ROBOTICS FOR INSPECTION AND MAINTENANCE

# ACCELERATING INNOVATION AND THE UPTAKE OF ROBOTICS IN INDUSTRIAL EUROPE

European Commission

ROBOTICS FOR INSPECTION
AND MAINTENANCE

This brochure has been created by The RIMA Network Partnership

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**RIMA Network**
Robotics for Inspection and Maintenance

1

# The RIMA Project

## 1.1 What is RIMA Network?

**Inspection and Maintenance (I&M) represents a large economic activity spanning across multiple sectors such as energy, oil&gas, water supply, transport, civil engineering and infrastructure hubs.** There is massive potential for robotic applications, to increase productivity and improve safety, but the total market size of robotics is still negligible in relation to the overall market size.

Currently EU is a global leader in this rapidly growing field with more than half of all manufacturers of I&M robots based in Europe. EU hosts a significant share of the world I&M robotics offer but there is a bottleneck connecting it to the market and high potential applications that would allow a higher development.

RIMA (Robotics for Inspection and Maintenance) is a 4-year project aiming to tackle this gap by establishing a network of 13 Digital Innovation Hubs (DIH) and industry associations to support the uptake of robotics – and help small and medium-sized companies (SMEs) to develop novel solutions for different industry sectors.

Our challenge is to reinforce this connection and to provide education and training on robotics I&M and to connect the value chain - research, technology companies, service providers, end users and investors- for accelerating economic growth in the field.

RIMA gathers leading research organizations over Europe aiming at creating a network of DIHs with the support from sectorial associations making a bridge with relevant actors of the value chain: end users, asset owners, asset operators and industries. Each research organization in RIMA supports one DIH in a European region with activities aligned with regional policies and industry sectors. The RIMA network of DIHs is built in close cooperation with the SPRINT robotics association, partner of the project in order to ensure the sustainability of the network.

RIMA Robotics. Bladebug

**RIMA offers services including support to testing and technology transfer, coaching and training on robotics for I&M, process optimization and communication. 50.5% of RIMA's budget will be distributed to SMEs to run experiments using FSTP**

**RIMA advises on funding opportunities relying on the S3 Thematic Platform on robotics for I&M federating the common ambition of 13 EU regions.**

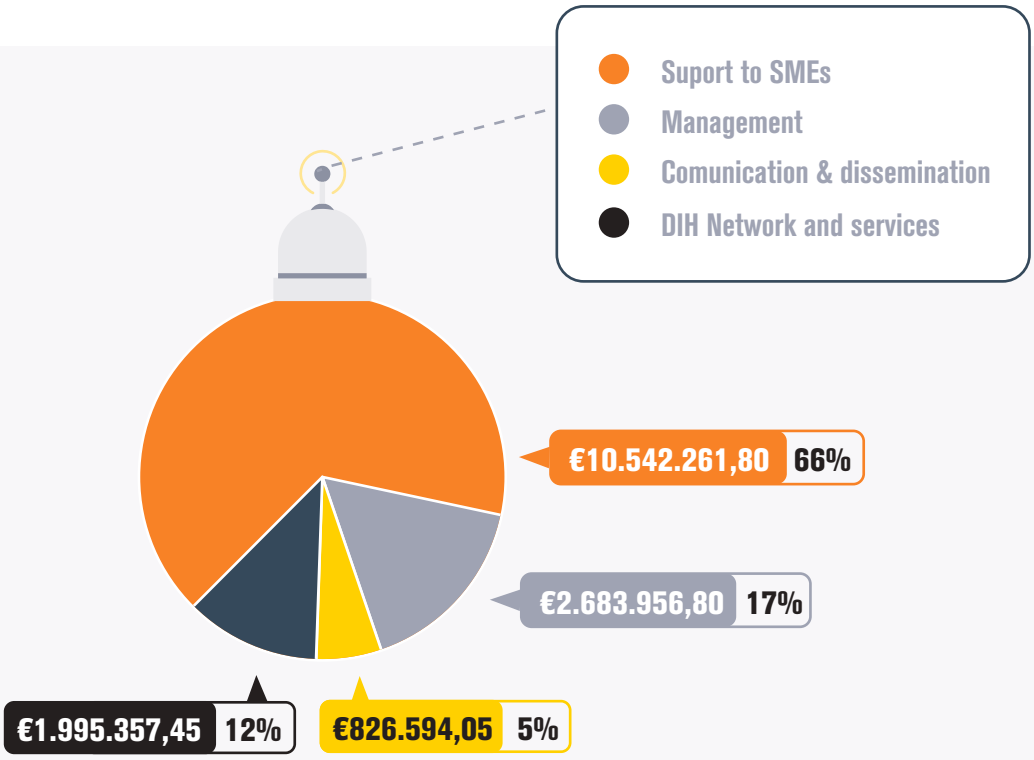



Figure 1: budget share per activity in RIMA

### Expected results are

I. Encreased competitiveness of EU I&M Robotics

II. Economic added value by increased productivity and availability of the critical infrastructure

III. Social and environmental impact through improved safety and less emission of hazardous substances

IV. The constitution of a sustainable and scalable (open to new members) DIH network aligned with the industrial and European policies and ambitions

### RIMA Network Community

RIMA Network seeks to connect and inspire key stakeholders in I&M robotics and aims to accelerate innovation and uptake of robotics. The RIMA Network Community is the ultimate product of the RIMA network project to allow stakeholders to collaborate, share information on I&M robotics and keep up to date on RIMA and I&M activities even beyond the scope of the project itself.

With these means, the RIMA Network Community aspires to bring together the technology providers, service providers, asset owners and operators, together with Digital Innovation Hubs and Facilitators, to join forces and competences in accelerating robotics in I&M.

**Join us to be part of this global community to collaborate, share knowledge, and participate in RIMA events and activities! More details in section 6.**

## Funding

RIMA supports financially and technically 50 cross-border experiments involving European Small and Medium-sized enterprises through 2 Open Call rounds (2019 / 2020) with a total amount of 8.1M€.

Successful candidates will receive equity-free funding for Technology transfer and development in I&M robotic applications.

## Network

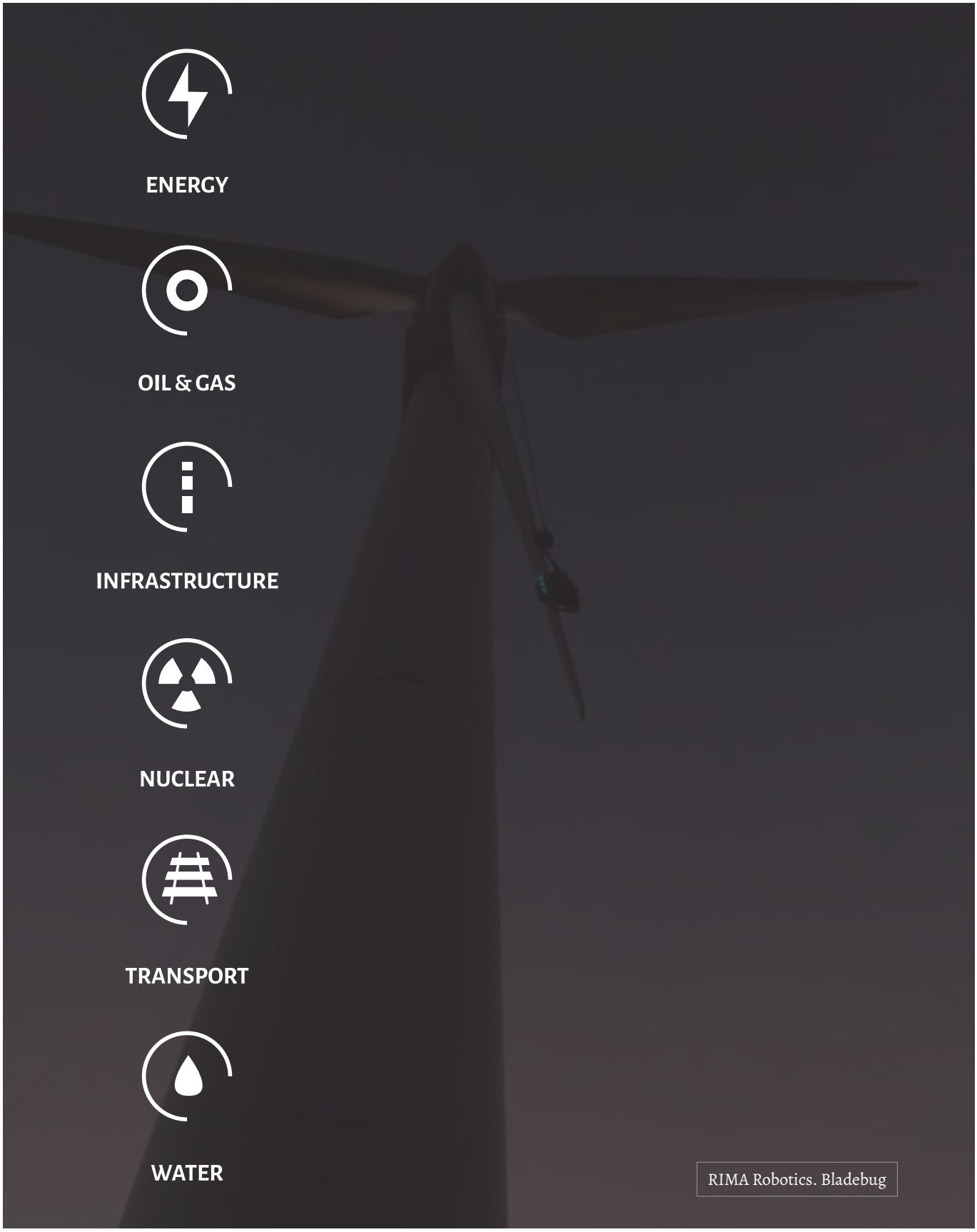
RIMA aspires to bring together DIHs and Facilitators operating under a common network that allow them to join forces and competences in promoting I&M robotics. The facilitator organisations have the connections and network to reach a broad set of industries in their domains of expertise.

The Digital innovation hubs offer key acceleration services for companies. These DIHs are linked to organizations involved in research and innovation activities, and they offer expertise in robotics, equipment and services applicable for I&M operations.

## Training

The RIMA Digital Innovation Hubs provide skills and tools to implement the latest methods in knowledge transfer between academia and industry.

The RIMA training framework aims to increase digital skills and knowledge of robotics, especially within the I&M domain, amongst a wide range of people – from students starting out on their career path, through the current workforce who need to retrain, managers who need to understand the importance and effect of digitisation, and start-up technology development companies that need concrete information and support for getting their upcoming technology to market.



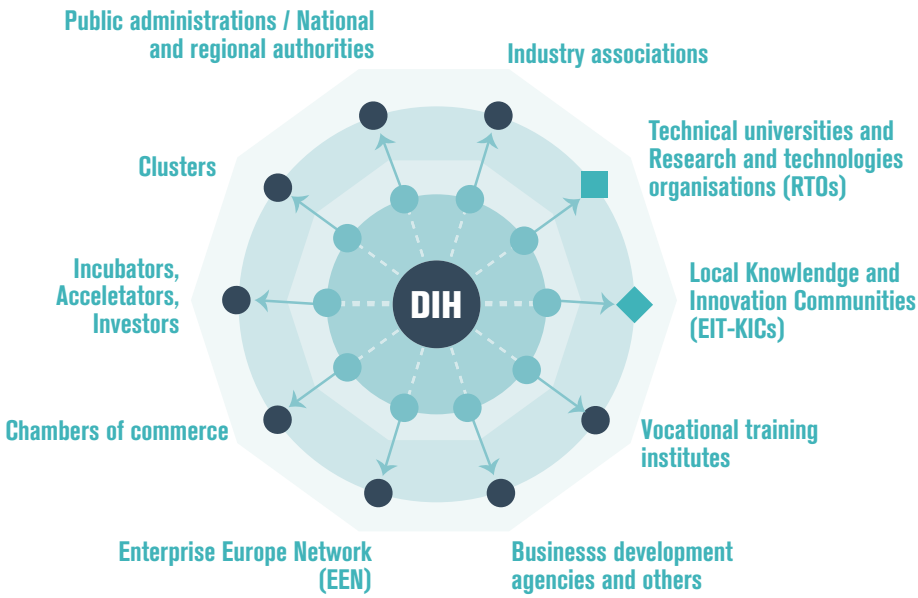

RIMA Robotics. Bladebug

## 1.2 RIMA Network DIHs: Accelerating innovation and the uptake of robotics in Industrial Europe

**Digital Innovation Hubs** in Rima are one-stop-shops that help companies become more competitive with regard to their business/production processes, products or services using robotics technologies. DIHs are providing access to technical expertise and experimentation, so that companies can **"test before invest".** They also provide innovation services, such as financing advice, training and skills development that are needed for a successful digital transformation. Key environmental issues are also considered, in particular regarding energy consumption and low carbon emissions. As proximity is considered crucial, they act as a first regional point of contact, a doorway, and strengthen the innovation ecosystem. A DIH is a regional multi-partner cooperation (including organisations such as research and technology organisations [RTOs], universities, industry associations, chambers of commerce, incubators/accelerators, regional development agencies and vocational training institutes and can also share strong connections with service providers outside of their region supporting companies with access to their services.

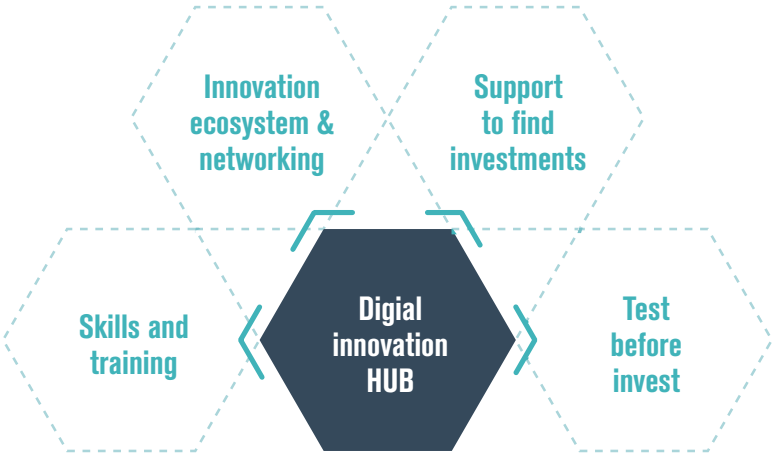
Each DIH acts as the epicentre of a local/regional or even national digital innovation ecosystem able to provide access to services, facilities and expertise of a wide range of partners. The aim is to ensure that the individual customers (SMEs) or the public sector get the services they need; that the target regional market segments get access to innovative, scalable solutions and that DIHs cooperate with each other at regional, national and/or European level.

RIMA network is composed by 13 DIH and still open to new incoporations. SMEs can approach different DIHs depending on the technological and sector specifications. SMEs, or any other organisation interested in their services, can choose the DIH that best matches your criteria (geography, sector, technology, type of service, etc.) via an interactive tool that helps navigate the network of DIHs available in Europe.



Thus, the RIMA Network initiative maximises the synergies among the participant DIHs and contributes to promote a joint approach and branding of DIHs, making possible a bigger recognition of the initiative outside the ecosystem and among end-users, increasing the chances to engage SMEs and other potential customers. These activities have to be seen as a way to raise awareness about the Digitising the European Industry Strategy and the role of the DIHs within it. In addition, RIMA network DIHs has been able to achieve the realisation of research and innovation objectives linked to the transformation of robotics applications in the industry by addressing its challenges.

- **Access to innovation and leading-edge technologies** and applications as for example manipulation, teleoperation, snake robotics, flying drones, terrestrial, subsea, or under water vehicles, human robot collaboration, supervision, control, mechatronics, sensing, perception, non-destructive testing or IA
- **Funding opportunities and technology acceleration programmes** through the Open Calls of RIMA Network Innovation Actions, to allow experimentation and **Test before invest** to understand new opportunities and return on investments, also including demonstration facilities and piloting



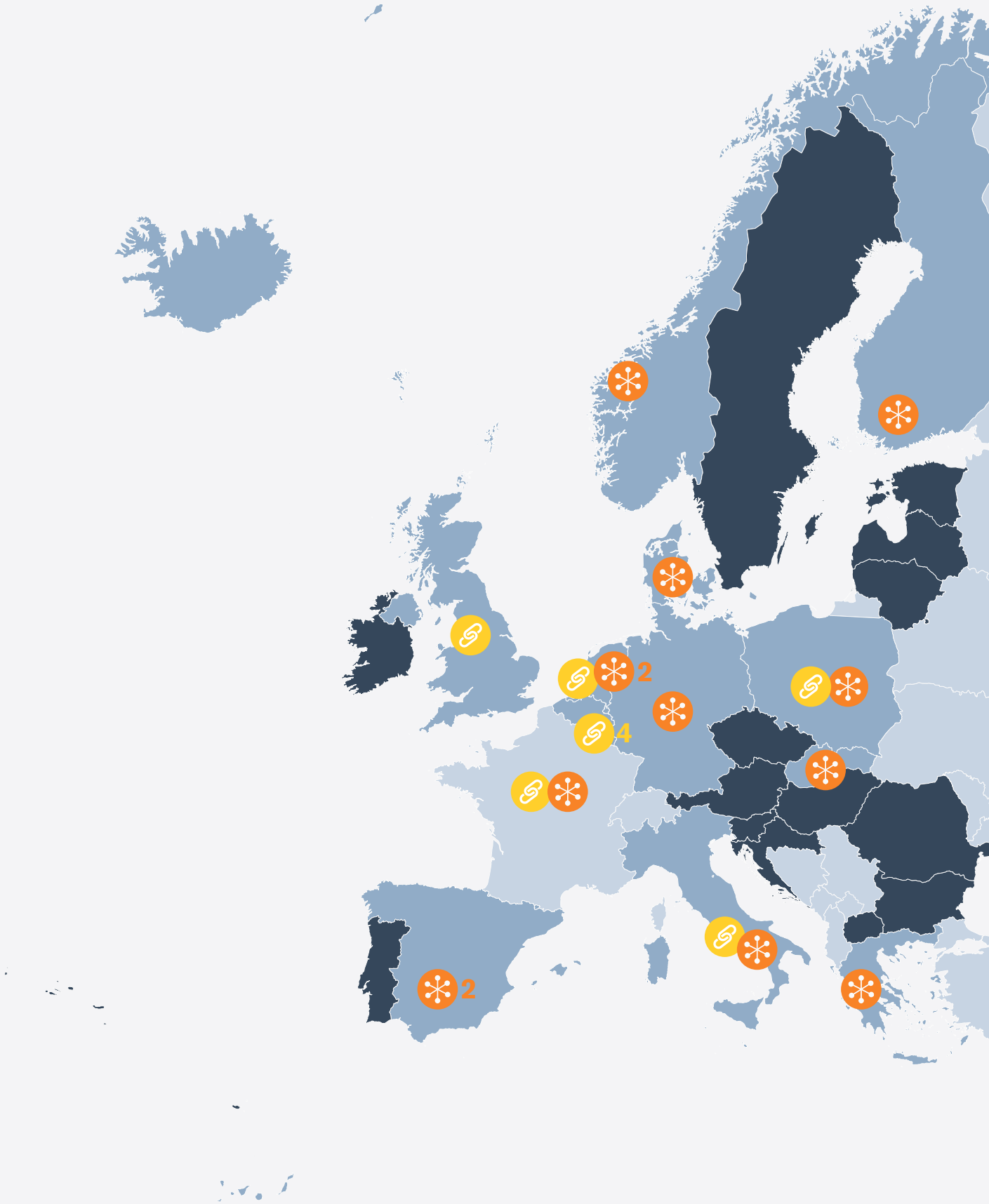

- **Strengthening the relationships of SMEs with Digital Innovation Hubs** and other relevant actors through the online community, engagement activities and the RIMA training catalogue.
- **Skills and training** to make the most of digital innovations: "train-the-trainer" programmes, bootcamps, traineeships, exchange of curricula and training material
- **Support to find investments and close to market additional opportunities:** access to financial institutions and investors, in order to get access to follow up finance to bring the results of testing and experimentation to the next phase, access to incubation & acceleration programmes

**Built around:**

- Competence Centers ICO
- Technical universities and Research and technologies organisations (RTOs)
- Local Knowledge and Innovation Communities (EIT-KICs)

**In collaboration with:**

- Vocational training institutes
- Industry associations
- Public administrations / National and regional authorities
- Clusters
- Incubators, accelerators, investors
- Chambers of commerce
- Enterprise Europe Network (EEN)
- Business development agencies and others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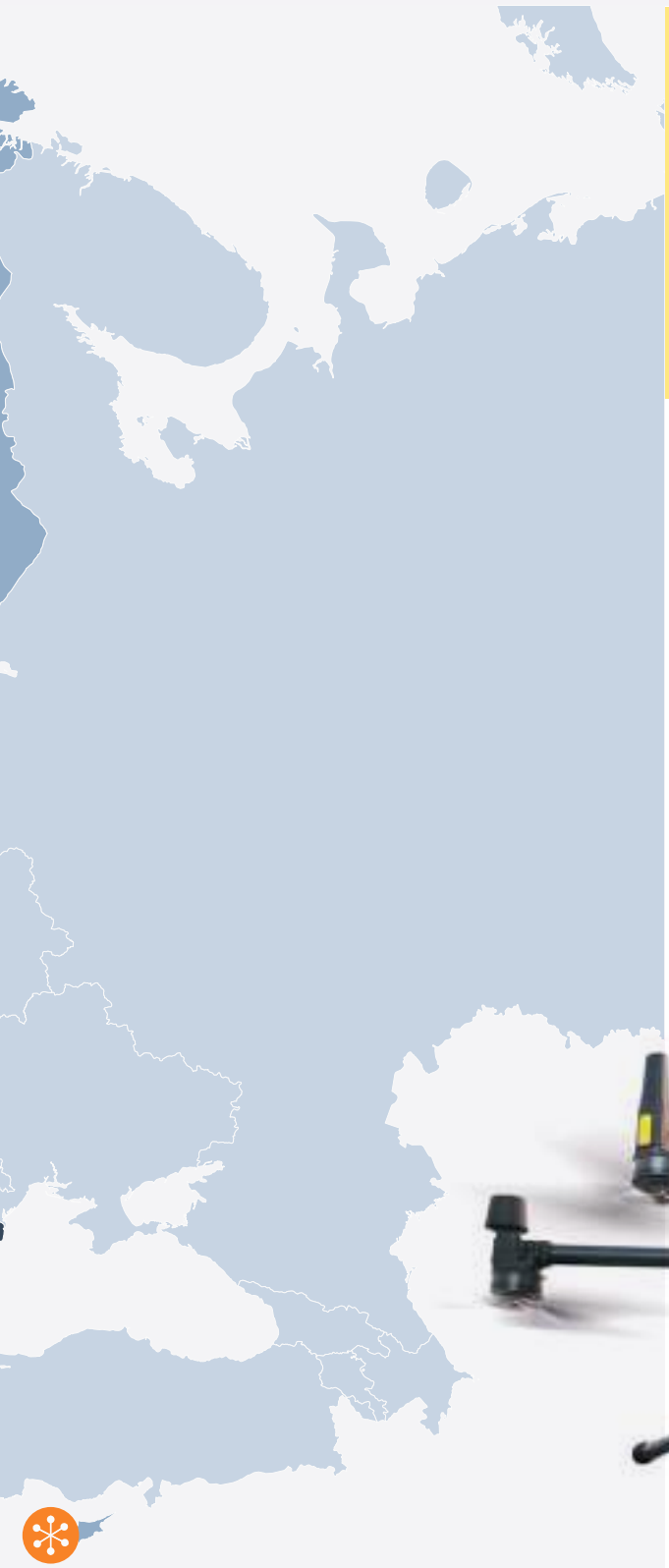

To find out a full list of EU DIHs see here:
*https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool*

For RIMA NETWORK DIHs, please, go to section 4.

Digital Innovation Hub

Facilitator

RIMA Robotics. Al-Water

**RIMA Network**
Robotics for Inspection and Maintenance

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# Market background

## 2.1 Estimate of the market

In order to have a clear understanding of the market of robotics for Inspection and Maintenance of Infrastructures, RIMA partners conducted an analysis of the market. Some of the key results contextualizing the positioning of the RIMA DIHs are provided below. The complete market study will be available under conditions for non-RIMA partners through the SPRINT robotics association.

### 2.1.1 The approach

Two options were pondered for this market study: top down or bottom up. These two options are presented in the Figure 2 below with some elements indicating the advantages of each of them.

**Approach** → Top-Down

**Steps**

1. Use global market studies (Multi-client)
   Worldwide
   Europe
   IF AVAILABLE Country
2. Identify most important market segments
3. Identify the technical / economic challenges for each market segment
4. Identify local specificities

**Results**

- Overview of market segments (O&G, water, Wind,...) – market size, where arte the main players (in Europe)? Dynamism of the segments, etc.
- Challenges for each market segment
- Is there local specificities OR is the market very global?

## Two approaches

Macro-market study research

Market size study
Value chain study

End users study
Representative interviews

Representative interviews

Consolidated view of the market and its challenges in Europe.What can be done globally to optimize the market?
Local specificities to address

### Bottom-up

1 For each location: map the players

2 Consolidate data to identify the main sectors according to regions

3 Identify the technical / economic challenges for each market segment

4 Identify the specific challenges per location / cross check with the sector's challenges

! In RIMA, the are 13 locations AND at least 10 sectores

Survey

End users study
Representative interviews

- Player mapping for all locations
- Statistical representation of challenges:
  - Most important challenges (technical/economical, etc.) over the whole area)
  - What are market segment specificities?

Local market cartography with the main challenges (addition of local challenges).
Some specific market segment challenges

Figure 3: Market study two possible approaches

A global approach was choosen for the market study for the following reasons:

### Added value for RIMA DIHs

- Regional DIHs have already a correct knowledge of their local ecosystem
- A global approach was more beneficial for the development of their service activities
- A global market study was seen more favorable to share a common vision

### Multi sectorial aspect of inspection and maintenance

- RIMA network is multi sectorial. Conducting a multi sectorial market study in as many regions as there are DIHs in the network would have asked a considerable effort, and the results would have been difficult to consolidate at European and international scale. Partners' effort to obtain local market information revealed not successful due to this multi sectorial approach in RIMA.

### Multi nationality aspect of some sectors

- Some sectors covered by RIMA like Oil and Gas, Nuclear, Renewable energy (wind) are supported by multinationals which are looking for global solutions applicable in all countries over the planet

### Expectations from customers of RIMA DIHs and network

- All SMEs which interact with RIMA network require for global market data to develop

The following sections provide some figures resulting from the study.

RIMA Robotics. Bladebug

## 2.1.2 Some figures

This section attempts to provide estimations about the number of companies with which the DIHs from RIMA could interact that is companies interested in robotics, which could be candidate to support innovation in inspection and maintenance of infrastructures. The figures below are indicative and will be refined in time.

### Case of flying drones

The RIMA market study indicates that 3,800 companies in France[1], are operating professional drones over 800g in different sectors. Europe represents approximately five times the French figure. Given the hypothesis of a European market being 5 times bigger than the French one, a reasonable extrapolation to Europe gives approximately 19,000 companies operating professional drones over 800 g, in Europe in different domains of application.

The market study for RIMA, indicates that in 2019, the global market for professional services using flying drones for inspection and maintenance of infrastructures would concern about 5% of the market for drones[2]. Making the simplifying assumption that this also corresponds to the number of companies concerned by these subjects, there would therefore be 950 companies in Europe operating professional drones in the infrastructure inspection and maintenance market.

### Robots other than drones

The market study indicates also that the market for robots other than drones for inspection and maintenance is at least three times larger than that for drones. Let us assume that the number of companies is proportional to the market, there would therefore be approximately 2,850 companies in Europe operating robots other than drones in the infrastructure surveillance market[3].

### An overall estimate

Therefore, in the end, there would be about 3,800 companies of all sizes operating robots (including drones) for infrastructure inspection and maintenance.

These are estimations from the first results of the market study. It would not be surprising if in reality there were three times more or three times less companies concerned. Reasoning around a range of 1,000 to 10,000 companies offering robotic inspection and maintenance services (air, sea, submarine, land) would seem to be a sound basis.

Extrapolating the number of "customers" seems more risky. Assuming that each of these companies work for three to five clients maximum, that would mean that there could be approximately 3,000 to 50,000 customers benefiting from the use of inspection and maintenance robots in Europe.

RIMA Robotics. FIDR / Capra

[1] "Aviation Civile" publication from the DGAC – French Civil aviation authority; 01/2020 DGAC

[2] The 2018 Drone Market Sector Report by Skylogic Research LLC

[3] Professional Service Robots Market Size, Share & Trends Analysis Report By Application (Logistics, Healthcare, Customer Service, Field Robots), By Region, And Segment Forecasts, 2020 - 2027 ; Grandview Research 2017

## 2.1.3 Market characteristics

The global inspection and maintenance robotics market in 2020 was worth $4,9bn. Its growth is +19% CAGR[4].

**Safety, security, rescue Robots**
Elbit Systems Ltd.,
Knightscope Inc.,
Cobham Limited,
Kongsberg,
L3Harris Technologies Inc.,
QinetiQ,
ReconRobotics Inc., RoboteX Inc.,
Shark Robotics, etc.

**Mobiles Robots**
AUBO Robotics,
Blue Ocean Robotics,
Clearpath Robotics Inc,
Eddyfi
Fetch Robotics,
Waygate Technologies,
Locus Robotics,
Lockheed Martin,
Mobiles Industrial Robots,
Northrop Grumman,
QinetiQ Group,
Seegrid Corporation,
Swisslog Holding AG,
Transbotics Corporation

**Inspection Robots**
Teradyne INc.
JH Robotics,
Cognex Corp.,
Eddyfi NDT Inc.,
Ensign-Bickford Industries Inc.,
FARO Technologies Inc.,
Waygate Tecnhologies,
Groupe Gorgé,
IPG Photonics Corp.,
MISTRAS Group Inc.,
TechnipFMC Plc,

**Underwater Robots**
Deep Ocean Engineering Inc.,
ATLAS MARIDIAN Aps,
ECA Group,
Bluefin Robotics Corporation,
International Submarine Engineering,
Oceaneering International Inc.,
Inuktun Services Ltd.,
Saab AB,
Soil Machine Dynamics Ltd.
and Schilling Robotics LLC

**In Pipe Inspection**
SuperDroid Robots Nexxis,
Inspector Systems, RIEZLER Inspektionssysteme, IPS Robot,
HiBot, etc
Gas Pipelines

Figure 4: major players per robotic segment

Inspection and maintenance robotics market is highly fragmented. This is true in Europe as well as at the global level. The market is composed of a myriad of companies (around 3500 as it was mentioned) mostly small and very technical, each offering a very specific robotic platform.

Interviews with stakeholders of different sectors show that robotic companies have to develop a robot almost for each client (the complete market study is provided in a document accessible through RIMA network). Figure 6, exploiting several market investigations[5], illustrates the market segmentations: the major players for each segment are small companies and they are present only on one segment. Only a few players are covering several segments.

Although we have seen a few mergers and acquisition, robotic companies remain very small, not really able to grow, because of this lack of market organization. Robotics Companies are often incorporated by NDT or inspection services companies (ex: Fugro has completed the acquisition of General Robotics Limited (GRL), Eddyfi Technologies Acquires NDT Robotics Leader Inuktun).

Refering to the Technavio market study (23), the major players for inspection robots worldwide are the followings:

| | | 2020 | ACTIVITY |
|---|---|---|---|
| EDDYFI | 475 | 130M€ | NDT<br>Acquisition of many pipeline inspection companies |
| TERADYNE (owns Universal Robots) | 5500 | $2,1b | Automatic test equipment |
| IPG Photonics Corporation | 5960 | $1,4bn (2017) | High-power fiber lasers and amplifiers (inspection, welding, etc) |
| Waygate Technologies (a BAKER HUGHES Cie) | 300 | $38M | Industrial inspection solutions - NDT<br>Develops mobiles inspection robots for large-scale facilities in the field of power generation and industrial processing |
| JH Robotics | 30 | $6M | Collaborative robots / automated inspection is a small part of their business |
| Cognex Corp. | 2000 | $725M | Machine vision products / robotics is a small part of their business |
| Faro Technologies | 1800 | $385M | High-precision 3D capture, measu rement and analysis across a variety of industries (manufacturing, construction, engineering and public safety) |
| Groupe Gorgé | 1800 | $270M | Safety: Drone and system, 3D printing and engg |
| Nexxis | 24 | $4M | NDT and Manufacturing automation |

Figure 5: Major players for inspection robotic (23) and their size

[4] https://www.technavio.com/report/inspection-robots-market-industry-analysis

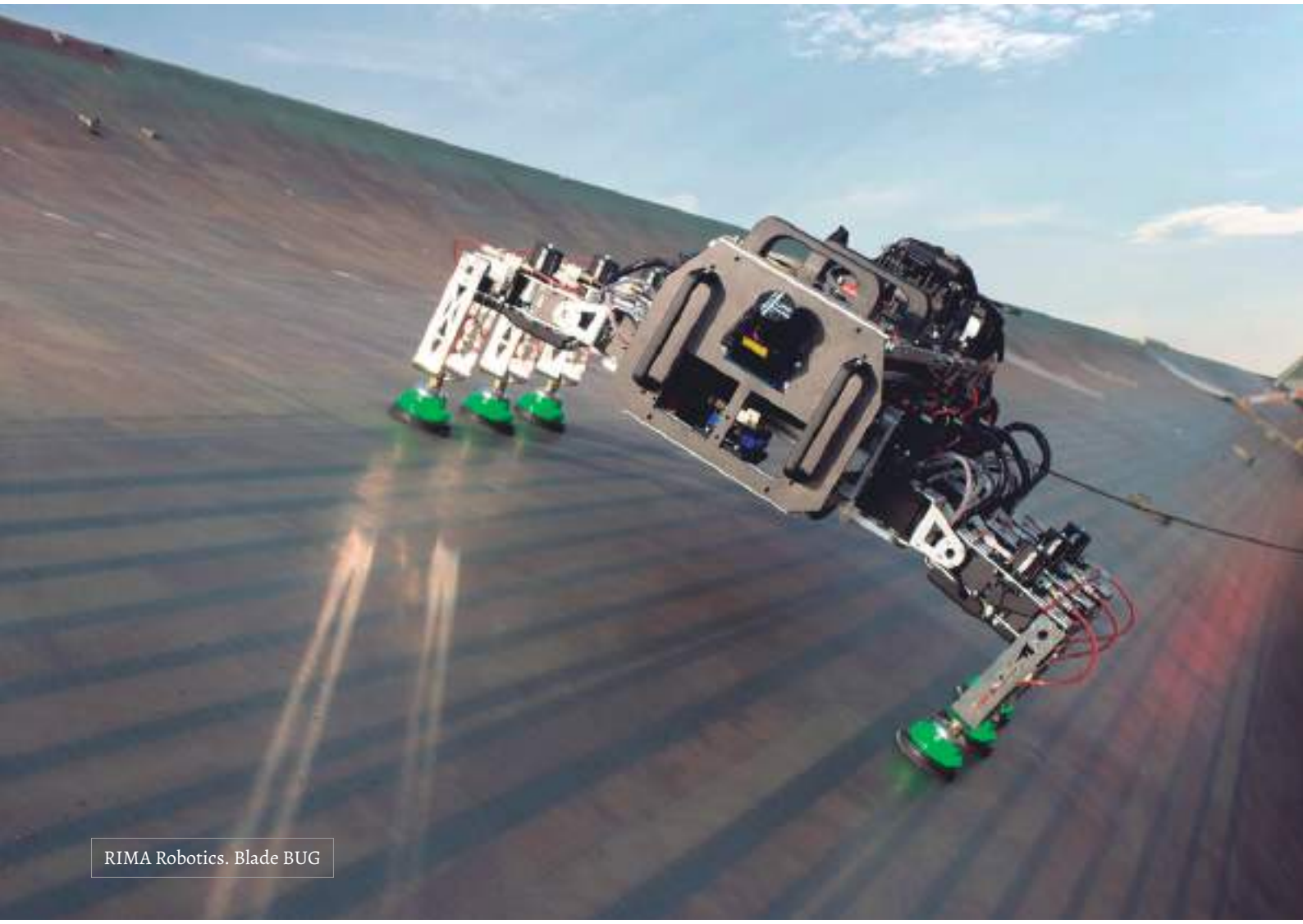
[5] Research and markets April 2018, Zion Market Research - April 2018, Transparency Market Research 2018,

Field interviews led to observe that those high-tech companies remain very small. This can be surprising with respect to the high expectations towards robotic and potential of applications. Most of them are North American and allowing a bit margin for the EU companies to grow.

The global market growth expressed with the CAGR is expected to be around 19%[6]. This is a rather good growth with respect to the global market growth.

## Major market issues

The feedback from robot companies indicates that one of the major issues is the effort needed to develop Proof of concepts (PoC) and run tests. Indeed, techno-providers have almost to tailor their robots for each of their customer. It is a major trend in this market. Time is dedicated, in particular, to tune their robot, find or adjust testing infrastructures, prepare proof of concepts, to test them, to qualify them, prevents those companies from growing. It is not so much a question of cash, but a matter of resource allocation. Small Companies cannot develop several platforms in parallel. Therefore, they cannot expand their market.



RIMA Robotics. Blade BUG

## 2.1.4 DIH and RIMA network value proposition:

The market study conducted during RIMA project details the challenges that can be addressed by RIMA network. Two of them need to be highlighted.

### 1 Need for universality / standardization

As mentioned before, the supply side of the market (SMEs, techno providers) is overwhelmed by a too scattered demand. It results in:

- A too important share of time is spent by SMEs for the development stage. Preparing Proof of Concept is one of the major activities. This development time could be shorten.
- A poorly consolidated view of the market – the technology providers have only a partial knowledge of the end-users needs.

The development time could be shorten with the help of RIMA network. It can be through the assistance for identifying and providing test facilities, through research focused on interoperable system or sub-system, through test standardization, etc.

Consolidation of technical market needs is also a very useful action for a transversal European network. Market investigations or inquiries is an example of action useful for the stakeholders.

### 2 Cross fertilization between sectors and regions, sharing of best practices

Cross fertilization could be a market accelerator and the role of RIMA would then be to ease good practices sharing to overcome reluctances from end users in some sectors to adopt robotic solutions for inspection – some players are however leading the way.

The complete RIMA market study, available for RIMA partners and network, is provided in another document as an appendix to this deliverable.

RIMA Robotics. Leaks Buster

[6] Inspection Robots Market 2020-2024 | Advantages of Robotic Inspection Over Manual Inspection to Boost Growth | Technavio

## Financial aspects beyond investment

"*Infrastructure consists of the basic assets and structures that support economic activity*" to quote a report from EPRS[7] a think tank of the European Parliament. The report further adds that, "*Investment in such assets is markedly different from other types of capital expenditure, due to the heavy involvement of the public sector and the significant positive spill-over that it generates throughout the economy*".

Investment in infrastructure in the key sectors of energy production and distribution, transport, sewerage and water distribution, and telecommunications are fundamental to European society with the need for new and modernized infrastructures and the technological and demographic changes. EIB estimates indicate that achieving the targets of the EU digital agenda would demand additional investment of approximately €55 billion per annum.

According to the EPRS study, investment in infrastructure has been declining since 2009 in Europe. European Investment Bank (EIB) estimated that investment needs for energy, transport, water supply and sanitation, and telecoms are as much as €688 billion per year. For water and sanitation, and telecoms, needs reach €160 billion and €138 billion respectively. In addition EIB evaluates investments for social infrastructures (Health, education and social housing), at €142 billion per year[8] in EU.

The investments needed for the inspection, maintenance and repair of infrastructure are similar to the investments for the construction of these infrastructures. The experiences of road infrastructure show that if maintenance is neglected over a period of 3 years, it is estimated that the necessary repairs or renewals of these roads may cost 3 to 6 times more than relevant maintenance[9]. The Chicago MPC[10], Metropolitan Council indicated that maintenance accounts for the bulk of resources, nearly 90% of the more than $2 billion the state spends each year on highways. As another example, results of poor infrastructure maintenance reveals fears and changes in behaviour. For instance, J.D. Power survey[11] shows that one quarter of Americans claim never to drink tap water. This is related to the bad smell of the water and fears about water safety. In US, State and local governments collectively spend in excess of $100 billion per year on the construction, maintenance, and repair of roads, bridges, and ancillary components (e.g., FHWA 2008, 2019)[12]. Different analysis of the importance of inspection and maintenance can be found in various reports[13]. Figure 1 illustrates the links between cost of maintenance and amount of maintenance.

This document presents the effort undertaken in RIMA H2020 project, to stimulate innovation in inspection, maintenance and repair of Infrastructures. The aim of RIMA is to create an instrument, a network of Digital Innovation Hubs on Inspection and Maintenance Robotics and to demonstrate the usefulness of this instrument in funding and mentoring of SMEs developing new solutions for the Inspection and Maintenance of Infrastructures in different sectors.

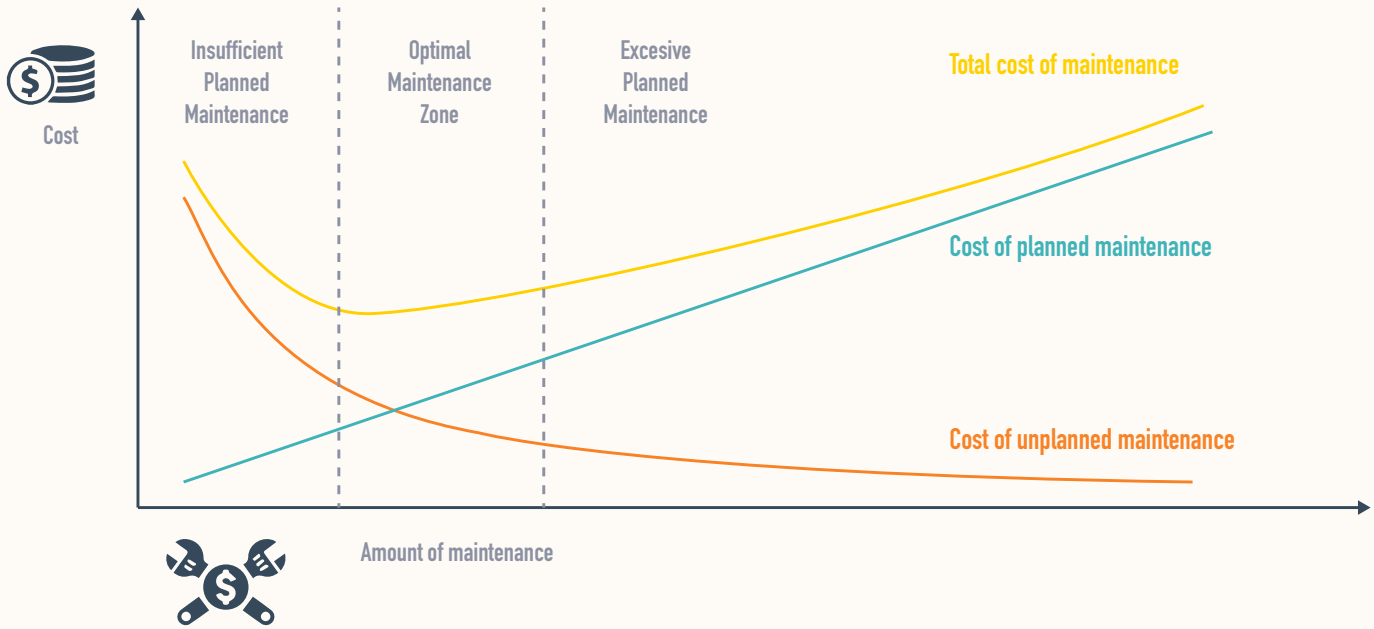



Figure 6 : Amount of maintenance

[7] Zachariadis Ioannis Agamemnon, Investment in infrastructure in the EU Gaps, challenges, and opportunities, October 2018. EPRS | European Parliamentary Research Service

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RIMA Robotics. MIMIC / MAGOS Platform

**RIMA Network**
Robotics for Inspection and Maintenance

3

# Cascade funding

## 3.1 PRINCIPLES

**Have you been aware that cascade funding existed and that it has been playing a major role to put Europe at the forefront of digital innovation?**

Cascade funding takes place in the framework of the European Union's flagship funding programmes for research and innovation Horizon 2020 and Horizon Europe (launched in 2021). Such innovation plans are to promote and create smart, sustainable and inclusive growth and jobs in Europe.

To achieve this, the cascade funding mechanism came to life to make the process of applying for public funding from the European Commission much easier and faster.

The process of discovering the most promising European innovators follows some main criteria established by the European Commission:

- **Transparency.** Funding decisions must be based on clearly described rules and procedures, and all applicants should receive adequate feedback on the outcome of the evaluation of their proposals;
- **Confidentiality.** All proposals and related data, knowledge and documents are treated in confidence;
- **Efficiency and speed.** Evaluation of proposals and award of the financial support should be as rapid as possible, commensurate with maintaining the quality of the evaluation, and respecting the legal framework;
- **Conflict of interest.** The beneficiaries must ensure that the action is implemented impartially and objectively, especially during the evaluation and monitoring;
- **Excellence.** The proposal(s) selected for funding must demonstrate a high quality in the context of the topics and criteria set out in the call.


RIMA Robotics. PIPEYE RIE

## 3.2 Cascade Funding in RIMA

RIMA supports the development and deployment of robotics I&M applications with grants for TTEs and TDs in the 1st Open Call and RIEs in the 2nd Open Call. Type of activities funded: Developing, testing and validating the technical and economic viability of a robotic system prototype demonstrated in an operational environment.

Proposals for Technology Transfer Experiments (TTE) and Technology Demonstrators (TD) should fit in at least one of the RIMA Target Use Domains that are:

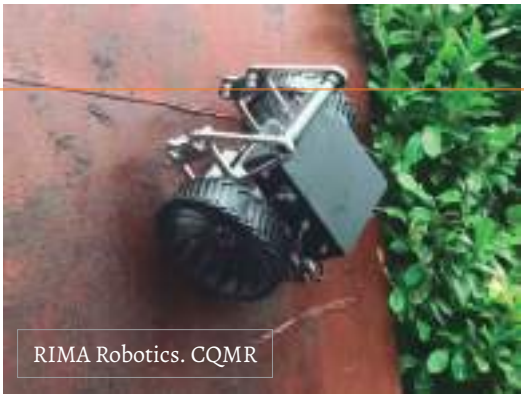
- Water supply and sanitation (1st&2ndOC)
- Energy generation and distribution (1st&2ndOC)
- Oil & gas (1stOC) Oil & gas and Chemicals (2ndOC)
- Nuclear (1st&2ndOC)
- Road, rail and infrastructure connected with cities (1stOC) Urban and suburban transport routes and buildings (2ndOC)
- Transport hubs (ports, airports, stations, etc.) (1stOC) Transport, Cargo and Mobility (2ndOC)

The maximum amount of financial support granted to each micro-consortium selected in the first Open Call was up to € 300.000 in the case of Technology Transfer Experiments and up to € 100.000 in the case of Technology Demonstrators.

The maximum amount of financial support to be granted to each micro-consortium selected in the second Open Call was up to €150.000.

Payments are done using lump sum methodology that is result-oriented and applied by FundingBox as the default mechanism to distribute funding: the grant is paid against the completion of specific milestones.


RIMA Robotics. ACIDRONES


RIMA Robotics. CQMR


RIMA Robotics. GUMBOT


RIMA Robotics. SBID

RIMA Robotics. SPARC I&M

RIMA Robotics. APRORAP

RIMA Robotics. MIMIC

## 3.3 PROCESS

### Proactive advertising for the call

To maximise our reach a few steps were taken by the RIMA partners:

- A communication toolkit with several materials was built (social media texts, banners, press releases, etc.) so that partners can adapt, translate and use in their communication.
- Social Media Advertising: In the 2nd OC call a paid promotion on social media was used to generate additional visibility on the favourite feeds of our targets.
- Partners participation in specialised events.
- Organising of Information Days/ Webinars as a great opportunity for potential applicants to ask more complex questions.
- Promoting the call in the newsletters of the Partners' organisations.
- Creation of online communities and helpdesk on FundingBox spaces
- Sending to-the-point email reminders

### Identification of the challenges to constitute the call

The preparatory tasks for the Open Call are crucial for a successful selection process. For this purpose, it is of real importance that there is an engagement from the partners with technical knowledge to build correctly the documentation and enrich every step of the process. In order to specify the scope of the call for proposals across the six application domains, research and technology challenges were used per domain. The applicants had the possibility to choose the challenge from the drop-down list.

### How the process of the Open Call does look like?

All proposals submitted to a call were treated equally. They were impartially evaluated on their merits, irrespective of their origin or the identity of the applicants.

# Step 1

## Application through the FundingBox Platform

As a first step, all candidates submitted their application on a dedicated FundingBox page. The forms in which potential candidates can be assessed follow the three main criteria:

**Excellence:** Credibility of the innovation proposal.

**Impact:** Expected impact of the solution for consumers and/or businesses from a qualitative perspective but from a quantitative one too (does the proposal have at least a European scope?). Environmental and social impacts are also taken into account.

**Implementation:** Coherence and effectiveness of the implementation plan which includes allocation of tasks and resources and complementarity of the team members.

# Step 2

## The Eligibility Check

Once the application deadline had passed, an initial verification was conducted in order to make sure the applications complied with some basic rules and are admissible for the next phase. Eligibility criteria related to:

- The language that was used for the application (everything must be in English)
- Country where the team was based (EU Member States or Associated Countries)
- The technology readiness of the innovation (Beneficiaries are expected to improve their technologies from TRL 5 to TRL 7)
- Minimum 2 independent entities - micro-consortium
- SMEs or slightly bigger companies from one RIMA target Use Domain

Following this first assessment, admissible applications moved on to the next phase.

# Step 3

## The Independent Evaluation

All the applications that qualified after the first eligibility check were assigned through the FundingBox platform to independent evaluators. The latter then proceed to a qualitative assessment of the three principles mentioned in the description of step 1: excellence, impact and implementation.

# Step 4

## The Jury Day

The applicants that made it to this stage were invited to participate in a Jury Day. They were asked to send a 10 minutes pitch before the event and it was displayed during the event. In addition, each project took part in 10-minutes Q&A session in front of a Jury composed of RIMA Consortium partners and external evaluators. Thus experts could make a more informed assessment concerning the proposal, its execution and its impact. Following this last stage, the pre-selected applicants were invited to provide formal documents to be able to join the support programme.

# Step 5

## Sub- Grant Agreement Signature

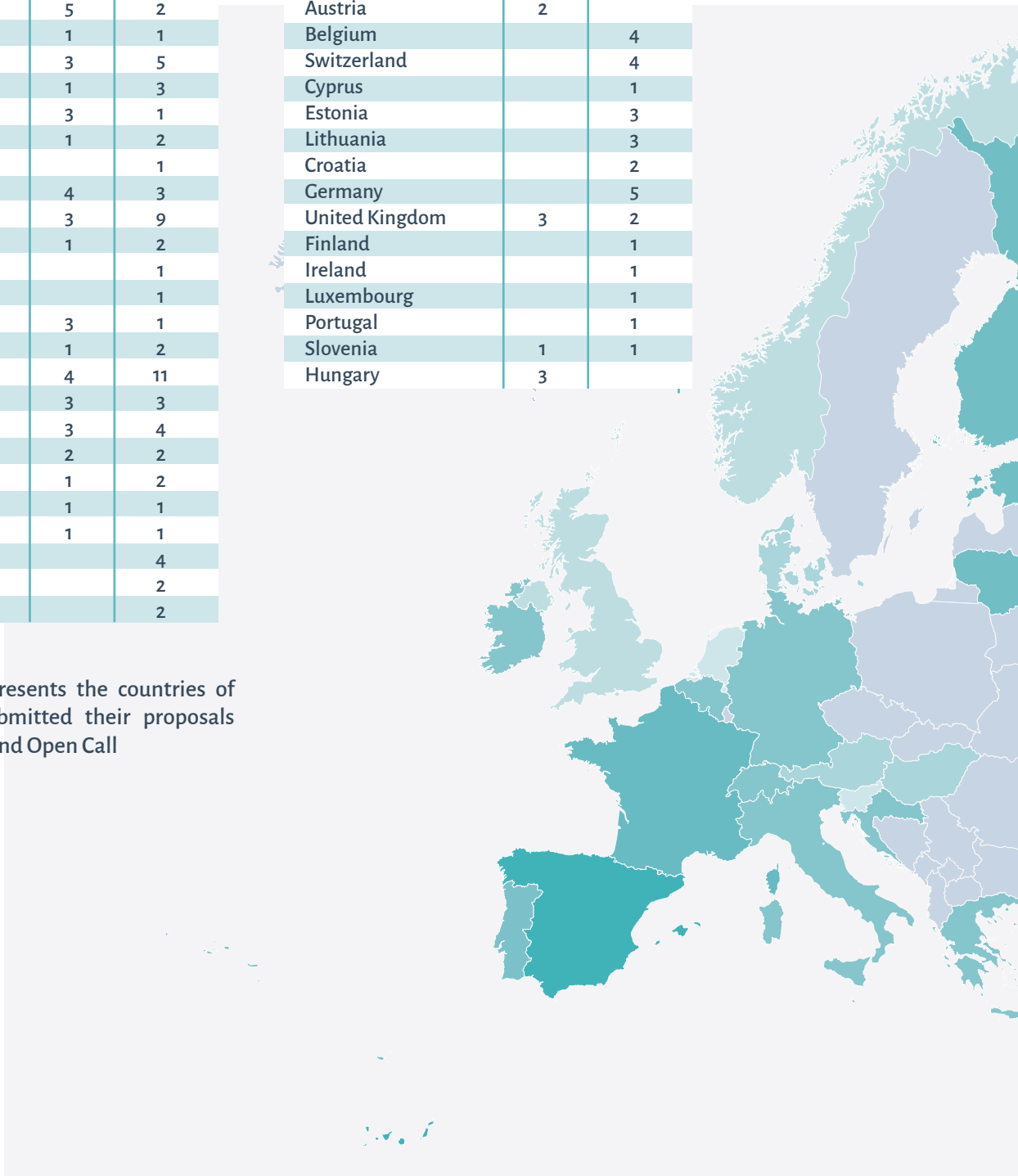
Once the SMEs submitted all this information to FundingBox, and it was reviewed and validated, the companies were able to sign the sub-grant agreement together with Individual Feasibility Plan and Individual Mentoring Plan, which is the official milestone for their commitment with the RIMA Programme and the condition for the first payment and start the experiment. Then, services provided by DIHs can be found in the next chapter.

The maps below presents the countries of beneficiaries selected both in the 1st and 2nd Open Call

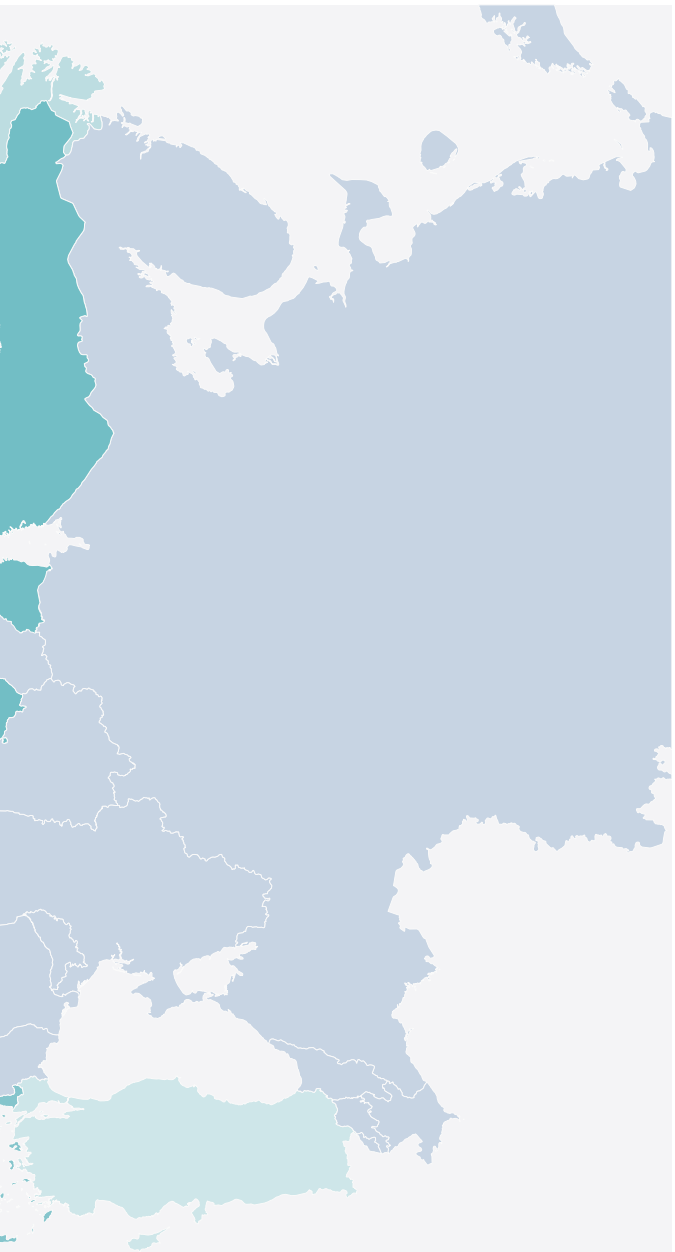
| Country | 1st OC | 2nd OC |
|---|---|---|
| Spain | 16 | 22 |
| France | 20 | 18 |
| Netherlands | 16 | 19 |
| Denmark | 9 | 8 |
| Italy | 8 | 8 |
| Norway | 7 | 2 |
| Greece | 5 | 11 |
| Austria | 5 | 2 |
| Belgium | 1 | 1 |
| Switzerland | 3 | 5 |
| Cyprus | 1 | 3 |
| Estonia | 3 | 1 |
| Lithuania | 1 | 2 |
| Croatia | | 1 |
| Germany | 4 | 3 |
| United Kingdom | 3 | 9 |
| Finland | 1 | 2 |
| Ireland | | 1 |
| Luxembourg | | 1 |
| Portugal | 3 | 1 |
| Slovenia | 1 | 2 |
| Poland | 4 | 11 |
| Bulgaria | 3 | 3 |
| Slovakia | 3 | 4 |
| Hungary | 2 | 2 |
| Turkey | 1 | 2 |
| North Macedonia | 1 | 1 |
| Israel | 1 | 1 |
| Romania | | 4 |
| Czech Republic | | 2 |
| Sweden | | 2 |

| Country | 1st OC | 2nd OC |
|---|---|---|
| Spain | 13 | 9 |
| France | 7 | 8 |
| Netherlands | 2 | 6 |
| Denmark | 4 | 6 |
| Italy | | 2 |
| Norway | 2 | |
| Greece | | 7 |
| Austria | 2 | |
| Belgium | | 4 |
| Switzerland | | 4 |
| Cyprus | | 1 |
| Estonia | | 3 |
| Lithuania | | 3 |
| Croatia | | 2 |
| Germany | | 5 |
| United Kingdom | 3 | 2 |
| Finland | | 1 |
| Ireland | | 1 |
| Luxembourg | | 1 |
| Portugal | | 1 |
| Slovenia | 1 | 1 |
| Hungary | 3 | |

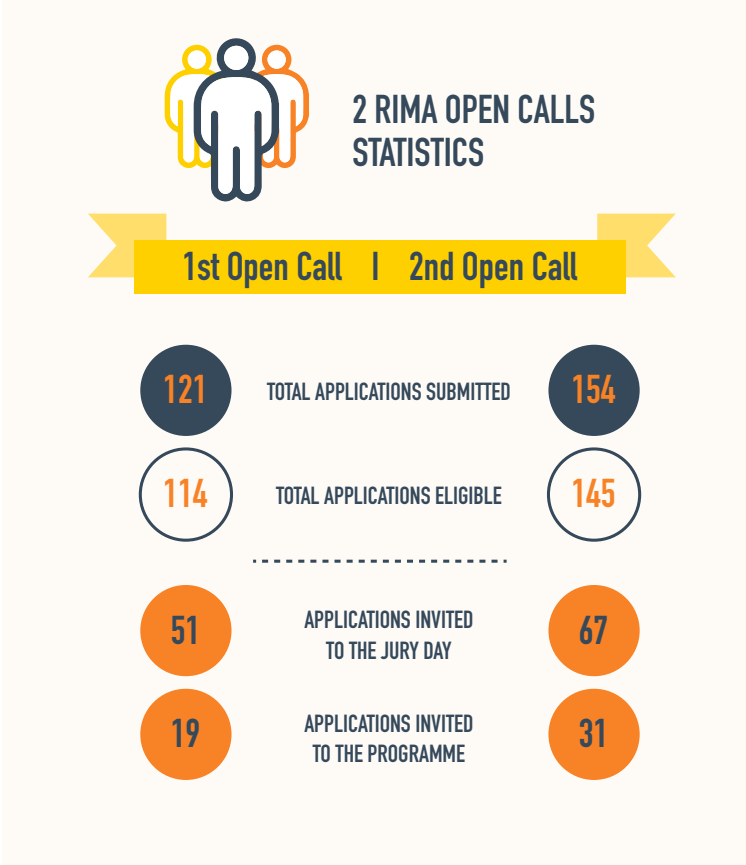
The maps below presents the countries of applicants who submitted their proposals both in the 1st and 2nd Open Call



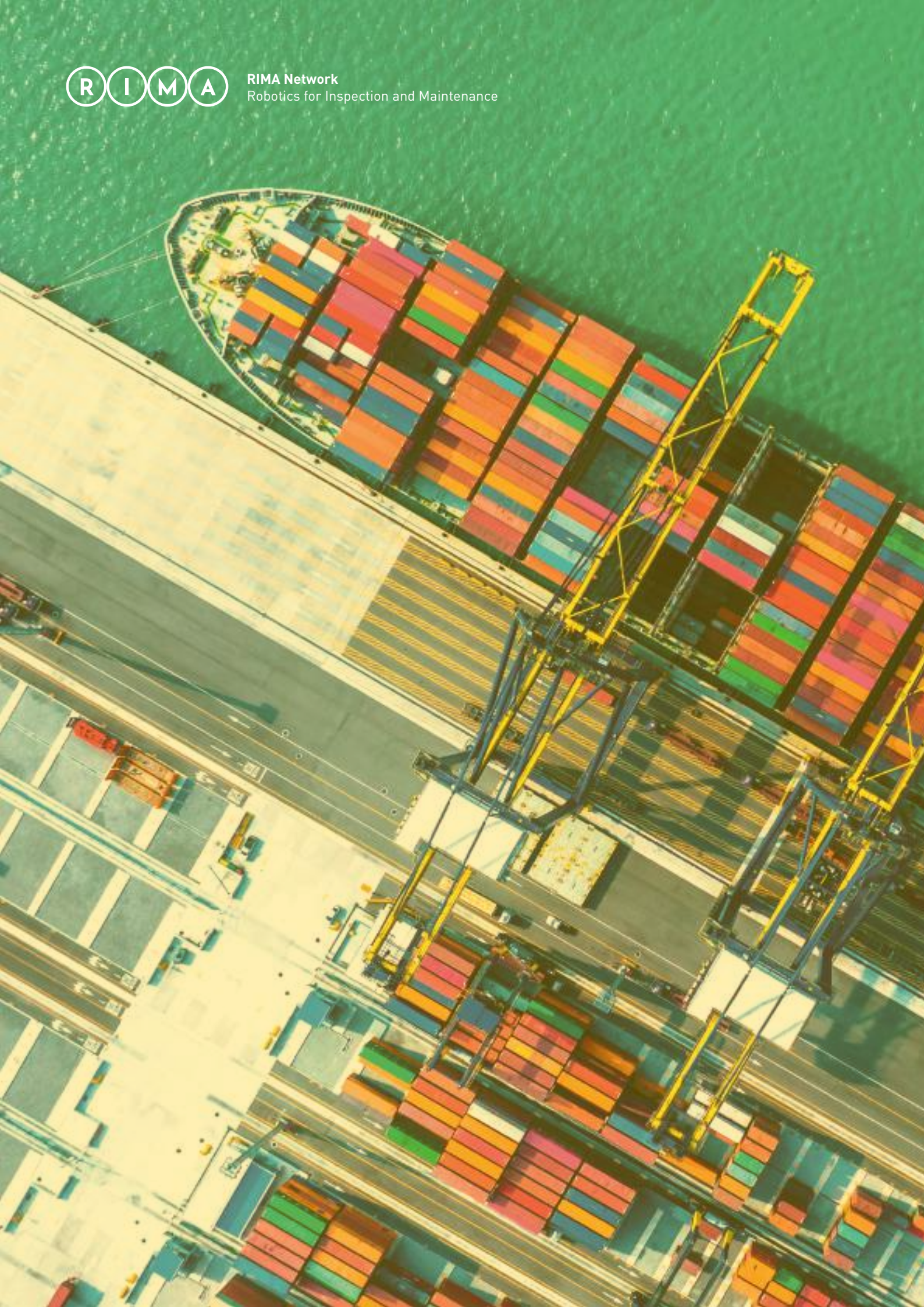
In the graphic below there are some statistics presented related to the 1st and 2nd Open Call



RIMA Open Call submissions-countries applying



**RIMA Network**
Robotics for Inspection and Maintenance



4

# Services and DIH activity figures

## 4.1 Requirements to I&M Digital Innovation Hubs

The concept of DIHs is dynamic and constantly adapting to the changing needs of the regions where they are located, as well as to the shifting needs and agendas at the national and European level. Thus, it is difficult to list a concrete set of requirements for being a DIH. Up until now, the criteria of the Smart Specialisation Platform (S3 platform) for DIHs has been widely accepted. According to this platform[15], one must fulfil the following 4 requirements to be characterized as a DIH:

1. Be part of a regional, national, or European policy initiative to digitise the industry.
2. Be a non-profit organisation.
3. Have a physical presence in the region and present an updated website clearly explaining the DIHs' activities and services provided related to the digital transformation of SMEs/Midcaps or industrial sectors currently insufficiently taking up digital technologies
4. Have at least 3 examples of how the DIH has helped a company with their digital transformation, referring to publicly available information, identifying for each:
   - Client profile
   - Client need
   - Provided solution to meet the needs

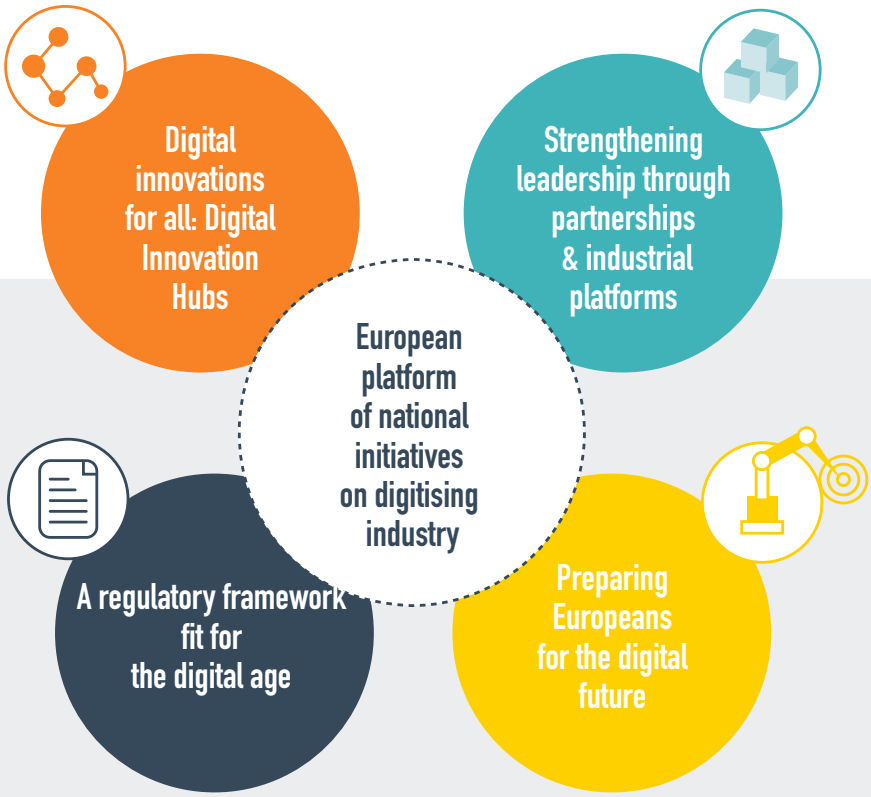



Figure 7. The pillars of the DEI initiative (source: European Commission)

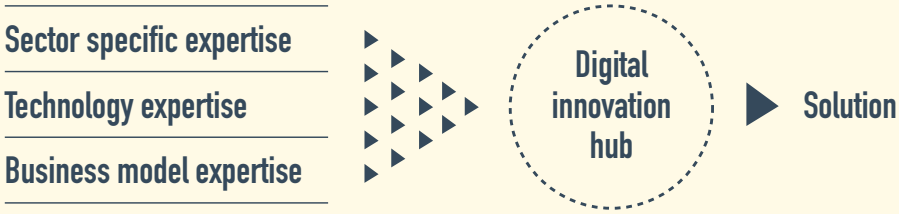
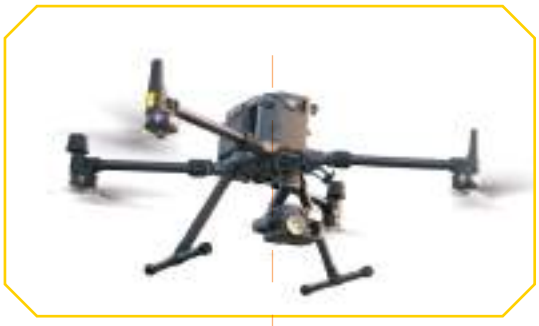
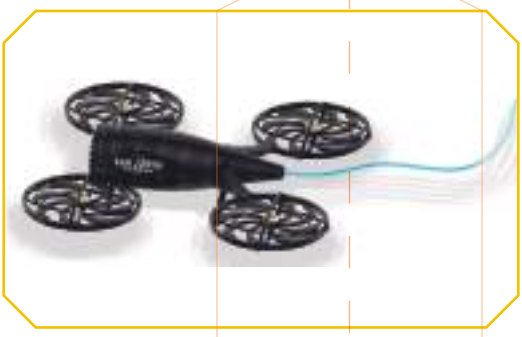



Figure 8. The DIH model (source: Roundtable on DEI, Working Group 1 on DIH)

[15] S3 Platform for DIHs, https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool



RIMA Robotics. AI-Water



RIMA Robotics. ATEXDRONE CONCEPT

RIMA Robotics. RAID_V1800 side on

RIMA Robotics. INOWATT_Scout 137

Although many of these criteria still apply to the DIHs being established today, it is widely recognised that the needs of the regions where the DIHs are located, or will be established, should be of a higher priority when deciding what it requires to be able to call oneself a DIH[16].

The current debate on DIHs[17] also increasingly recognise that it would be difficult for a single organization to fulfil the needs to be characterized as a DIH. Therefore there is a strengthened emphasis on DIHs needing to be ecosystems of various partners, as described above. However, the conceptual operating model of DIHs largely remains the same as presented in Figure 2.

One could say that this model includes the most basic requirements towards being or establishing a DIH: the necessity to combine sector expertise, technology expertise and business expertise, in a hub with access to relevant (digital) infrastructure, in order to provide the best solutions, training and advice to businesses in a given region and/or sector. For DIHs operating in the field of robotics for I&M, we suggest that they would need to combine sector specific expertise from sectors that use this type of robotics in their operations (e.g. through partners or stakeholder using the DIH), with technologic expertise on robotics (e.g. research expertise), and business expertise (e.g. on how the technology could help transform and/or impact a business model). This combined with access to infrastructure to enable testing and validation of suggested solutions and/or technologies, gives a great foundation for DIH service provision. Examples of services a DIH can provide based on this combination of expertise and infrastructure are as follows:

- An SME is developing a UAV-based system for inspection. The SME has competence on UAV-development but lacks competence on sense&avoid technology. The DIH supports the SME in developing a sense&avoid system for the drone, by e.g. providing cameras and other types of sensing systems or licenses for vision and decision-making algorithms.
- An SME has developed a great start on a product but lacks proper test facilities to validate and prove its product. A DIH supports the SME by connecting it with an end-user who has relevant test facilities and has an interest in the product.
- An SME has a very good idea for a product, but lacks the suitable partners, knowledge of the market and a strategy for commercialization. The DIH supports the SME with identifying these aspects and developing a business plan and a strategy for commercialization with an IPR strategy.

The concept of DIH as a regional hub has become quite well established in Europe over the last 3 years, however there is currently a growing focus on the pan-European collaboration between the hubs. This is very clear in the newly launched concept of European Digital Innovation Hubs (EDIH), which is suggested in the proposed Digital Europe Programme[18]. The Digital Europe Programme aims to make sure that there is a hub in every region, and then connect these hubs on a European level to create a sort of DIHs of scale, to be in a better position to compete with larger markets such as U.S. and Asia.

RIMA Robotics. MAGIC / LANCER II

[16] Heard in panel discussion during the Digitising European Industry Stakeholder forum in Madrid, November 2019

[17] Ibid.

[18] European Commission, Fact Sheet on Digital Europe Programme

## 4.2 Service categories

DIHs may provide a large range of services to companies and public entities, and it is important that the companies and public entities that need services properly understand which services are available. To this end, the services can be divided into categories such as those illustrated in Table 1. In this section, we further describe the best practices for delivering services within each of the service categories. The best practices have been gathered from the RIMA partners and are further described on rimanetwork.eu[19].


RIMA Robotics. TANGO / Fuvex

| | SERVICE SUB-CATEGORIES |
|---|---|
| ECOSYSTEM | Community building |
| | Strategy development |
| | Ecosystem learning |
| | Representation, promotion |
| TECHNOLOGY | Strategic RDI |
| | Contract research |
| | Technical support on scale-up |
| | Provision of technology infrastructure |
| | Testing and validation |
| BUSINESS | Incubator/accelerator support |
| | Access to finance |
| | Skills and education |
| | Project development |
| | Offering housing |

## 4.3 Ecosystem

The ecosystem service categories are listed in Table 1These service categories aim to create regional, inter-regional, national and international environments where SMEs, larger industries, research centres, system integrators and technology transfer centres work together sharing knowledge and experience in order to establish fruitful collaborations. Furthermore, in such an environment it becomes important and relevant also to create market and technological awareness to establish collaborations and cooperation among SMEs, research centres, industries to strengthen the industrial environment.

| SERVICES AND ACTIVITIES | |
|---|---|
| **Awareness creation** of I&M robotics, regional **ecosystem building** through, e.g., **dissemination, workshops,** 1-to-1 follow-up, **matchmaking** both within the DIH and to external stakeholders (e.g., industry associations, end-users) and national/international ecosystems. | ECOSYSTEM |
| **Market research,** market awareness, **market/technology trends,** mentoring by technical and application experts. | ECOSYSTEM |
| Facilitate **knowledge sharing** by organizing and informingabout seminars, **workshops, conferences, field trips, newsletters** and other information sharing. | ECOSYSTEM |
| **Promote/advertise** the capabilities and technologies of the DIH and its members through, e.g., **roadshows, exhibitions,** dissemination, and otherwise **represent interests** (e.g., suppliers, end-users). | ECOSYSTEM |
| **Long-term (2-10y) R&D collaboration,** combo with shorter-term spin-out commercialization projects (e.g., contract research), **typically up to TRL 5**. | TECHNOLOGY |
| **Shorter-term R&D (0-4y)**, compensate short-term lack of resources/competence, close customer -R&D-suppliers interaction, technology demonstrators. **Typically from TRL 5.** | TECHNOLOGY |
| Proof of concept, **prototyping**, commercialisation/industrialisation, **small series production. Typically from TRL 6.** | TECHNOLOGY |
| **Lab facilities,** equipment for lease/use (**sensors, robots, robot tooling,** etc.) rapidprototyping. | TECHNOLOGY |
| **Certification, product demonstation & testing,** comparison of products. | TECHNOLOGY |
| **IPR strategy, business development,** free/discounted services through vouchers, **time-bound support.** | BUSINESS |
| Support to produce **research grant applications,** inform about and **connect to funding sources** (e.g., open calls, public funding, investors). | BUSINESS |
| General and topic-specific **courses, hands-on training,** education. | BUSINESS |
| Identify and concretize **project opportunities** within RDI, create consortia, **contract** negotiation. | BUSINESS |
| **Office space** and workspace to spin-offs/start-ups and others incl. **co-location of DIH partners.** | BUSINESS |

Table 1. Categorization of services offered by the DIHs (TNO is source for the 2 columns regarding the naming of the three main and 14 sub-categories)

[19] https://rimanetwork.eu/bestpractice/main

## 4.3.1 Community building

The community building service is fundamental to:

- connecting the SMEs in the region to relevant actors within the value chain both within the region and outside the region; · create awareness of the possibilities of I&M robotics;
- to establish a thriving ecosystem, both at regional, national, or international level. This is to support the SMEs in delivering their services and technologies regionally, nationally, and internationally.

Key aspects of community building include

- **Create awareness of opportunities with I&M robotics and digitalization.**
- **Facilitate participation of actors in the regional ecosystem.**
- **Connect the organizations within a region and establish strategic collaborations with organizations in other regions.**
- **Connect the actors with relevant national, European and international industry associations.**


RIMA Robotics. AUTOBOLT / ABM

**Example:** SINTEF has organized I&M robotics innovation workshops in Norway in collaboration with the Norwegian Society of Maintenance and a national unmanned aerial vehicle organization (UAS Norway ). The purpose of the innovation workshops has been to connect suppliers and end-users within I&M robotics and the workshops have gotten very positive feedback from the participants. The workshops have been multi-domain with focus on I&M robotics in transportation (rail, road, aviation) and petroleum (subsea and topside). The program for the workshops has generally been divided as follows: 1) end-users share concrete needs within their industry, 2) suppliers (typically SMEs) give 3-minute pitches about their offerings, 3) short presentations on funding opportunities (e.g., EU, national, regional), 4) interactive session where end-users and suppliers discuss concrete opportunities for collaboration.

### 4.3.2 Strategy development

This service provides support to the industrial sector as regards market awareness and future directions of the market. Generally, this service is provided through the organization of workshops which gather experts of the field as well as one-to-one follow-up with companies. Generally, workshop host technical experts which work with technology development for the sector and market experts who are aware of the current and future challenges of the field. The workshops are a good opportunity to share knowledge about the future of the market (5/10 years horizon) and about technical solutions for the current and the future challenges. Furthermore, these events facilitate the meeting of technical and market experts which may not easily meet otherwise.

In addition to workshops, one-to-one dialog between DIH-representatives and relevant companies to identify opportunities in I&M robotics for a specific company and determine how to realize them commercially. Such a dialog can be structured according to three services within strategy development as follows (see also Figure 3):

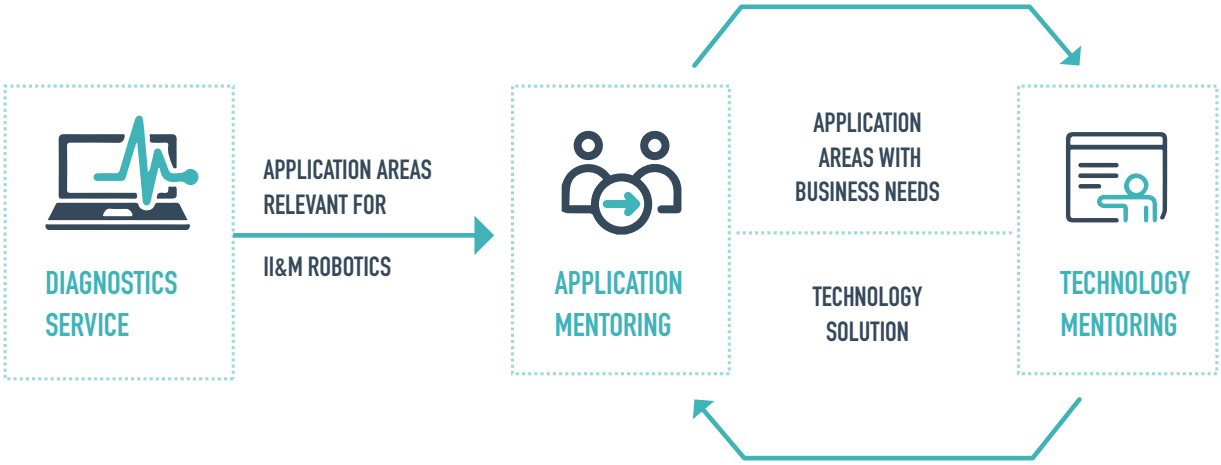
Diagnostics service: It considers current needs of I&M within companies and identify relevant application areas in which the companies could benefit from introduction of robotics and automation or increase use of such. Typically performed by visiting a company (e.g., an end-user) and going through relevant operations.

Application mentoring: Senior experts, preferably with a wide background in business modelling and fundraising, and with an overall vision of all the market domains addressed by the company using this service. This mentor will support in business modelling, fund raising and corporate engagement. Moreover, application mentors will also support on determining whether there is an actual business need/case.

Technology mentoring: Matching the application areas identified by the diagnostics service in more detail with what is technologically feasible and suggesting relevant technologies and solutions. Technology mentors have a broad overview of I&M robotics technologies and solutions, including limitations and possibilities.

Depending on factors such as how in-depth the work with the above three services should be and the skills of the persons involved in providing the service, one or several persons can be involved in providing the service.

Figure 9: A combination of services within strategy development to increase uptake of I&M robotics.




[20] Norwegian Society of Maintenance: www.nfv.no
[21] UAS Norway: https://www.uasnorway.no/

## 4.4 Ecosystem learning

This category of services focuses on increasing the knowledge within the ecosystem of a DIH on aspects relevant for I&M robotics. Such knowledge includes end-user needs, possibilities with new technologies, funding opportunities, business development, and more. This service is closely connected to community building services (since workshops within community building often contain some component of sharing knowledge) and skills and education services (as courses within education can be directly or indirectly used to share knowledge within the DIH).

There are a range of activities and events associated with ecosystem learning including:

- Seminars, workshops and conferences: Events on specific topics or more general.
- Organize trips with actors from the regional ecosystem: To visit relevant clusters, trade fairs, etc. and learn from these.
- Newsletters and other sharing of relevant information.

In addition to organizing events and trips, the DIH can also actively inform interested parties about relevant conferences, new technology / business developments and other relevant information on I&M robotics so that DIH participants can choose to attend these events or dive into the presented information to learn about relevant aspects within I&M robotics.


RIMA Robotics. FIDR / Capra

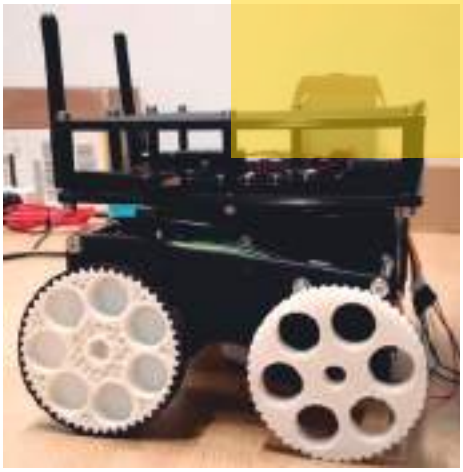
**Example:** Water Europe organizes workshops including business, organization and local authorities. These meetings facilitate discussions about the latest technology available on the market and the new challenges that the sector offers. In this way the people may discuss the opportunity to discuss collaborations and start new projects. Generally, the events are organized having presentations from the speakers in the morning such that the afternoon may be dedicated to facilitate business discussions and new collaboration opportunities.

### 4.4.1 Representation and promotion

This service encompasses dissemination activities aiming at advertising and promoting the activities within the DIH. The promotion of the DIH is an essential activity to allow for the sustainability of the DIH itself. In fact, promotion activities are paramount to give visibility to the DIH and to attract new partners. A possible way to do so is to attend workshops or conferences with the aim to present and promote the projects and the activities carried on by the DIH. More specifically, it may be possible to attend technical conferences and workshops to share and discuss technical results and achievements obtained by the projects in the DIH.

Roadshows to show-case new I&M robotic technologies and services have been proven a way for suppliers to reach out to potential customers. The roadshow can serve several important purposes including to build trust in new technologies. In addition, suppliers can advertise their products and services and get feedback from potential customers on new features and systems, as well as those roadshows can be a key enabler for asset owner personnel to get live demonstrations of new technologies.

Organization of visits outside the region of a DIH is also included in the range of services within representation and promotion. Such visits also can have a component of ecosystem learning and is therefore described in Section 2.1.3.



RIMA Robotics. RoboHop

**Example:** SPRINT Robotics has organized roadshows to facilitate that companies can show-case new I&M robotic technologies and services in Europe and the asset owners can learn about new opportunities with such technologies and services. An important part of the road shows is to include live demonstrations of I&M robotics and SPRINT Robotics transports the exhibition material between locations. The roadshow is moved between asset owner's facilities. This enables key personnel from the asset owners to see the exhibition. Much of these personnel would normally (in case of, e.g., international conferences) not be able to attend such an exhibition as it would have required too much time for travelling and attending. The suppliers are responsible for their own travels and accommodation and pays a participation fee to SPRINT to cover some of the costs in connection with the road show.

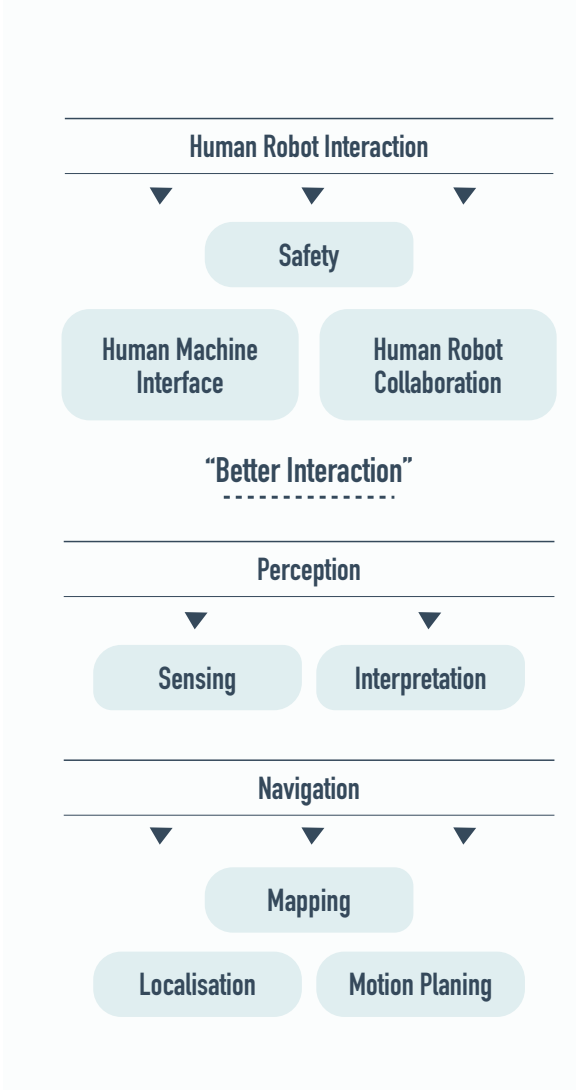
## 4.5 Technology

The technology service categories are listed in Table 1 Error! Reference source not found.. These service categories aim to help technological development in different sectors (e.g., industry sector, public sector) related to I&M robotics. The support may be given in different forms and with different rules which are affected by local or national regulations and habits. Generally, the DIHs provide R&D services, support and infrastructure to carry out projects. Funding sources for the projects vary from project to project (e.g., joint industry projects, regional, national, European, international, etc.).

### 4.5.1 Strategic research, development and innovation (RDI)

By strategic research, development, and innovation within we mean long-term, low Technology Readiness Level (TLR) activities. Strategic RDIs Strategic RDI activities for SMEs and larger companies in a DIH is typically within one or more of the technology areas described in Figure 4.

Strategic RDI contribute to keeping companies competitive in the long-term and thus support long-term strategies in the companies. Strategic RDI can also be a way of realizing long-term collaborations between companies and between companies and RTOs. Moreover, these kinds of RDI can be beneficial for creating visibility through, e.g., media, of the activities in a DIH as plans for technology leaps may create more attention compared to incremental developments (where the latter is usually the target in shorter-term RDI initiatives).




Strategic RDI activities typically have a timespan of 5-10 years before main results are materialized into commercial products. However, it can be advantageous to combine long-term RDI with shorter-term spin-out projects as "branches" from the long-term efforts so that companies can more continuously capitalize commercially from the long-term efforts. It is important for a DIH to have strategic RDI activities to ensure that a DIH is in the front in relation to the state of the art within the strategic areas the DIH is focusing on. Hence, this enables the DIH to better support companies such as SMEs in their region.

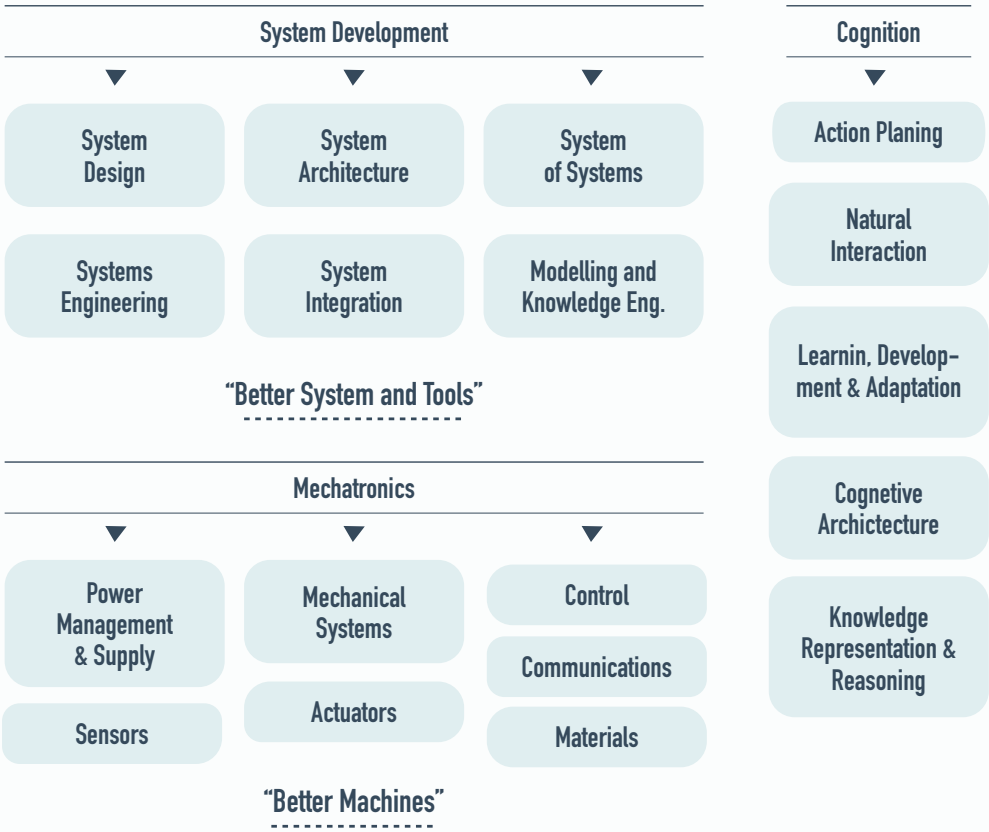



Figure 10: Technology clusters and areas from the SPARC SRA 2014–2020 page 68.

RIMA Robotics. Leaks Buster

**Example:** SFF Autonomous Marine Operations and Systems (AMOS) is an eight-year strategic RDI effort organized as a Center of Excellence and lead by the Norwegian University of Science and Technology (NTNU). AMOS represents a close cooperation between large-scale asset owners, technology / service providers, university (NTNU) and an RTO (SINTEF) and has led to several spin-off companies. The centre has close collaboration with other national and international universities. The centre is financed from funds from the Norwegian Research Council (a public entity which funds RDI in Norway), the industry partners and in-kind contributions from the RTO and the university.



## 4.5.2 Contract research

Contract research is often the primary research service for a DIH and is of key importance to SMEs, larger companies, and public entities to solve challenges and/or gain new knowledge which is not already available in the market. Contract research is typically offered by a DIH to a company in cases where the company lacks in-depth knowledge about an area that needs development, and/or that the company needs additional resources for a limited amount of time in connection with R&D-activities. The contract research can be in the context of a research project, or as consultancy-like services in direct cooperation with the industry. Contract research as a service is often targeted towards medium to large companies, government agencies, or institutes – and typically span from one year up to 4 years in duration. Contract research with SMEs may typically involve some type of third-party funding such a national or European funds. Traditional contract research projects may be too slow-moving (in terms of time to set up the project and carry it out) for start-ups as they typically need results at a relatively high pace. Nevertheless, start-ups can also benefit significantly from traditional contract research projects.

A path to commercialization / industrialization of results from contract research can also involve involvement of system integrator companies – either during the project or toward the end of the project. This is discussed further in the next service on technical support on scale-up (Section 2.2.3).

## 4.5.3 Technical support on scale-up

This service category covers prototyping and small series production within I&M robotics. These can in many cases be seen in connection with the service categories contract research, testing and validation and provision of technology infrastructure. To this end, a project with contract research can result in a prototype which is tested and validated within/with infrastructure provided fully or in parts from the DIH. The goal with a prototype affects how the development of the prototype is made and may significantly affect the cost of a prototype and what kind of competence is needed for the development work:

1) Demonstrate and test a concept: Development of a prototype which demonstrates a concept but does not necessarily reflect how the final system will be implemented in terms of choice of, e.g., materials, programming language.
2) Final steps towards a commercial/industrialized product: Development of a prototype which closely resembles (in terms of choice of, e.g., materials, programming language, etc.) what is believed to be the final product/service.

In terms of financing prototyping activities, these may be organized in connection with, e.g., contract research projects, or in some cases as stand-alone prototyping activities. Some national funds in some countries are targeted towards prototyping and demonstration activities, and some FSTP (e.g., those within RIMA) also can support such activities financially.

### 4.5.4 Provision of technology infrastructure

The technology infrastructures generally encompass lab facilities, system platforms, office facilities or more generic equipment. The provision of technology infrastructure is key to the "test before invest" mantra of DIHs and offers companies and may happen by means of different approaches:

- The infrastructure may be made available for the scope of a project in which the DIH is part and then DIH personnel operates the lab and the equipment according to scope and indications defined in the project.
- To rent out facilities to industries using different form of lease. That is, labs and equipment may be rented out directly to industries and personnel support may be included or not. In this case, the facilities costs are charged directly to the industries.
- The infrastructures may be rented out using a voucher system where the vouchers are given to industries as a funding form from regional or national development plans.
- Free use of infrastructures to promising start-ups as a part of a development and support plan to them. In this case, the DIHs may gamble on the fact that the return of the investment is generated by future income from research contracts granted through developing start-up. In this case, the DIHs indirectly supports the start-up covering the initial costs of the infrastructures and when and if the start-up is mature enough to sustain itself reasonable price for equipment rent may be negotiated.

### 4.5.5 Testing and validation

This service deals with the support to companies for what concerns certifications, product qualifications and product demonstration and is closed linked the to the service on provision of technology infrastructure. The DIH may offer support offering testing facilities and know-how in order to prepare the product for a final certification which may be given by specific external associations. Some DIHs do certification of certain types of products, but in general it is more common that DIHs support the product development towards this objective. It is then clear that the DIH may also support with product demonstration in order to understand what the product status is, or it can be demonstrated to interested third party companies or possible clients. This service may be financially supported by direct payments of the rented facilities from the interested companies.

RIMA Robotics. NYMO

## 4.6 Business

Business-related services encompass key aspects of establishing know-how and projects leading them to commercialization. Thus, skills and education provide the foundation in terms of technical and business knowledge. Services connected to project development, access to finance, incubator/accelerator support and offering housing focus on creating activities that can realize knowledge into market-ready products and services.

### 4.6.1 Incubator/accelerator support

Services linked to incubator/accelerator support include that a DIH can support start-ups with strategies on Intellectual Property Rights (IPR) including patenting strategies and business development. DIHs can also give input on market needs as the DIH may have close connections to potential customers. Services within, e.g., the categories community building (Section 2.1.1) and ecosystem learning (Section 2.1.3) are also closely linked to supporting start-ups. DIHs can also support incubators with, e.g., contract research (Section 2.2.2) and provision of technology infrastructure (Section 2.2.4).

In terms of business development, some DIHs support incubators with IPR strategies and management. This can include that a DIH helps to set up a start-up's strategy for how to secure and produce value from the IPR in the company. A patenting approach can be one way of achieving such securing, but not the only way. Moreover, DIHs can support start-ups with writing proposals for research grants. Such grants can also enable cooperation through contract research between an RTO/university in a DIH and a start-up. Bilateral RTO-company research projects without external funding from, e.g., regional/national/EU grants, may in many cases be too costly for a start-up.

### 4.6.2 Access to Finance

DIH services for accessing financing to companies and public organisations is primarily through research grant applications. These competition-based grants can be either Regional/national funding or from EU. In addition, DIHs can coordinate between potential partners (SMEs, larger companies, asset owners) to start Joint Industry Projects (JIPs) without public funding. It is healthy to a DIH not to be dependent on a single finance source, to survive changing market conditions.

### 4.6.3 Skills and education

Research, industry, and academia need education to be relevant and up to date so personnel attain a skillset relevant for I&M robotics. Academic institutions need to stay relevant to attract students, and research institutes need to stay industrially relevant to attract funding. DIH services in skills and education can help sustain this co-dependency.

To cover important target groups within I&M robotics, DIHs can provide courses to the following groups:

- Students, typically at bachelor, master and/or PhD level: This would give the students the opportunity to seek a job I&M robotics. In addition, they could get a training to enable them to use and develop new I&M robotic technologies and services. i.e., prepare a skilled workforce within I&M robotics.
- Technology developers: Inform them about the new technologies available and business development.
- Service providers: To explain to them how to take new I&M robotics into efficient use and business development.
- Asset managers: To inform them in what are the opportunities with I&M robotics and how it can affect their business.

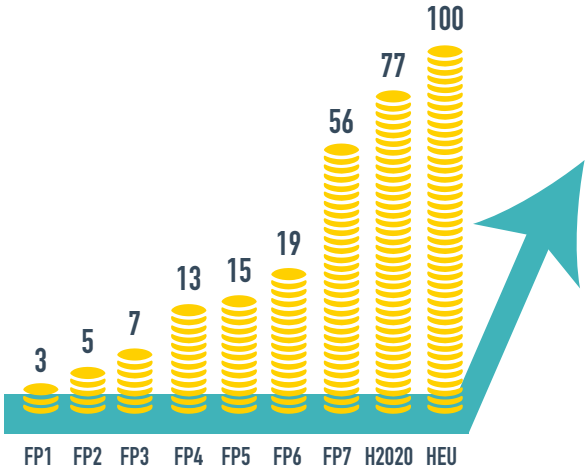



Figure 11: EU spending on research in Billions of Euro (€) [Source: European Commission].

| Course | Main target group |
|---|---|
| Introduction to I&M robotics | All groups |
| **Financing robotics** | **Asset managers** |
| Overview of technologies within I&M robotics | service providers (I&M personnel) |
| **Innovation management and developing new robotic technologies** | **Technology developers** |
| Optimizing your I&M technologies | Technology developers |
| **Working with robotics in I&M jobs** | **Students** |
| Upcoming technologies in I&M | Students |
| **Working with Virtual Reality (VR) and simulation in I&M** | **Students** |

RIMA Robotics. Mimic / Dolly

**Example:** An example of a service in this area is "The Teaching Factory" at Laboratory for Manufacturing Systems & Automation (LMS) which is designed to increase collaboration between academia and industry. The industry provides relevant engineering challenges. The university supports with teams of students that propose solutions to the challenge. Dialogue along the way foster healthy idea generation and industry/academic collaboration. The students in the last years of studies are selected on merits and are sided by an LMS representative, and they begin to interface with engineers in the industry. The semester is split in 13 weeks with periodic meetings between the students and the industry in order to discuss ideas, possible solutions, prototypes and possible final demos. This initiative gives good visibility to good students who may have the possibility to get hired and, at the same time, may lead to innovative solutions to technical problems that industry is facing.


RIMA Robotics. GreenBee / PG

### 4.6.4 Project development

Projects are an essential part of DIHs and there can be a range of different projects that involve different types of stakeholders and financing. DIHs can support SMEs, larger companies, and public entities with services through having joint projects. Some projects are internal to a DIH (e.g., with SMEs and RTOs within the DIH) while others also involve entities outside the DIH (e.g., with other regions). Project development encompass how to establish new projects. Different kinds of projects require different approaches to project developments. Activities such as those within community building, ecosystem learning, and strategy development may be important initial activities for initiating project development. A key to project development is in many cases to understand the needs of the stakeholders involved and how the ecosystem around the different stakeholders' work

DIHs are organized in different manners – also in terms of project development. On some DIHs there are business development groups responsible for project development, other DIHs have business developers employed within the different research groups in the organizations. There can be benefits to establishing a team for each specific business development case and having close collaboration between business developers, technical experts, legal and project managers in such a team. Also, in some cases, personnel at DIHs can have many of these roles at once (e.g., a senior research scientist may also have expertise in business development). Business developers can formally leave a project initiative when/if it materializes to project, but there can be benefits to keeping some involvement in a project to keep relationships with the clients involved.

### 4.6.5 Offering housing

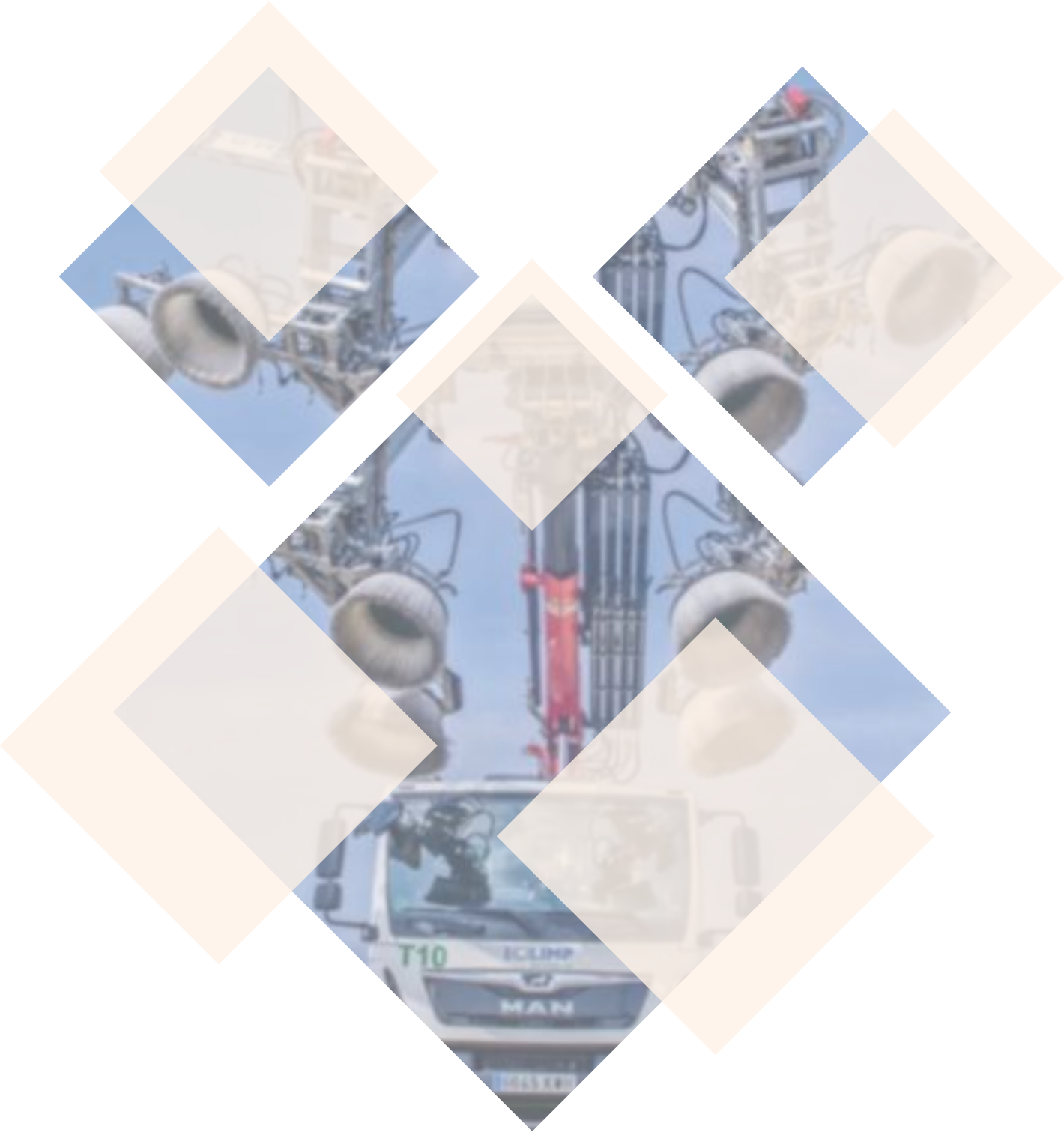
This service focuses on the possibility to offer infrastructure to small promising companies which need support in the initial phase of their activities. Among the different ways this service may be offered, a possible approach may be to seal deals with local or/and national governments to have a financial support so that they have the possibility to offer office space and lab use at a competitive price or, even better, for free, when this is possible. This approach may lead to the definition of a selection process which carefully chooses the most promising companies which shall benefit of this support. It shall be noticed that the possibility to host several small companies in the same building may offer several advantages, for example in terms of synergies. That is, small companies like small start-ups working in affine or totally different sectors may support each other giving rise to possible collaborations. They might end up starting new projects together benefitting of the possibility to broaden up their knowledge or they may just support each other during "corridor talks" or even with reciprocal consultancy support. In other words, a sort of side effect of this service may the implicit establishment of a small ecosystem.

RIMA Robotics. MIMIC

**RIMA Network**
Robotics for Inspection and Maintenance

5

# RIMA network of DIHs




RIMA Robotics. ROBULCLEAN

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## RIMA network of DIHs

# Center for Advanced Aerospace Technologies (CATEC)

http://www.catec.aero

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C/ Wilbur y Orville Wright 17-19-21 Seville 41300 Spain

Phone +34 95.417.9002

Email info@catec.aero

## About

CATEC is a technological center that develops its activity based on seven strategic lines:

1. New composite materials, their production processes, life cycle and recycling. Automation of production, assembly, inspection and testing
2. New onboard systems: electrical, hydraulic, compressed air, fuel, etc. directed to achieve the most efficient and ecological plane.
3. New Avionics Systems and subsystems, especially with application to general aviation, sports, business and Very Light Jets.
4. New techniques of air traffic management, including management of airports and their technical facilities.
5. Unmanned Aircraft, its applications and associated technologies. Special attention to commercial, civil and security applications. The UAV's as a flight test platform.
6. Development of computational simulation techniques and their applications to systems, platforms and / or vehicles (integrated systems)
7. Development of techniques, components, subsystems, systems and spatial applications.

CATEC has a staff of more than 60 researchers as well as specialized technical personnel, most of them being engineers and engineers from the Industrial, Aeronautical, Telecommunications, Materials, Computer or Chemical fields, and there are also some graduates in other technical careers.

## DIH Information

### The form of Robotics DIH Spain and the Team

GRVC Robotics Laboratory at the University of Seville, leads the Robotics DIH Spain with the support of Technological Corporation of Andalusia (CTA) and the active participation of FADA CATEC. The three entities are currently committed to contribute to the digitalization of industry and services through robotics.

### Services

Robotics DIH Spain holds a set of technologies and expertise in robotics and related technologies in a manner that is not available on the market, from which proposes a set of services to favour digitizing Inspection and Maintenance of assets and infrastructures. While this background makes USE/CATEC to be very active in the robotics research area (e.g. in the aerial robotics), they also aim at the effective transference to the industrial sector. Hence, they are supporting the DIH services at creating the framework facilitating deployment of technologies, building connections and trust and understand needs of industrialists.

The geographical scope is Andalusia region first and also to the national scene. It extends also to Europe, although typically from contacts harvested at EU programs former collaborations.

## Business Services

- Access to finance
- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

## Ecosystem Services

- Community building
- Ecosystem learning
- Representation, Promotion
- Strategy development

## Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up
- Testing and Validation

# Consorzio C.R.E.A.T.E.

https://www.create.unina.it/

Via Claudio, 21 Napoli, Campania 80125 Italy

Phone +39 081.768.3243

Email jonathan@slimict.com
Email 2 giancarlo.gargiulo@fastwebnet.it
Email 3 j.pavon@euronautas.com

## About

### DIGITAL INNOVATION HUB

As coordinating institution of FP7 and H2020 projects, CREATE is a key player in EU robotics. In addition to wide expertise provided in R&D and technology transfer as competence centre in I4MS focused on robotics, CREATE offers services including mentoring, technology scouting, feasibility studies, best practice evaluation and dissemination, with a focus on the Regional SMEs.

- Competence Centres: CREATE, Napoli, Italy (focus on robotics). Additional competence centres are expected in Campania, Lazio, Basilicata and Calabria regions, considering past experience of the CREATE Consortium in the coordination of robotics research projects and technology transfer actions.
- Activities/Services: Technical support; Access to users; Training and education; Network development; Ecosystem building and networking; Dissemination and awareness
- **Focus on innovation:** TRL 5 - technology validated in relevant environment; TRL 6 - technology demonstrated in relevant environment; TRL 7 - system prototype demonstration in operational environment.

**Coordinator:** Bruno Siciliano

For additional information, please see https://www.create-dih.eu/

### PRESENT OTHER ACTIVITIES OF CONSORTIUM CREATE

· Computational electromagnetism and applications

· Non Destructive Evaluation

· Nuclear Fusion Technology

· Robotics

· Superconducting Magnets Technology

· Conferences & Workshops

## DIH Information

### The form of the DIH CREATE and the team

Consorzio C.R.E.A.T.E. (CREATE) is a no profit research organisation possessing a legal personality; it belongs, according to the Italian law, to the class of Consorzi, where several subjects give life to an independent body intended to reach commonly agreed objectives. C.R.E.A.T.E. was founded on late 1992 by ABB-Ricerca and the University of Reggio Calabria with the aim of establishing a stable link between industry and university. Successively, the partnership was extended with Università di Napoli Federico II, Università di Cassino, Università della Campania Luigi Vanvitelli, Università Parthenope, Università della Basilicata and Ansaldo-Energia.The financial resources come from the funds given by the partners at the constitution date and to the additional resources gained directly by the partners during their activity.

The scientific and technical aims are pursued by means of the coordinated effort of experts acting as consultants. In addition, the Consortium takes advantage of temporary staff for technical and secretarial support. For 15 years is active a collaboration with PRISMA Lab (Projects of Industrial and Service Robotics Mechatronics and Automation) . The PRISMA team is committed for 30 years to pursuing research in robotics and automation and is internationally recognized in the community for their achievements on industrial and service robotics.

Over the years, CREATE has gained vast experience from participation and coordination of twenty FP7 and H2020 European projects in the field or robotics and automation in general and in Inspection and Maintenance in particular.

### Business Services

- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

### Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

### Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI

# Cyprus University of Technology

https://www.rcdslab.org

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Email: savvas.loizou@cut.ac.cy

## About

The Robotics, Control, and Decision Systems (RCDS) Laboratory and Digital Innovation Hub is part of the Mechanical and Materials Science and Engineering Department of the Cyprus University of Technology (CUT), with a strong focus on education and research. It has extensive collaborations with both industry and RTOs within and outside Cyprus. The RCDS is a one-stop-shop for all things related to developing and using robotics to support business operations: It combines theoretical and applied robotics to designing, and building, operational systems coupled with business expertise. It is active in the air, ground, underground, and marine and maritime robotics areas, serving multiple business sectors. We have worked (and are working) with entities of all sizes (start-ups to multinationals) and academia, government agencies, and NGOs in the EU and beyond.

## DIH Information

RCDS is the first robotics laboratory in Cyprus (established in 2011- we were recognised as a DIH by the EU's Horizon 2020 Framework Programme in 2017). Since then, we have developed externally funded activities worth more than 26 million euros. We engage in research, technology development, innovation and commercialisation activities.

The RCDS Laboratory is at the heart of the RCDS DIH. It provides the foundation (people, expertise, infrastructure) upon which all the services of the Digital Innovation Hub are built. The laboratory operates out of two facilities (one focusing on marine and maritime robotics and another one dealing with mobile, aerial and underground robotics) at the Cyprus University of Technology campus.

## DIH Information

Our service offering is wide and varied. Are you a start-up or a larger corporate entity? Or maybe a government agency, an academic or research entity, or an NGO. Reach out to us to discuss the issues you are facing. Even if we cannot help you ourselves, we might be able to direct you to those who could. We have an extensive, international network of partners capable of addressing a wide range of robotics and automation-related needs. Let's talk!

## Our offering

We offer a range of technology, business, and ecosystem services:

1. Strategic RDI
2. Contract research, technology, and product development
3. Technical support with scaling up
4. Project development support
5. Incubator/accelerator support
6. Market analysis
7. Strategy development
8. Ecosystem learning
9. Training and education

## Technological expertise

**Fundamental science and technology development: Decision and control of robotics and autonomous (multi-) agent systems**

1. Navigation
2. Control
3. Coordination
4. Motion task planning

**Applied science and technology development**

1. Aerial Robotics
2. Marine and maritime robotics
3. Mobile robotics
4. Underground robotics

# Danish Technological Institute

https://www.dti.dk

Taastrup Gregersensvej 1 2630 Taastrup Denmark

Phone +45 7.220.2000

## About

Danis Technological Institute is a leading research and technology company.

We help our customers converting the newest knowledge and technology into value.

We are experts in production, materials, environmental technology, business, energy, agro technology, meat research and more.

## DIH Information

### The form of DIH DTI

The Danish Technological Institute (www.dti.dk) is a self-owned and not-for-profit institution that dates back to 1906. DTI has locations throughout Denmark as well and offices in Sweden and Poland. DTI occupies a crucial position at the point where research, business, and the community converge. Its mission is to promote growth by improving interaction and encourage synergy between these three areas. It has over 1,000 employees, making it one of the world's most significant private institutes to supply approved technological services such as consultancy, tests, certification and training for companies and public-sector organizations. It has over 10,000 customers from 65 countries. It has a turnover of some 149 million Euros and is financially sound. DTI is organised in 7 major divisions with more than 40 centres of expertise.

## Business Services

Access to finance

Incubator/accelerator support

Offering housing

Project development

Skills and education

## Ecosystem Services

Community building

Ecosystem learning

Strategy development

## Technology Services

Contract Research

Provision of technology infrastructure

Strategic RDI

Technical support on scale-up

# French Alternative Energies and Atomic Energy Commission (CEA)

https://www.cea.fr

France

## About

CEA is a R&D governmental agency whose field of expertise applies to energy, health, transport, security, defence, and ICT. CEA has more than 15.000 researchers working throughout France.

The Robotics Unit inside CEA LIST provides the technological expertise in robotics for inspection and maintenance. The Robotics Unit dates for more than 40 years. Specialized originally in remote handling for operations in hazardous environments (nuclear, underwater applications), the Unit focuses on manufacturing applications. It also holds an historical background in robotics for Healthcare applications including assistive, surgical robotics and rehabilitation robotics. Its main research foci carry on human robot collaboration (co-working). The technological researches cover mechatronics and the conception of actuators for the design of innovative robotics systems, robot control, supervision and user assistances (force, haptic, vision, graphic, immersive feedback) aiming at an efficient human robots collaboration in all domains of applications.

CEA is deeply involved in innovation and development of the European industry. CEA is the most innovative public research organization in Europe and 2nd worldwide according to CLARIVATE ranking[1].

The Unit has regular collaborations with industrialists in France and abroad, supporting large groups or SMEs.

CEA is at the origin of the creation of several spin Offs like Haption[2] (Haptics devices) and iSYBOT[3] (collaborative robotics), DIOTA[4] (solutions for manufacturing), Light and Shadow[5] (virtual reality).

CEA has a strong culture for defending Intellectual Property Rights. CEA holds a large number and panel of patents related to robotics and ICT. CEA's policy is to transfer licences on the patents it can hold, to the industry. The objectives of CEA regarding IP, are to protect knowledge and offer a context to build trust with industries using CEA's licences.

The Robotics Unit is composed of 50 people, half being permanent. Most of the personnel are experts in robotics full time researchers in robotics from PhD students to senior researchers and project managers. The Unit also holds senior business developers who develop the technical and commercial activity and the bilateral links with industrialists

DIGIHALL

## DIH Information

### The form of the DIH Paris-Saclay and the team

The Paris-Saclay DIH is an alliance gathering two legal entities: CEA and SYSTEMATIC. The DIH might expand in the future. Each entity has its own domain of competences and work together to stimulate innovation. The two entities are located in the Paris region and have offices on the same site (Nano Innov).

Paris-Saclay Digital Innovation Hub for Inspection and Maintenance Robotics is relies on two entities:

CEA, which is a Research and Technology Organization

Systematic, an innovation and technology cluster in Île-de-France (Paris-Region) created in 2005, and devoted to Deep Tech.

### Services

Paris-Saclay DIH for robotics and inspection and maintenance proposes a set of services to favour digitizing of industry and develop innovation in different sectors of Inspection and Maintenance of Infrastructures. DIH Paris-Saclay holds a set of technologies and expertise in robotics and related technologies that are not available on the market. The services proposed by the DIH are aiming at creating the framework facilitating deployment of technologies, building connections and trust and understand needs of industrialists in order to promote the economic development.

The geographical scope is Paris region first. It extends to the national territory, Europe and has the capacity to address the international market.

## Business Services

- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

## Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up
- Testing and Validation

## Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

# German Aerospace Center (DLR)

https://www.dlr.de

20 Münchener Straße Weßling BY 82234 Germany

## About

We, the German Space Agency, undertake statutory tasks in the space sector on behalf of the German Federal Government. Under the "Raumfahrtaufgabenübertragungsgesetz" and within the scope of the tasks effectively assigned to us, we implement the space strategy of the Federal Government, develop and manage the national space programme, and represent the interests of the Federal Republic of Germany in space-related international bodies in accordance with the tasks assigned to us. We advise the Federal Government and develop initiatives and strategic approaches for space policy. All of our activities are based on the guidelines laid down by the Federal Government in its space strategy.

## DIH Information

### The form of the DIH DLR

The DIH is based on the Institute of Robotics and Mechatronics at German Aerospace Centre (DLR) located close to Munich. The Institute of Robotics and Mechatronics develops a wide array of robots to enable humans to interact more safely and efficiently with their surrounding environments. The robots are designed to act in surroundings inaccessible or dangerous to humans as well as to support humans in everyday life and work. Around 240 full time researchers of the institute have been working on

different robotics projects using a wide network of partner companies in Germany and in Europe. Robotics for inspection and maintenance is an important part of field robotics, one of the key research areas of the institute. DLR Institute of Robotics and Mechatronics is embedded in different local networks for industrial research and development. The institute is involved in DLR wide technology transfer activities and support the establishment of start-ups. The DIH coordinates the activities related to industrial inspection and maintenance.

### Business Services

Incubator/accelerator support

Project development

### Technology Services

Contract Research

Provision of technology infrastructure

Strategic RDI

### Ecosystem Services

Community building

Strategy development

# German Research Center for Artificial Intelligence (DFKI)

https://www.dfki.de

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Phone +49 63.120.5750

Email info@dfki.de

## About

The German Research Center for Artificial Intelligence (DFKI) was founded in 1988 as a non-profit public-private partnership. It has research facilities in Kaiserslautern, Saarbrücken and Bremen, a project office in Berlin, a Laboratory in Niedersachsen and branch offices in Lübeck, St. Wendel and Trier. In the field of innovative commercial software technology using Artificial Intelligence, DFKI is the leading research center in Germany.

## DIH Information

### The form of the DIH Bremen & the team

The DIH in Bremen is currently cantered around the DFKI Robotics Innovation Lab, which is one of the leading RTOs for inspection & maintenance robotics in the region and in Germany. DFKI RIC comprises close to 100 full time researchers, most of them with extensive experience in robotics R&D for and with customers from industry and SMEs. Most technical experts at DFKI do have experience with teaching and academic education. DFKI RIC also maintains a team dedicated to project development and project management, and has access to administrative and legal experts in other DFKI institutes throughout Germany.

## DIH Information

DFKI is embedded in a local innovation ecosystem that is currently evolving quickly, building up services for innovation management, start-up support, vocational training and application-oriented education etc. In addition, DFKI is developing capabilities for the commercial exploitation of research results and the commercial offering of training courses. Both these internal capabilities and the offerings through the innovation ecosystem will be leveraged by the Bremen DIH in the future.

### Services

Bremen DIH for robotics and inspection and maintenance proposes a set of services to favour digitizing of industry and develop innovation in different sectors of Inspection and Maintenance of Infrastructures. DFKI holds a set of technologies and expertise in robotics and related technologies and infrastructure that are not available on the market. The services offered by the DIH are mostly technology services, but also ecosystem and business services are provided.

## Business Services

- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

## Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up
- Testing and Validation

## Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

# Łukasiewicz Research Network - Industrial Research Institute for Automation and Measurements PIAP

https://piap.lukasiewicz.gov.pl/

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## About

Łukasiewicz - PIAP is a Research institution with strong commercial branch. It was established in 1965. Currently it has c.a. 300 employees, out of which more than 2/3 are scientists and/or engineers. Łukasiewicz - PIAP is a part of Łukasiewicz Research Network – 3rd biggest research network in Europe, that has more than 8000 employees in Poland. The main objective of the Łukasiewicz Network is to conduct research work of key importance to the national policy and commercialization of its results. Within the Łukasiewicz Network - PIAP specialises in Digital Transformation and Intelligent Mobility.

Main activity topics include: mobile robotics, cyberphysical systems development, industrial automation, measurement devices, and rapid prototyping centre. The Institute actively promotes new technologies to be implemented by SME and industry as part of itsresearch exploitation efforts. Being the leader of Polish market Łukasiewicz - PIAP is also one of the biggest European producers of IEDD/EOD/CBRN mobile robots and robotic accessories. For more than 25 years Łukasiewicz - PIAP has beene active in research collaboration within European Union (programmes like: FPs, H2020, DIHs, EDF), ESA, EDA and NATO. In 2020, the Institute became the EIT Manufacturing HUB in Poland

Łukasiewicz – PIAP stands out in the market due to:

- high quality of products and services confirmed by the quality system certified according to ISO standards,
- specialized expertise in integration of large systems built using com-ponents from different manufacturers,
- tailor made cyber-physical systems, robotics & IoT that responds to end-users requirements and combine many innovative technologies in one solution,
- implementation of complex tasks requiring non-standard solutions and participation of experts from different fields.

## DIH Information

### The form of PIAP HUB

The mission of PIAP HUB is to boost transition of Polish companies to digital economy. The HUB actively develops, demonstrates and facilitates early adoption of technological breakthroughs such as advanced robotics, artificial intelligence, and 3D printing in order to help industry to respond to customers' demand for personalized products & services, safety and comfort as well as improved energy and resource efficiency. Under the brand PIAP HUB, (No. 1408 in the S3 portal) Łukasiewicz - PIAP and its partners has been providing technology, business and ecosystem services to domestic and foreign companies since 2017. During this time it participated in four H2020 consortia creating DIH networks, developing service standards, and implementing support programmes. Łukasiewicz - PIAP has also participated in the activities of other DIH networks. As an expert in inspection and maintenance robotics PIAP HUB is one of the founders of the European DIH network in the area of artificial intelligence

### Business Services

- Access to finance
- Incubator/accelerator support
- Skills and education

### Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

### Technology Services

- Contract Research
- Provision of technology infrastructure
- Technical support on scale-up

# Laboratory for Manufacturing Systems & Automation (LMS)

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Phone +30 261.091.0160

## About

LMS is focused on research and development in cutting edge scientific and technological fields. LMS is involved in a number of research projects funded by the CEU and European industrial partners. Particular emphasis is given to the co-operation with the European industry as well as with a number of "hi-tech" firms.

## DIH Information

### The form of DIH LMS

Laboratory for Manufacturing Systems & Automation (LMS) is oriented on research and development in cutting edge scientific and technological fields. LMS is involved in a number of research projects funded by the CEU and European industrial partners. Particular emphasis is given to the co-operation with the European industry as well as with a number of "hi-tech" firms. It currently employs approximately 70 researchers organized in four different groups: a) Manufacturing Processes Modelling and Energy Efficiency, b) Robots, Automation and Virtual Reality in Manufacturing, c) Manufacturing Systems d) Software Development for Manufacturing.

In terms of LMS as a DIH, it is actively engaging SMEs in robotic technologies in the manufacturing sector, on regional and national level. Using its long experience on the HRC technologies and its activities on the European landscape, LMS transfers its knowledge to the Greek SMEs as well as to large industries, closing the gap between the Greek and the European manufacturing domain.

## Business Services

- Access to finance
- Incubator/accelerator support
- Project development
- Skills and education

## Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

## Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up

# SINTEF

www.sintef.no

SINTEF, P.O. Box 4760 Torgarden, NO-7465 Trondheim, Norway

Phone +47 4.000.5100

## About

For more than 70 years, SINTEF has developed solutions and innovation for society and customers all over the world. This is how we have become a world-leading research institute.

## DIH Information

### The form of DIH SINTEF

SINTEF is organised as an enterprise group consisting of seven research institutes. In addition, SINTEF Holding manages SINTEF's ownership in start-up companies and other enterprises. SINTEF is located in Trondheim in mid-Norway (1400 employees) and in Oslo (400 employees). We also have personnel in offices and subsidiary companies in Bergen, Tromsø, Ålesund, Raufoss, Mo i Rana, Porsgrunn, Brussels and Hirtshals (Denmark). SINTEF also operates a research station in Svalbard.

In 2016, SINTEF carried out 5700 research projects for 4000 customers. Our multidisciplinary approach enables us to create teams with the broad range of expertise our customers and projects often demand.

In terms of SINTEF as a DIH with activities on inspection and maintenance robotics, a national network on I&M robotics called RINVE is central. RINVE was initiated by SINTEF, co-funded by the Research Council of Norway, and has around 30 members. The member list comprises of end-users (asset owners), technology providers, service providers, research institutes and universities.

## DIH Information

SINTEF[1] is one of Europe's largest independent research organisations. We generate new technologies and knowledge together with our clients. SINTEF is an independent, not-for-profit organisation. None of its owners receive any form of dividend. Any financial surplus is invested in scientific equipment, skills and expertise. We work extensively with other research organisations in Europe. SINTEF has an office in Brussels and is by far the largest Norwegian participant in the EU's research programmes.

We offer world-leading laboratory and test facilities in a wide range of technological fields. Our advanced laboratories range from microelectronics and nanoscale technologies, to the world's largest laboratory for the multiphase transport of oil and gas, and the world's largest marine laboratory.

The commercialisation of our research results is part of SINTEF's role in society. We achieve this by means of licensing and creating new companies based on technologies developed as part of our research activities. SINTEF has spun-out a number of new companies include Zivid, a company specializing 3D sensors for producing high-quality 3D data relevant for e.g. inspection, manipulation and quality check operations.

Several institutes and research groups at SINTEF contribute to SINTEF's overall service delivery within robotics for inspection and maintenance. We have institutes specialising in technology and applications within specific sectors (e.g., SINTEF Manufacturing, SINTEF Ocean, SINTEF Industry, SINTEF Energy) as well as an institute focusing on enabling technologies (SINTEF Digital). There is cooperation between the institutes and research groups to deliver a complete set of technology- and application specific know-how and technologies. We have around 50+ people working on robotics-related technologies including business development.

### Business Services

- Access to finance
- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

### Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

### Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up
- Testing and Validation

# Systematic Paris Region

https://systematic-paris-region.org/

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Email contact@systematic-paris-region.org

## About

Systematic leads an ecosystem of 900 members, including 600 start-ups, SMEs and scale-ups, 150 major industrial players, 140 academics, an investors' group and 20 local authorities

Systematic in figures:

€3.18 billion funding for R&D collaborative projects

625 innovation projects

620 products and services resulting from collaborative R&D projects

The cluster's innovation strategy (2019-2022) is organised and conducted around two strong and complementary themes: innovation in backbone technologies and digital transformation.

Innovation in backbone technologies, or Deep Tech, built on technological breakthroughs, inspired Systematic's creation of its 7 hubs:

- Data Science & AI
- Cyber & Security
- Digital Infrastructure & IoT
- Digital Engineering
- Optics & Photonics
- Open Source
- Drones

Digital transformation, enabled by Deep Tech, with 3 stakes' groups, focusing on economic and societal concerns:

- Transformation of territories
- Transformation of industry and services
- Transformation of society

DIGIHALL

## DIH Information

### Systematic is part of DIGIHALL (DIH Paris-Saclay)

DIGIHALL is an alliance gathering two legal entities: CEA and SYSTEMATIC. The DIH might expand in the future. Each entity has its own domain of competences and work together to stimulate innovation. The two entities are located in the Paris region and have offices on the same site (Nano Innov in Palaiseau).

Paris-Saclay Digital Innovation Hub for robotics' inspection and maintenance relies on two entities:

- CEA, a Research and Technology Organisation (RTO)
- Systematic, an innovation and technology cluster devoted to Deep Tech

### Services

Paris-Saclay DIH for robotics' inspection and maintenance offers a range of services to support digitizing of industry and develop innovation in different sectors of Robotic's inspection and maintenance of infrastructures. Those services aim at creating the framework facilitating deployment of technologies, building connections and trust and understand needs of industrialists in order to promote the economic development.

Its geographical scope is primarily on the Paris region, but it can extend nationwide, across Europe and in some cases internationally.

### Business Services

Access to finance

Project development

### Ecosystem Services

Community building

Ecosystem learning

Strategy development

### Technology Services

Provision of technology infrastructure

# Technical University of Košice (TUKE)

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## About

The Technical University of Košice was founded in 1952, but its roots must be sought much deeper in the past. As early as 1657 the Universitas Cassoviensis was established in Košice, but technical education in Slovakia was only elevated to higher - education level in 1762, when the Austro-Hungarian monarch Maria Theresa established the Mining Academy in Banská Štiavnica. This provided education and promoted research activity in a group of scientific disciplines ranging from ore mining through to production and processing of metal materials.

The origins of higher technical education in Košice reach back to 1937, when the M.R.Štefánik State Technical College was established in the city. Teaching was supposed to start in the academic year 1938/39, but the pre-war events following the Vienna Arbitration caused the college to be moved first to Prešov, then to Martin and finally to Bratislava, where it remained and later formed the basis for the Slovak Technical University in Bratislava.

The true birth of the Košice Technical College came on 8th July 1952, when the Czechoslovak Government issued Directive No.30/1952 Statutes setting up three faculties, namely the Faculties of Heavy Engineering, Mining and Metallurgy. These were joined in 1969 by the Faculty of Electrical Engineering and in 1978 by the Faculty of Civil Engineering.

The important event of the renaming of the College into the Technical University of Košice occurred on 13th February 1991. In 1992 the Faculty of Professional Studies was set up in Prešov, which was transformed in 1996 into today's Faculty of Manufacturing Technologies.

The year 1992 also saw the introduction of the Faculty of Economics, which meant that the University outgrew its original framework of purely technical disciplines, and it continued in this trend in 1998 with the founding of the present-day Faculty of Arts.

The Faculty of Aeronautics of the Technical University of Košice was established on 1st January 2005 as a successor of the Air Force Academy of Milan Rastislav Štefánik in Košice, which has been a prestigious educational institution in Europe and in the world providing university education for pilots and air operating personnel for over 30 years.

## DIH Information

### The form of DIH TUKE

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Nowadays the Technical University of Košice is a public college covering a wide range of educational needs and in many fields it is the only science, research and education center, not just for the East Slovak region but also for Slovakia and the Central European area.

One of those fields is the field of robotics in which the Technical University of Košice has traditionally been a center of robotics research and innovations.

Several different faculties, centers and laboratories, with various specializations related to robotics, AI, cybersecurity etc. have the possibility to cooperate and bundle forces on research, development and innovation.

A typical technology center in this framework is the Prototyping and Innovation Center. This center has extensive facilities for developing, manufacturing and testing of innovations and offers custom-made responses to the needs of business partners / customers. Multidisciplinary teams of experts, if applicable also from other faculties/laboratories, are involved in these customer innovation projects.

Robotics Hub Kosice is related to the Prototyping and Innovation Center with a focus on robotics challenges and applications.

## Business Services

- Access to finance
- Incubator/accelerator support
- Offering housing
- Project development
- Skills and educati

## Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

## Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up
- Testing and Validation

# TNO

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## About

TNO was founded by law in 1932 to enable business and government to apply knowledge. As an organisation regulated by public law, we are independent: not part of any government, university or company.

TNO connects people and knowledge to create innovations that boost the sustainable competitive strength of industry and well-being of society. This is our mission and it is what drives us, the 3,400 professionals at TNO, in our work every day.

As TNO, we can only strengthen the knowledge base for the Netherlands by working together with internationally leading knowledge partners, companies and governments. Given the globalisation of research, TNO is becoming an increasingly international character.

TNO has a breath of knowledge on a broad range of topics. Within robotics, TNO has extensive knowledge on telepresence, human factors, human system integration, multisensory information presentation, Brain-Machine Interfaces, sensor fusion, interpretation of environments, SLAM, network technologies, wearable robotics, social robotics, (semi-)autonomous systems, and human-autonomy teaming.

## DIH Information

### The form of DIH i-Botics

The University of Twente is one of the four technical universities of the Netherlands. Originally founded in 1961 as the Technische Hogeschool Twente, it was renamed University of Twente in 1986. It offers a wide range of technical Bachelor and Master degree studies, mainly in technical fields like physics, chemistry, mathematics, robotics, mechanical engineering, etc. From a research perspective, we believe technology and people have a leading role to play

## DIH Information

in providing solutions for complex societal challenges worldwide. Central to our vision is our High Tech Human Touch philosophy, in which we fuse natural science, data-science, biology and engineering with social and behavioural science while maintaining a relentless focus on societal impact. Furthermore, with over a 1.000 start-ups and spin-offs created in its lifetime, the UT is by far the most entrepreneurial university of the Netherlands. Novel-T, the valorisation institute of the university, provides students and researchers with all the support and tools to bring ground-breaking research results and promising business case.

The Netherlands Organisation for applied scientific research TNO is a private, fully independent, not-for-profit research & technology organization established by Dutch Law in 1932. Over 3,400 TNO employees are dedicated to innovation through applied research to enhance the wellbeing of society and the competitiveness of companies. TNO has an extremely broad expertise base, but specifically in the field of Robotics, TNO has extensive knowledge on telepresence, human factors, human system integration, multisensory information presentation, Brain-Machine Interfaces, sensor fusion, interpretation of environments, SLAM, network technologies, wearable robotics, social robotics, (semi-) autonomous systems, and human-autonomy teaming.

TNO and the University of Twente proudly initiated, and jointly collaborate in innovation hub and DIH i-Botics. It develops knowledge and technology for value adding Robotic solutions. I-Botics cooperates with Industry partners in the full value chain and Governmental organizations. This involvement is crucial for realization of value adding developments and successful implementation of these solutions. i-Botics is mainly active in the domains of telerobotics (haptic feedback, remote operator, remote sensing etc.), human-robot teaming and interaction, the inspection & maintenance robotics domain, subsea robotics, and wearable robotics.

Knowledge is aggregated from various domains and researchers from our partners work together with us. It is our joined goal to develop robotic systems with enhanced situational awareness, intuitive control and thereby maximize effectiveness and efficiency.

Extensive experience in various domains and durable cooperation with partners assures competence of applications and creates value adding solutions with a win-win for involved stakeholders.

### Business Services

- Access to finance
- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

### Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

### Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up

# University of Twente

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## About

The University of Twente is a research university with a focus on technical developments and their significance for people and society. This is reflected in our bachelor and master programs, which are organized by five faculties:

- Engineering Technology (ET)
- Electrical Engineering, Mathematics & Computer Science (EEMCS)
- Applied Sciences (TNW)
- Behavioral, Management & Social Sciences (BMS)
- Geo-Information Sciences and Earth Observation (ITC)

## DIH Information

### The form of DIH i-Botics

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## DIH Information

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### Business Services

- Access to finance
- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

### Ecosystem Services

- Community building
- Ecosystem learning
- Strategy development

### Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up

# VTT Technical Research Centre of Finland

https://www.vttresearch.com/

P.O. Box 1000, FI-02044 VTT Finland

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## About

**VTT is one of Europe's leading research institutions. We are owned by the Finnish state. Our task is to advance the utilisation and commercialisation of research and technology in commerce and society.**

Key figures:

- 244 total revenue, MEUR
- 2,129 number of employees
- 1942 year of VTT's establishment
- 440 patent families
- 27% of Finnish innovations are completely or in part results of VTT's expertise
- 45% of our turnover comes from abroad

The special duty of VTT as an independent and impartial research centre is to promote the wide-ranging utilisation and commercialisation of research and technology in commerce and society. VTT is a non-profit company.

VTT has nearly 80 years of experience in cutting-edge research and science-based results. Our research, development and innovation activities are divided into three business areas: carbon neutral solutions, sustainable products and materials and digital technologies.

At the core of our research in 2020 was, for example, to build Finland's first quantum computer.

The VTT Robotics research is divided in three locations: VTT Espoo is specialised in Industrial robot safety and robotics in indoor logistics and drones. VTT Tampere is specialised in human-centred Robotics, tele-operation and teleoperation interfaces. VTT Oulu is specialised in special robotics, as robotics in heavy mobile robotics. Most of the personnel are experts in robotics and full time researchers in robotics from PhD students to senior researchers and project managers. The Unit also holds senior business developers who develop the technical and commercial activity and the bilateral links with industrial companies.

The services proposed by the DIH are aiming at creating the framework facilitating deployment of technologies, building connections and trust and understand needs of industrialists in order to promote the economic development.

## DIH Information

### The form of the DIH VTT & SMACC

The VTT and SMACC (Smart machines and manufacturing competence centre) DIH gathers several legal entities: VTT, Tampere University (TUNI), Tampere University of Applied Sciences (TUNI), Tamlink ltd. Tampere University and Tampere University of Applied Sciences have just unified several research and education institutes of Tampere region. DIH will also expand in the future, when all the stakeholders of each institute are involved to the DIH operation. Each entity has its own domain of competences and work together to stimulate innovation. All the entities are located in Tampere.

SMACC Tampere Digital Innovation Hub has laboratory facilities in many locations (and the situation is evolving):

- VTT facilities in Tampere, Espoo and Oulu.
- TUNI facilities in Tampere University, Tampere, Hervanta
- TUNI facilities in Tampere University of Applied Sciences, Tampere, Teiskontie 33

## Business Services

- Incubator/accelerator support
- Offering housing
- Project development
- Skills and education

## Ecosystem Services

- Community building
- Ecosystem learning
- Strategy developmentnt

## Technology Services

- Contract Research
- Provision of technology infrastructure
- Strategic RDI
- Technical support on scale-up
- Testing and Validation

**RIMA Network**
Robotics for Inspection and Maintenance

6

# Skills and Training

The RIMA consortium recognizes that robotics I&M require a new educational basis is set for increasing the awareness of stakeholders and end users in the relevant technologies.

RIMA includes several activities in this direction by designing and offering of training services. These activities allow the building of trust and acceptance of robotics technologies by the EU SMEs, the current and future workforce of I&M robotics. These set of services focus on creating a culture on robotics I&M that will feed the innovation in the targeted sectors of energy, oil & gas, water supply, transport, civil engineering and infrastructure.

## 6.1 RIMA training framework

The concept behind the RIMA training framework is to increase digital skills and knowledge of robotics, especially within the I&M domain, amongst a wide range of people. From students starting out on their career path, through the current workforce who need to retrain, managers who need to understand the importance and effect of digitisation, and start-up technology development companies that need concrete information and support for getting their upcoming technology to market. In this direction RIMA has designed a network training offer which is harmonized across the member DIHs, i.e., providing customized courses in local languages while covering the regional market needs, and contains four major categories based on the stakeholders that are the target participants:

End-user and senior staff: the aim under this training category is to increase awareness of the abilities of modern robots and associated technologies amongst end users. Special emphasis is given on people that have the decision-making power to choose whether to invest in robotics or not. The focus is around showcasing available I&M robotics technologies, direction to Financing such technologies and hands-on introduction of inspection technologies for different applications.

Current workforce: RIMA focuses on getting the best out of whichever technologies their management has chosen for existing I&M applications. This knowledge is normally passed on successfully to new staff by the current operators in "on the job" training.

Technology developers: Under this category emphasis is given on how to contribute to the pool of upcoming technologies, the creation of demonstrators, the optimization of I&M robotics applications and the innovative use of standard robotics platforms.

Upcoming workforce: RIMA acknowledges that the current generation of workforce is much more digitally aware than previous generations, but this general fluency with technology needs to be sharpened into usable knowledge in I&M technologies. Thus, RIMA promotes an education paradigm equipping the upcoming workforce with the knowledge and skills required to work on robots in I&M, utilizing the state of the art in computer science, VR and simulation tools for robotics.

RIMA Robotics. Bladebug


RIMA Robotics. GreenBee

## 6.2 Description of the courses

**The courses targeted** for the End-user and senior staff:

- **Introduction to inspection and maintenance robotics:** This course is targeted at anyone who wants basic insight into underlying technologies for inspection and maintenance, e.g. sensors, drones, mobile platforms and complete solutions on the market. The course will concentrate on robotic applications of I&M within e.g. energy, water, roads, railways, etc. and present cases, success stories and examples of solutions. Also learn how we can help companies enter the market.

- **Financing robotics inspection and maintenance:** This course will uncover how you can finance the development of new robot solutions. We guide you in specific financing options in both European and financing bodies in your local region.

**The courses targeted** for the Current work force:

- **Useful inspection and maintenance robotic technologies:** This course is aimed at inspectors and repairers who are experts in their field, but who would like to be introduced to how robot technology can be used in everyday life. There we focus on introducing robotic solutions that are already on the market, the benefits of using these and final help in identifying robotic potentials in your particular area.


RIMA Robotics. Drone 4PV

**The courses targeted** for the Technology developers:

- **Developing robot technologies for the inspection and maintenance market:** This course focuses on innovation models and tools that can accelerate product development of new robot solutions. The course is based on current challenges and issues within inspection and maintenance, and which innovation techniques can be used to advantage to ensure the development of value-creating and cost-effective robot solutions for all stakeholders.

- **Optimizing your inspection and maintenance technologies:** This course is aimed at technology developers in companies, including startups that develop robot solutions for inspection and maintenance. The course will guide participants in how to prepare technology optimization from the early stages of product development, as well as sustainable methods for continuous further development and technology optimization of marketed solutions.

**The courses targeted** for the Upcoming workforce:

- **Working with robots in inspection and maintenance jobs:** The aim of this course is to introduce and inspire students, entrepreneurs and newly trained developers / engineers on how to collaborate with robots in daily work tasks. The course is introducing examples of market-ready solutions, looks at the technologies behind these solutions and finally teaches you more about how to get support for your startup.

- **Upcoming technologies in inspection and maintenance:** This course focuses on early technologies that have not yet been implemented in solutions on the market, e.g. research solutions, but have the potential to solve specific tasks within inspection and maintenance. This could be, for example, AI, collaborative robot systems, new sensor types, mobile platforms, etc.
- **Working with vr and simulation in inspection and maintenance:** This course introduces the possibilities and technologies behind VR (virtual reality), MR (mixed reality) and AR (augmented reality) as well as shed light on the benefits of using these technologies for inspection and maintenance.

## 6.3 Where can you find these courses?

Local RIMA DIH are offering courses or talks in collaboration with local clusters, training schools and universities. Courses are offered physically (where possible) and online. The newest course offerings can be found in the RIMA homepage and RIMA network social media. If you have any questions about the courses, please contact your local DIH representative.

RIMA Robotics. Tunnel Eye

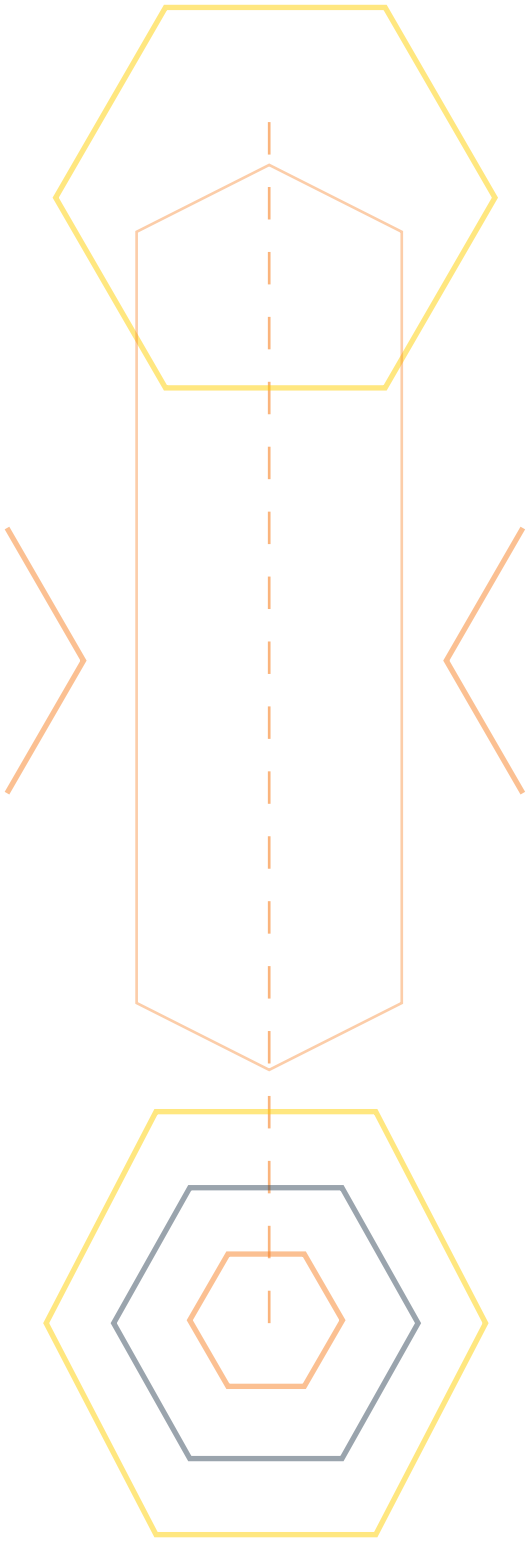
**RIMA Network**
Robotics for Inspection and Maintenance

7

# Network Sustainability & RIMA Network Community

# 7. NETWORK SUSTAINABILITY & RIMA NETWORK COMMUNITY

The goal of the RIMA Network is to be an actor of reinforcement of European leadership in I&M robotics by connecting technology to industrial/sectorial needs and fostering cross border co-operation through the RIMA Network.



**This goal is achieved by**

- Influencing real world deployment and application of robotics for I&M
- Bringing together the whole value chain from different industries in need of robotic solutions for I&M by promoting and stimulating activities so novel solutions can be applied/implemented
- Creating visibility of existing technologies, common challenges and solutions across different industries
- Promoting services and products of European companies
- Sharing information through a common Knowledge Base
- The network will offer a number of services to its members, for example:
- Participation in action groups and projects
- Information sharing through webinars
- Seminars
- Robotic demonstration days
- Regular meetings within regions and action groups
- Access to reports and guidelines published by action groups and joint industry projects
- Roadshows
- Access to community tool
- Information on training
- Information on funding

RIMA Robotics. Green Bee

### How will RIMA become sustainable?

To achieve a sustainable, relevant and active network, RIMA will merge with SPRINT Robotics. SPRINT Robotics, a consortium partner in the RIMA project, is a not-for-profit organization focusing on Inspection & Maintenance Robotics (including Cleaning) for capital-intensive infrastructure. The organization is successful and sustainable, with a main source of income existing of participation fees from member companies. It does not receive public funding. The SPRINT Robotics business model and infrastructure will be used as a firm basis to continue the RIMA Network after the end of the RIMA project.

SPRINT Robotics promotes the development, the availability, and the application of robotics techniques in technical inspections and maintenance of capital-intensive infrastructure. It is an end user driven and global organisation, focusing on close-to-market and market-ready technologies. The RIMA Network is focusing on technologies with lower technology readiness level along with the digital innovation hub services. Bringing together the networks brings value to both, providing an output of research activities to the market, sharing clear market requirements to DIHs and their local networks, sharing best practices between industries. This will provide a sustainable network promoting the European knowhow in robotics globally and this embedded network will further strengthen the European I&M robotics industry, giving it a global platform.

The network operates with a membership fee, the fees are based on the size of the company. The membership fee will secure the sustainability of the network, as all activities are budgeted based on the gathered fees. For the membership fee, members have free access to events and an opportunity to actively participate in the action groups and projects initiated in the network. The events offer ways to collaborate with the value chain, for example during demonstration days SMEs can showcase their technology or research organization can highlight a project during a webinar.

All members have access the community tool that provides an easy way to upload project or product information or request for support to all members. All employees of a company/organization member have access to the community tool.

As the network has global reach, the opportunities for collaboration and information sharing outside of the DIH regional network are available through the network. This will give the DIH an opportunity to participate in projects outside of their local network and offer a chance for SMEs to reach out to global customers.

## 7.1 RIMA Network Community

The RIMA Network Community is a place to collaborate, share information on I&M robotics and keep up to date on RIMA activities. The aim is to connect and inspire key stakeholders in I&M robotics and to accelerate innovation and uptake of robotics.

### Who will you find there?

The RIMA Network community aspires to bring together the technology providers, service providers, asset owners and operators, together with Digital Innovation Hubs and Facilitators, to join forces and competences in accelerating robotics in I&M.

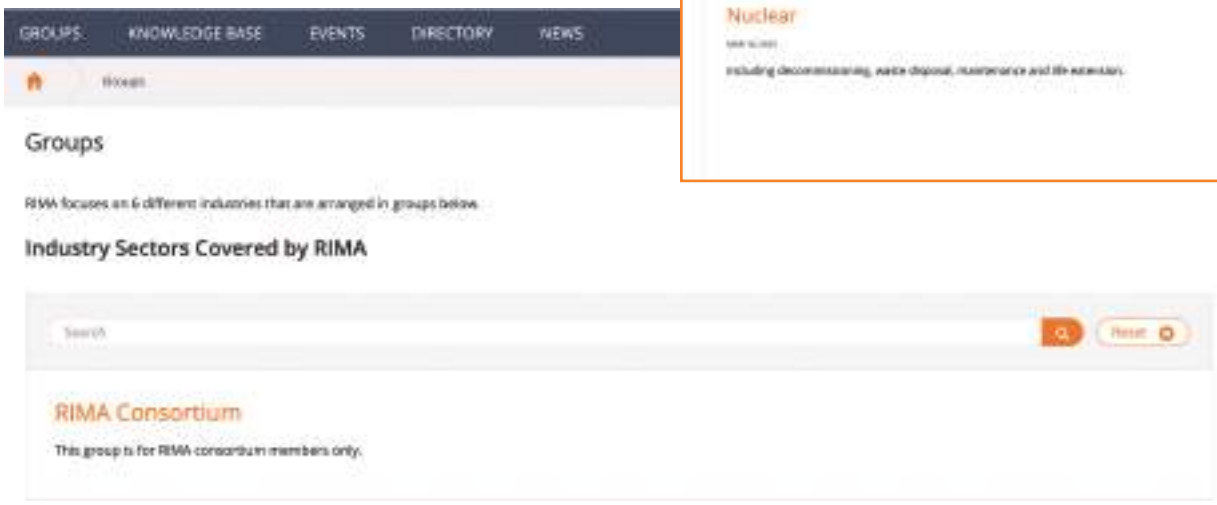
### Where can I join the?

Register here:
*www.community.rimanetwork.eu*

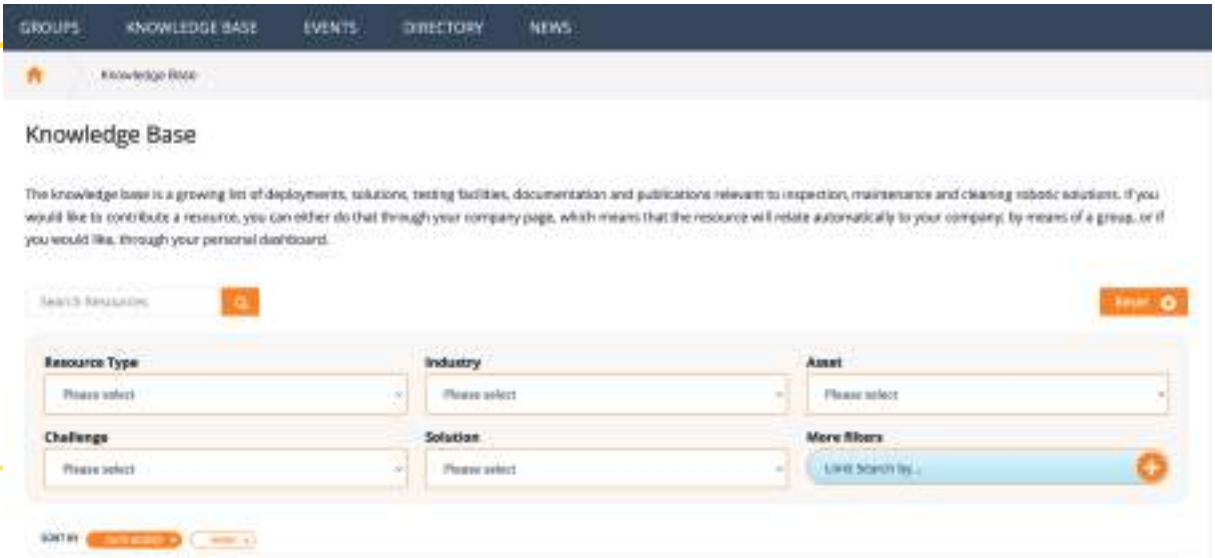
## 7.2 Community Content

- **Home page:** We display the latest news, upcoming events, announcements, latest resources and part of the RIMA Community Feed.

- **Groups:** There are 7 groups so far. RIMA Consortium is a closed group uniquely accessible for the RIMA Consortium Partners. Other 6 are open groups for each of the RIMA domains: Energy; Nuclear; O&G Chemical; Transport, Cargo & Mobility; Urban & Suburban Transport; Water.


- **Knowledge base:** Filtering option for searching any resources.



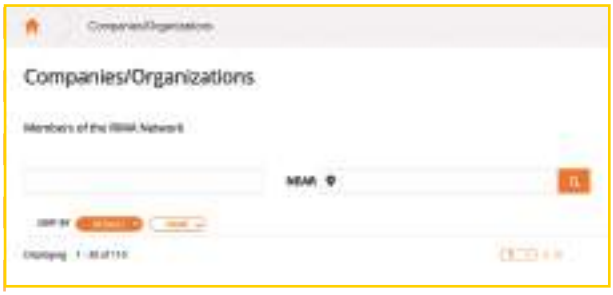
- **Events:** General Calendar of Events. For some past events, recordings of sessions are available.


- **Directory:**

1. Companies/Organizations: Profile of all companies/organizations registered with the RIMA Network. Here companies can edit their profiles, see the contacts from each organization, share an update or publish a resource on behalf of their organization.

2. People: Profile of individuals who joined the RIMA Network community.

3. Digital Innovation Hubs: In here all the DIH's organizations are listed and besides displaying their organizations' profiles, services in categories are promoted as follows:





· **News:** To check out the latest updates and resources from the Community and general announcements.


### Why join the RIMA Network Community?

This platform makes interaction easy and accessible between professionals and companies & organizations in the RIMA Network Community to:

### Collaborate

Collaboration happens in groups on the RIMA Community Network. There are 6 Industry groups open for members to join. The RIMA Consortium also have a closed space to collaborate and discuss.

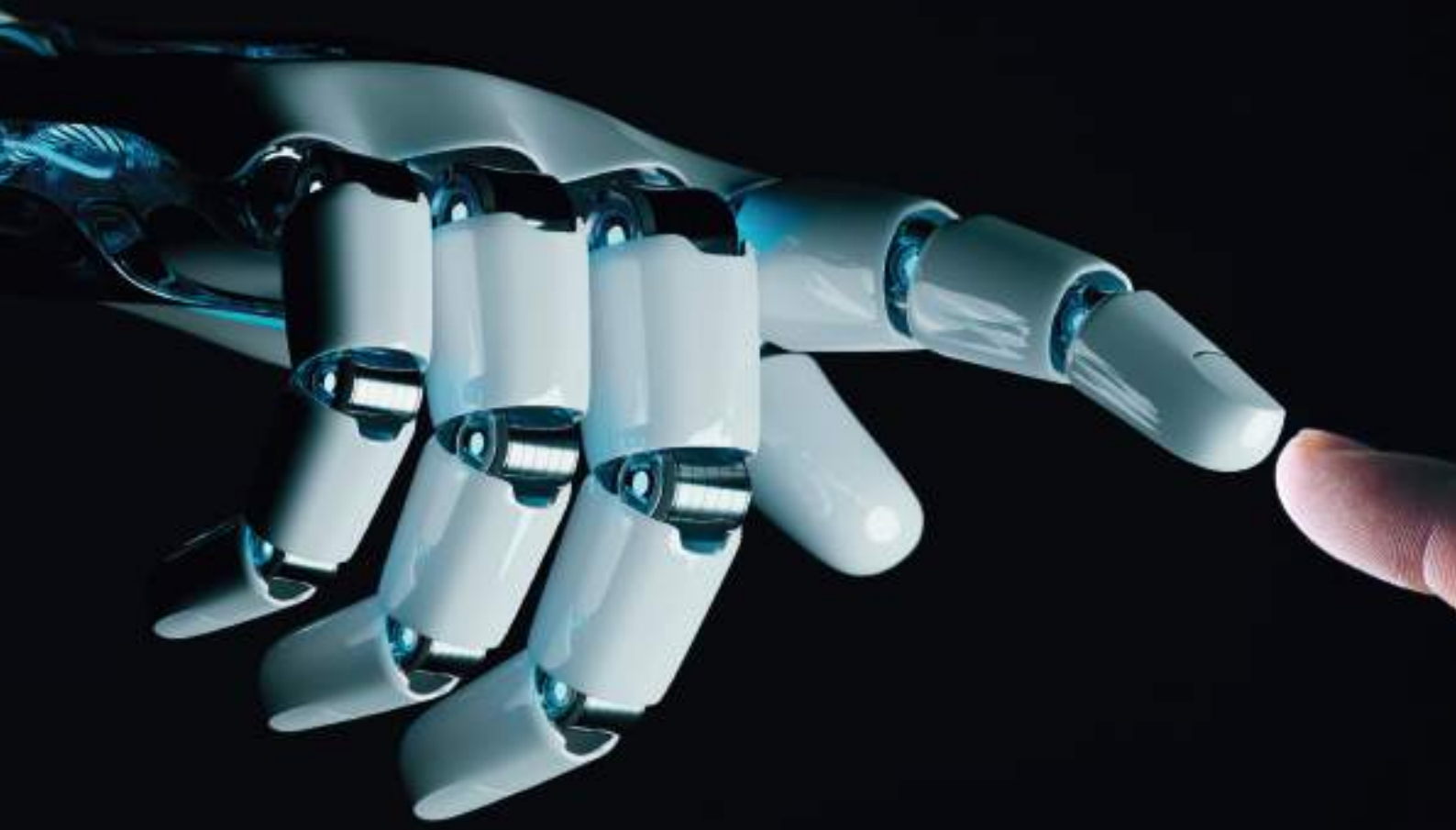
### Share

Share industry knowledge, upload deployments, share links, start a discussion. The RIMA Network Community also has a powerful search feature in the Knowledge base which lets you find essential information.

### Engage

All planned events happening locally and globally, ranging from webinars, seminars, conferences, trainings, etc. are included in the RIMA Calendar.

**RIMA Network**
Robotics for Inspection and Maintenance



8

# Conclusions

# 8. CONCLUSION and Lessons Learned

**RIMA project helps to reinforce the competitiveness of the SMEs in Europe through the innovative use of robotic technologies.** The financial support scheme offered to SMEs and slightly bigger companies as well as the service provision by the DIHs help them grow their products and bring them closer to the market. Through services, SMEs where able to receive mentoring support on technical and business level, access high-quality infrastructures, demonstrators and testing facilities for advanced robotic technologies and engage to network opportunities disseminating their activities. The benefit of this kind of support is that SMEs, apart from the funding which comes from a simpler administrative and submission process and a quick funding decision, have the opportunity to collaborate with other organizations on European level and gain from their experience.

Currently, SMEs face a lot of limitations and barriers to evolve their applications, such as the lack of internal resources that can be devoted to the implementation of the Application Experiments, the difficulties SMEs experience identifying the right funding opportunities to tackle their challenges, and the lack of knowledge of the advantages that robotic technologies can bring to their products. Furthermore, receiving funds through complex contracts and funding schemes from European Commission is another challenge that requires a lot of resources and experience that SMEs do not possess. Last but not least, SMEs need the assistance of DIHs, due to lack of experience and contacts, to bring together the application experiments, the technology providers and the system integrators to understand what the challenges are, how to optimise the solutions and which advanced technologies are best suited.

Overall, **the acceptance from the SMEs side to the RIMA program has been very positive,** leading to the completion of all applications, despite unexpected delays such as the pandemic, without any stoppage from anyone. Beyond the funding, the RIMA DIHs covered the need of advice and facilities, which has been heavily appreciated by the SMEs and has been identified as key benefit for them. More specifically, among the different services offered by the RIMA network, the following ones have been the most requested:

- Provide technical and business advice
- Offer of infrastructure
- Offer support on standardization, IPR, legislation etc.
- Offer dissemination and network opportunities

**The knowledge and expertise of the RIMA DIHs has been recognized by the applicants,** thus the latter tried to make the most of it going beyond the level of guidance and mentoring, reaching the level of accessing DIH facilities and have a hands-on experience and test if the solutions are conforming the market expectations. On the other side, the mentoring program has been designed and organized in a flexible way, understanding that each SME faces different restrictions, such as level of knowledge and experience, legislation restrictions, financial capabilities etc. to which each DIH should adapt and try to mentor them accordingly. Also, part of the mentoring organization included the high availability of partners to SMEs requests as well as the highly supportive and tolerant spirit towards them. The mentors have been advised to be flexible both from an operation and organization point of view, refrain from being judgemental towards the SMEs, trying to have an open mind to their needs. Last but not least, it should be mentioned that all DIHs respected their role, both as individuals as well as members of the network, in terms of mentoring activities through the offering of services. The findings from real practice showed that the DIHs played an important role to SMEs.

Success stories shared in RIMA events show the benefits for SMEs to participate in RIMA scheme, such as the **acquisition of new knowledge both on business and technical level, the support offered in testing new technologies and the networking capabilities offered** on a pan-European level.

# RIMA

ROBOTICS FOR INSPECTION
AND MAINTENANCE

European
Commission