployment of the funded pilot. The implementation plan should account for the integration of the selected JARVIS module with the rest of the technologies and the fulfilment of the project's objectives.

The outcome of "Sprint 1: Requirements" should include the following:

- Detailed description of the use case and the current process workflow (as-is scenario).
- Conceptual description of the envisioned use case including the planned technology deployment (to-be scenario).
- Description of the technologies and system components developed by the applicants to be used, including their technical specifications.
- Identification of baseline technologies or existing prototypes that will serve as the starting point for development.
- Definition of the system architecture and integration concept with the selected JARVIS module.
- Refinement of the overall project implementation approach including project milestones, deliverables, and Key Performance Indicators (KPIs), accompanied by metrics and target values for assessing success.

At the end of Sprint1, beneficiaries should deliver:

1. a report presenting the technology adopter requirements, technical specifications of the solution, description of the baseline technologies/prototypes and roadmap to the final demonstrator together with the finalization of the case specific KPIs including baselines, as a means of verification of work performed.
2. A one-pager dissemination material including the publishable summary of the results obtained at this stage.

7.1.2 Sprint 2 - Development & Deployment

Sprint 2 lasts six months and is dedicated to the core development and deployment stage of the projects. During this stage, beneficiaries implement the functionalities defined in Sprint 1 and progressively deploy the system prototype in a relevant environment.

The activities in this Sprint focus on system development, prototype integration, and initial deployment, including the integration of the selected JARVIS module into the applicant's system architecture. Projects should follow the implementation plan defined in Sprint 1 and carry out the following activities:

- Development of the required functionalities as identified in Sprint 1
- Initial integration with the JARVIS module to test the designed interfaces and data exchange mechanisms.
- Deployment of a demonstrator of the system prototype in relevant environment, including the JARVIS module that the third-parties have selected from the list in section 4 of the present document.
- Collection of operational data and evaluation of the system performance at this intermediate stage.

At the end of Sprint2, third-parties will have to deliver:

1. Sprint 2 Report describing the implemented functionalities, achieved progress, and next development steps toward the final demonstrator.
2. Video demonstration of the system prototype operating in a relevant environment.
3. Publishable summary of the achieved technical progress to be used in the third-parties dissemination activities including at least two social media posts (e.g., LinkedIn).

7.1.3 Sprint 3 – Integrate & Validate

Sprint 3 focuses on the final integration and validation of the developed solution within the intended use case environment. The objective of this stage is to demonstrate the fully integrated system prototype operating at TRL7 and to evaluate its usability, technical performance, and operational value.

Validation activities should include system demonstrations, user validation studies, and assessment of the potential impact and exploitation pathways of the developed solution.

Key activities in this Sprint include:

- Demonstration of the system prototype operating in an operational environment (TRL7).
- Final integration and validation of the selected JARVIS module within the overall system architecture.
- Execution of user validation studies involving at least five participants (e.g., operators, engineers, or workers) interacting with the proposed solution. Participants should provide structured feedback regarding usability, technology acceptance, and the perceived value of the solution.
- Development of an exploitation roadmap outlining potential commercialization pathways and future development steps.

At the end of Sprint 3, third-parties must submit the assigned deliverable as proof of work completed including:

1. The final report with the achieved results including the outline for future exploitation and feedback to the impact assessment.
2. A publishable video from the system prototype demonstration in operational environment (TRL7).
3. A publishable summary of the achievements.

7.2 Evaluation during the Programme

For accessing the funding, the third-party projects need to demonstrate and present proofs of their progress and achievements and the deliverables presented must be assessed positively in each of the Sprint. In case of missing the above, the third parties are not paid and may be requested to not participate longer in the JARVIS project.

The grant received by the third parties is to finance:

- Work performed by employees of the third-party.
- Investment in software/ hardware (only the value associated with its depreciation).

- Travels associated with the project deployment or **JARVIS** activities.
- Participation in events/ conferences and promotion campaigns associated with **JARVIS.**

Table 3. Review for External Pilots projects

Stage	Item	Description
Sprint 1	**Requirement**	• Signed sub-grant agreement • Timely Submission of the contracted deliverables per Sprint 1 in mid M2. • Reporting all activities required per Sprint 1 listed in the selected Challenge and Sprint 1. • Successful achievement of Sprint KPIs
	Result	Payment of 30% of the grant
	Timeline	Early M3 (Sprint 1 Review)
Sprint 2	**Requirement**	• Timely Submission of contracted deliverables per Sprint 2 in mid M8. • Reporting all activities required per Sprint 2 listed in the selected Challenge and Sprint 2. • Successful achievement of Sprint KPIs
	Result	Payment of 40% of the grant
	Timeline	Early M9 (Sprint 2 Review)
Sprint 3	**Requirement**	• Timely Submission of the contracted deliverables per Sprint 3 in mid M10. • Reporting all activities required per Sprint 3 in the selected Challenge and Sprint 3. • Successful achievement of Sprint KPIs
	Result	Payment of 30% of the grant.
	Timeline	Early M11 (Sprint 3 Review)

The relevant KPIs and expected outcomes are gathered in the table below:

Table 4. KPIs for the assessment of the external pilots

KPIs – Sprint 1
• KPI-S1.1: System architecture definition • KPI-S1.2: Demonstration scenario definition • KPI-S1.3: KPI baseline definition • KPI-S1.4: Preparation of dissemination material, minimum 1 public announcement of the scope of the project (e.g., via Social Media (SM)).
KPIs – Sprint 2
• KPI-S2.1: Functional prototype implementation • KPI-S2.2: Successful data exchange with the JARVIS module • KPI-S2.3: Prototype demonstration in relevant environment (TRL6) • KPI-S2.4: Presentation intermediate performance evaluation • KPI-S2.5: Preparation of dissemination material, minimum 1 publishable video demonstration at TRL 6.

KPIs – Sprint 3	
• KPI-S3.1: Successful demonstration of the use case in the selected domain at TRL7. • KPI-S3.2: One **JARVIS** module integrated in the proposed pilot • KPI-S3.3: At least 60% of participants in the pilot user studies report willingness to adopt the system in their regular work, based on predefined acceptance criteria assessed in a structured user study (≥6 repeated-measures or ≥12 between-subjects participants). • KPI-S3.4: Preparation of dissemination material, minimum 1 publishable prototype demonstration at TRL7. Select 2 from the KPI types below and define specific target values for your pilot in the proposal: • KPI-S3.O1: Reduction of human exposure to harmful environments by X% (specific value to be defined by pilot and listed in the proposal) • KPI-S3.O2: Reduction of reconfiguration and programming time by X% (specific value to be defined by pilot and listed in the proposal) • KPI-S3.O3: Reduction of cycle time by X% (specific value to be defined by pilot and listed in the proposal) • KPI-S3.O4: ≥ X% (specific value to be defined by pilot and listed in the proposal) reduction of the perceived or measured physical workload (RULA, OCRA, NIOSH, or similar metric) compared to baseline manual operation. • KPI-S3.O5: X% (specific value to be defined by pilot and listed in the proposal) improvement of the perceived or measured mental workload (NASA-TLX, SWAT, SUS, Eye-tracking metrics, or similar metric).	
Dissemination KPIs applicable to all Sprints	• KPI 1: Minimum 3 SM posts per each Sprint and 200 interactions in total (likes, shares, comments) across all posts during the programme. • KPI 2: One blog post for JARVIS website per Sprint
Expected final outcome	The expected outcome at the end of the 10-month project execution includes: • the demonstration of the solution including the **JARVIS** selected module at a relevant environment with the selected use case (onsite or testbed). • a report presenting the testing with actual users in the selected industry. This should be supported by a user satisfaction study and documented in a report. • a report presenting their go to market strategy.

The sub-granted projects must submit to the JARVIS consortium the deliverables and reports corresponding to each Sprint by the 15th calendar day before the end of the respective Sprint, unless otherwise specified by the JARVIS consortium.

Each Sprint will conclude with a remote review meeting conducted via teleconference. During the review, beneficiaries will present the work performed, describe the progress achieved, and respond to questions from the JARVIS experts.

Following the review, beneficiaries will receive a review report including comments and recommendations. The report will indicate whether the submitted deliverables are accepted, require revision, or are rejected.

Upon acceptance of the deliverables, the corresponding lump sum payment will be approved. Payments will be processed on average within forty (40) working days following the positive review outcome.

In the case of rejected deliverables or an unsatisfactory review outcome, beneficiaries will be requested to revise and resubmit the deliverables. Based on the revised submission, the JARVIS experts will determine whether the project can proceed to the next Sprint or whether the risk of unsuccessful completion is considered too high.

If rejection or an unsatisfactory review occurs during the final Sprint (Sprint 3), the JARVIS consortium may grant a short extension period for the beneficiary to revise and resubmit the deliverables. If the revised deliverables are approved within the extension period, the final lump sum payment will be released accordingly.

7.3 Participation in events

During the three Sprints, the selected beneficiaries must participate in events such as audio calls, video calls, webinars, online training, virtual and physical conferences, etc. organized or suggested by the JARVIS Consortium.

7.4 JARVIS Mentoring Programme

JARVIS offers a comprehensive support package to support the External Pilots. In addition to the financial support of up to €130,000 per project, participants will benefit from tailored mentoring for the overall solution deployment, as well as expert guidance to integrate and deploy JARVIS modules that will complement the existing solutions in real-world scenarios.

Each selected project will be supported by a dedicated JARVIS Mentoring Team, ensuring that External Pilots maximize the potential of JARVIS modules while effectively implementing their solutions. The mentoring team includes:

- Innovation Mentor (IME): Main contact point between the External Pilot and the JARVIS project. The IME may provide inputs on innovation and technical aspects, and involve other resources from JARVIS, if necessary.
- SSH Mentor (SSM): Ensures that your solution is fit for market, user-centric, and aligned with societal and regulatory considerations, leveraging insights from social sciences and humanities (SSH).

To ensure fair and objective assessment, an Internal Evaluator (IEV) will independently evaluate project progress, offering valuable feedback while remaining uninvolved in day-to-day activities.

The Innovation Mentor (IME) will provide the External Pilot with a template, which will serve as a roadmap for monitoring milestones and results. Each External Pilot will undergo a minimum of three evaluation meetings, corresponding to key project sprints, ensuring continuous improvement and impact assessment. The document will be the main part of the “Review report” referred to in Section 8.2. Please see that section for further information about the evaluations.

8 WHAT ELSE IS IMPORTANT TO KNOW?

8.1 Intellectual Property Rights (IPR)

Any background intellectual property brought into the project by either the third parties or the JARVIS consortium partners remains the property of the respective owners.

Results generated by the third parties during the execution of the External Pilot projects, including software, algorithms, models, and technical developments created within the funded project, remain the property of the respective third parties.

The JARVIS modules, tools, and software components provided by the JARVIS consortium remain the property of the respective JARVIS beneficiaries that developed them. Third parties participating in the External Pilot programme are granted the right to use the selected JARVIS modules for the purposes of pilot implementation and evaluation during the programme. Likewise, the JARVIS consortium is granted the right to integrate the third-party solutions with the JARVIS modules for the purposes of pilot deployment, validation, and demonstration within the scope of the JARVIS project.

Data generated during the pilot execution, including operational data, sensor recordings, experimental results, and evaluation datasets, remain the property of the third parties or use case providers generating the data, unless otherwise agreed. However, the third parties grant the JARVIS consortium a non-exclusive right to use such data for project validation, reporting, benchmarking, and dissemination activities within the scope of the JARVIS project, respecting confidentiality obligations.

Where appropriate, non-sensitive datasets produced during the pilot activities may be requested to be shared with the consortium and uploaded to the AI-on-Demand platform, in accordance with the JARVIS Data Management Plan and the provisions described in the Sub-Grant Agreement (Annex 7.2).

All evaluators involved in the review of the External Pilot projects will sign a confidentiality agreement before accessing applications or project results to ensure the protection of intellectual property and sensitive information.

8.2 Ethical issues

JARVIS complies with the fundamental ethical issues particularly those outlined in the “European Code of Conduct for Research Integrity”.

- All applicants must submit a self-assessment ethics questionnaire, available in the Proposal Template.
- If the applicant confirms the existence of potential ethical issues, they must contact the JARVIS Helpdesk for guidance, as required.
- The JARVIS will verify the declaration's consistency with the application contents and may contact applicants to resolve any ethical issues.
- Applications that fail to properly address ethical issues or inadequately deal with privacy aspects will be rejected.

8.3 Data protection

In order to process and evaluate applications, and manage project implementation, the JARVIS consortium will need to collect Personal and Industrial Data.

- F6S Network Ireland Limited, will act as Data Controller for data submitted through the F6S platform for these purposes. Please see our privacy policy here.
- A Data Protection Officer (DPO) has been appointed by F6S generally, to ensure compliance with data protection regulations, such as the General Data Protection Regulation (GDPR), and that personal data is collected, processed, and stored in a secure manner.
- The F6S platform's system design and operational procedures ensure that data is managed in compliance with the General Data Protection Regulation (EU) 2016/679 (GDPR).
- Each applicant will accept the F6S terms to ensure compliance. Please refer to https://www.f6s.com/privacy-policy to review the F6S platform's privacy policy and data security policy.
- Apart from the F6S platform, data will also be stored in the F6S Google Drive, and in the project repository on a secure Sharepoint folder managed by the project coordinator **LMS**.
- Note that the **JARVIS** consortium must retain generated data until five years after the balance of the **JARVIS** project is paid or longer if there are ongoing procedures (such as audits, investigations or litigation). In this case, the data must be kept until their conclusion.

8.4 Confidentiality

Confidentiality obligations:

- Selected applicants are required to maintain confidential any project data, documents, invoices and other materials (in any form) during the implementation of the activities and for 5 years after project completion.
- This confidentiality period can be extended by agreement with the EC and the **JARVIS** consortium.
- Confidential information must only be used for project implementation, unless otherwise agreed upon.
- Any information shared during the application stage will be treated as confidential.

8.5 Promotion of the action and ensuring visibility of EU funding

The Beneficiary (ies) must promote the funded project, the **JARVIS** project and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner and to highlight the financial support of the EC, including on the official third party website. The **JARVIS** Communication team (CECIMO) will guide and support these communication activities to selected Beneficiaries.

8.6 Checks and reviews

The EC may, at any time during the implementation of the sub-project and up to five years after the end of the sub-project, arrange for a check and review activity to be carried out, by external auditors, or by the EC services themselves, including the European Anti-Fraud office (OLAF). The procedure shall be deemed to be initiated on the date of receipt of the relevant letter sent by the EC.

There will be no financial checks, reviews, or audits to check costs, since beneficiaries have no obligation to document the costs incurred for the action. Checks, reviews, and audits will focus on the technical implementation of the action. However, in cases of delays, incomplete implementation, or deviations from the approved project plan, F6S may require a financial report or other justification of costs.

8.7 EU restrictive measures

Entities subject to EU restrictive measures under Article 29 of the Treaty on the European Union (TEU) and Article 215 of the Treaty on the Functioning of the European Union (TFEU) are ineligible to participate as recipients of FSTP funding.

The Council Implementing Decision (EU) 2022/2506 of 15 December 2022 establishes measures to protect the Union budget from breaches of the rule of law in Hungary.

The beneficiaries must ensure that their contractual obligations under Articles 12 (conflict of interest), 13 (confidentiality and security), 14 (ethics), 17.2 (visibility), 18 (specific rules for carrying out action), 19 (information) and 20 (recordkeeping) of the grant agreement also apply to the third parties receiving the support (recipients).

The beneficiaries must also ensure that the bodies mentioned in Article 25 (e.g. granting authority, OLAF, Court of Auditors (ECA), etc.) can exercise their rights also towards the recipients.