

European Innovation Hubs: An Ecosystem Approach to Accelerate the Uptake of Innovation in Key Enabling Technologies

23 February 2018

Introduction

The last decades have strongly evidenced that Europe's economic growth and employment capacity depend on its ability to support companies' competitiveness and industrial renewal, delivering high socio-economic impact. The [OECD](#) recently demonstrated that increasing productivity through Research, Development and Innovation (RD&I) and enabling our economies to absorb, adapt and reap the full benefits of new Key Enabling Technologies (KETs) is essential to boost companies' growth. The crucial role of RD&I activities to support and boost industrial competitiveness is now at the heart of the [renewed European Industrial Policy Strategy](#) with the ultimate goals to benefit society.

Today, private investment in RD&I remains low in Europe, with consequences on private RD&I capacities. In addition, more recent technology trends have also changed the way companies do RD&I: technology is more complex, technology cycles are shorter, knowledge becomes global. Besides, such complexity and the interdisciplinarity of technology makes it even more difficult for industry to fully capture its full value creation potential, which requires an important understanding of non-technological aspects as well. The main consequence of such trends is that collaboration and co-creation in RD&I is even more crucial. To access new technology, companies increasingly collaborate and rely on Research & Technology Organisations (RTOs) for their multi-disciplinary understanding of technology and its maturation process, their technology infrastructures and their market insights. RTOs today are essential instruments for building long-term and trusted ecosystems of RD&I partners all along key industrial value chains.

These networks of RD&I partners are crucial elements of the so-called innovation hubs, which often act as a one-stop shop providing all technological and non-technological services needed to accelerate the uptake of innovation by large and small industry. These innovation hubs connect all the relevant actors essential for technology maturation. They enable efficient and sustainable technology uptake and scale-up, boosting industry productivity and competitiveness with high impact for society. Such ecosystems are therefore composed of competence centres with key technology infrastructures, including test and demo facilities, as well as universities, incubators, science parks, investors, etc. To efficiently connect and facilitate the relations between all those actors, RTOs very often act as hub managers and integrators.

In this context, EARTO believes that the next European Framework Programme for Research and Innovation (FP9) should build on Horizon 2020's efforts and be even more strongly based on an ecosystem approach, boosting collaboration and co-creation, focussing on the orchestration of Europe's innovation hubs along key industrial value chains. Strengthening and orchestrating Europe's innovation hubs will be the next big step driving Europe to sustain its industrial competitiveness on a global scale by enabling excellent collaborative research, supporting the development and market uptake of KETs, and fostering innovation in key industrial sectors. This paper aims to bring further inputs, explaining how innovation hubs work today and the role RTOs play as orchestrators and integrators of those hubs. It also gives 3 main recommendations for future EU RD&I policy as follows:

- **Recommendation 1** - Design a strong EU cross-border collaborative programme in FP9, building on the concept of innovation hubs linked to key industrial value chains to promote a competitive RD&I ecosystem, strengthening European Industries' capacities to further absorb and scale up the technologies matured into new solutions, maximising FP9's impact for society. This needs to be set as a strong priority for FP9 and clearly reflected in its total budget, its structure, and its internal budget allocation.
- **Recommendation 2** - Develop a pan-European strategy to strengthen and foster the development of European innovation hubs, creating synergies and alignment between the existing European, national and regional strategies, giving RTOs a clear mandate to drive the development of innovation hubs along key industrial value chains, and strengthening a consistent mixed-funding schemes at European, National and Regional levels for those hubs.
- **Recommendation 3** - Within Innovation Hubs, ensure the long-term sustainability of the Technology Infrastructures managed by competence centres with a strategic approach based on Industry's needs.

RTOs Ecosystem Approach to Accelerate the Uptake of Innovation in Key Enabling Technologies

With their open-innovation business model, RTOs play a crucial role in strengthening Europe's Industrial base by developing highly innovative key enabling technologies. Taking an idea from the drawing board through the whole maturation process, with demonstrations and pilots phases towards practical development, requires expertise and infrastructures that RTOs manage and that are heavily used by European industries and national governments today. RTOs use their results-oriented organisational culture based on a long history of cooperation between research and industry. By collaborating with their public & private partners in an ecosystem approach, RTOs aim to accelerate technology uptake and ensure that their industrial partners transfer those technologies to the market. With the evolution of RD&I and increased importance of collaboration and networks, establishment of hubs and ecosystems at regional and national level has been growing over the last two decades. European RTOs naturally operate in an ecosystem approach as it connects them early on with industrial partners allowing them to align technology maturation with concrete market needs.

These ecosystems, or "hubs", are often organised around RTOs' open technology infrastructures (noting that open access does not mean free access). Always aiming at excellence, with their highly skilled experts and know-how, RTOs' technology infrastructures are essential to create and mature technology allowing market uptake by industry, large & small. In a context where the costs of research infrastructures and the products and services' complexity are increasing as well as demanding a multidisciplinary approach, RTOs' support should be further utilised. Thanks to their understanding of technologies and their maturation processes, technology infrastructures and long-term market vision, collaborations with RTOs lower the risks for industry to invest in new technologies. RTOs are key for industries' (large and small) technology uptake and scaling up process.

Formalising the Ecosystem Approach at EU level: Innovation Hubs in EU Policy

The concept of Innovation Hubs at EU level originally emerged in the frame of the [KETs strategy of DG GROW](#) in 2014 and later [further outlined by DG CONNECT](#), as key to the support of companies' access to digital technology. Today, the concept of innovation hubs is evolving and encompassing all technology sectors, with the aim of creating support for companies to access technology through an ecosystem approach.

An innovation hub can be defined as a networked organisation that supports the maturation and transfer of excellent technology to industry, in order to apply innovative technological opportunities. There are at least two different types of innovation hubs focussed on different stages of technology:

1. **Excellence hubs:** focussing on the maturation and development of upcoming new and highly innovative key enabling technologies, on which this paper focusses,
2. **Technology Transfer hubs:** focussing on the transfer to and effective uptake of existing commercially available technology by the market, particularly targeting SMEs' access to technologies, developing their innovation capacity and business transformation, spurring new competitive products, and accelerating time-to-market, with the objective of boosting their competitiveness at global scale.

The following key elements can be found in an innovation hub:

- **Objectives:** bring advanced research to technology take-up through technology maturation, pilot production and demonstration, all the way to the market. Innovation hubs support the development and maturation process of new highly innovative technologies, aiming at excellence. They are important and strategic platforms for cross-cutting dialogue, cross-discipline cooperation, validating/promoting societal acceptance of new technologies and preparing for upcoming standards. Innovation hubs have a strong societal mission, they address market imperfections, and the knowledge and expertise they create benefits many companies, creating important knowledge spill-overs.
- **Means:** collaborative ecosystem approach to build critical mass and strengths and train people in the new technology in order to strengthen technology uptake in a sustainable manner. The entire value-chain is crucial for industry's engagement. Innovation hubs often act as a one-stop-shop offering all the services needed to make commercial application of innovation happen. They are based on open technological infrastructures, crucial to the technology maturation, and are often operated by RTOs. They enhance information sharing and the diffusion of expertise for all actors involved to increase the chances of success, lower risks, and reduce costs.

To achieve these objectives and ensure technology uptake in companies, both technological and non-technological services are crucially needed. Therefore, innovation hubs mainly offer three categories of services:

- **Technological services:** providing access to expertise, technology, and infrastructures, including manufacturing and product development. This includes for instance: collaborative RD&I, technical support on scale-up, commercial infrastructure, testing and validation, etc.

- **Ecosystem services:** developing and driving open innovation ecosystems with strong cooperation between research and industry and good connections between users and suppliers of innovations across the value-chain. This includes for instance: dissemination of information, innovation strategy development, brokerage, inter-hub collaboration, etc.
- **Business-oriented services:** supporting businesses to commercially apply these innovations and transform their business, including access to financing and investors. This includes for instance: incubator/accelerator support, access to finance, business/market intelligence, etc.

Competence Centres: Ecosystem Integrators

Competence centres are part of, or closely linked to, one or several innovation hubs. They create a critical mass of research in specific technological fields, and often have the important roles of ecosystem integrator, linking the different actors together. With their open innovation business model, many RTOs' laboratories or field labs have naturally taken up the role assigned today to these competence centres, often in collaboration with universities' labs and those of other RD&I organisations.

Competence Centres leverage their innovation-driven culture and expertise to develop, mature and disseminate new technologies for industry by:

- having excellent technological expertise on innovative opportunities operating at Technology Readiness Levels (TRLs) 3 to 7, developing key enabling technologies of interest to all industries of all types and sizes, serving as an innovation catalyst and accelerator for businesses;
- having a societal mission to manage and provide access to their excellent international-calibre technology infrastructures and platforms for the experimentation in real-life environments at a competitive cost, and showcase technologies in pilot factories and fab-labs. They regularly invest to create or upgrade such infrastructures and equipment so that they remain cutting-edge and excellent;
- having a strong business/market orientation, creating critical mass by connecting and integrating the different actors in the value-chain in specific technology fields, including start-ups and SMEs but also large industries, whose role is crucial for the sustainability of those hubs since they both have the means to undertake high RD&I investment, and the market access to commercialise the final product, often as SMEs' clients. They also play a key role in connecting SMEs and large corporations and mediating in that asymmetrical collaboration;
- creating links to other key actors, including governments at all levels, investors, incubators, and industry associations;
- enabling the connection of different innovation hubs together to combine technological expertise in different technological fields.



Through innovation hubs, competence centres' expensive RD&I equipment and high-skilled expertise can be shared, thereby reducing the costs of RD&I and the risk of RD&I investment, making it both more efficient and accessible to all actors.

Excellent Technology Infrastructures: Backbone of Dynamic RD&I Ecosystems

RTOs' Technology Infrastructures are one of the crucial element of Innovation Hubs. Indeed, one essential mission of competence centres such as RTOs' laboratories or field labs is to manage and provide access to their excellent technology infrastructures, both virtual and physical. They are the backbone of dynamic RD&I ecosystems and stable innovation-driven value chains. They are crucial for any innovative technology to 1) reach high enough maturation level and to 2) be validated via early stage experimenting, developing upscaling, prototyping, and 3) validating new solutions before they can enter the market, demonstrating their value for end-user clients and investors.

Industry relies on RTOs to access such excellent technology infrastructures, as they very often cannot afford the investment and skills needed to operate them even if a public grant is provided. Competence centres have long had the role of supporting industrial value chains by housing the complex large-scale research and technology infrastructures/facilities. These infrastructures are used to:

1. Investigate completely new technology piloting and spin-off incubation,
2. Test changes in existing products,
3. Validate emerging concepts, either with single industry partners or together with a consortium of several players.

Sharing such large-scale infrastructures is crucial to lower both the costs and the risks of RD&I investment, making it more accessible to industries of all sizes. Core public funding is essential for allowing competence centres to perform their strategic roles, providing critical resources for the acquisition and maintenance of large-scale facilities and specialised equipment. However, since this type of funding is currently decreasing in many European countries, the long-term sustainability of industrial research infrastructure is at risk. These infrastructures hosted among others by RTOs require high level of investments and highly skilled technical staff to be maintained and kept at the forefront of innovation.

EARTO Recommendations

To boost technology uptake and enable industry to absorb and scale up the technologies matured into new products and services and bring them to the market with high societal impact, EARTO believes that the next step for Europe is to clearly support EU cross-border collaborative research in FP9. Building on H2020's efforts, the future European policy on KETs based on the understanding of industrial value chains, RD&I ecosystems, and innovation hubs needs to be a strong element of FP9. Enabling our economies to absorb, adapt and reap the full benefits of KETs is crucial to increase productivity and boost growth and jobs creation in Europe. The following EU actions are strongly recommended:

Recommendation 1 - Design a strong EU cross-border collaborative programme in FP9, building on the concept of innovation hubs to promote a competitive RD&I ecosystem strengthening European Industries' capacities to further absorb and scale up the technologies matured into new solutions, maximising FP9's impact for society. This needs to be set as a strong priority for FP9 and clearly reflected in its total budget, its structure, and its internal budget allocation.

- 1.1 Foster collaboration and co-creation in FP9 with clear visibility in the FP9 structure, to build long-term and trusted ecosystems of partners through value chains to accelerate technology transfer.** Put more focus in FP9 on consortia's capabilities to turn technologies into impact and fostering the development of Innovation Hubs aiming at technology uptake by the private sector. This would enable Europe to remain at the forefront of innovation by supporting the development of innovative technologies and skills with the view to address societal challenges and create new markets and new industries with high impact on jobs & growth.
- 1.2 Support public-private partnerships in FP9 (cPPPs and JTIs) as well as at national & regional levels, as key instruments to build competitive RD&I ecosystems with a long-term vision, enabling trust between partners.** Such partnerships play a crucial role in leveraging private sector investments, linking those with EU, national and regional efforts, as well as in helping SMEs and start-ups to engage in EU and international supply chains.
- 1.3 Position the future European policy on KETs as a strong element of FP9, building on H2020's efforts.** The work of the current [High-Level Group on Industrial Technologies](#) launched by the European Commission is key to give direction on how to orchestrate the KETs policy in FP9.
- 1.4 Further utilise RTOs with their open-innovation business models as key actors to foster collaboration and co-creation in RD&I at EU level, and to integrate industry into robust innovation hubs.** To access cutting-edge KETs and create new competitive products and services, industry increasingly needs to collaborate and rely on RTOs' extensive understanding of technology and its maturation process, as well as their technology infrastructures and long-term market vision. Besides, the complexity and interdisciplinarity of technology makes it even more difficult for industry to fully capture its full value creation potential, which requires understanding of non-technological aspects that RTOs also offer.

Recommendation 2 - Develop a pan-European strategy to strengthen and foster the development of European innovation hubs, creating synergies and alignment between the existing European, national and regional strategies, giving RTOs a clear mandate to drive the development of innovation hubs along key industrial value chains, and strengthening a consistent mixed-funding schemes at European, National and Regional levels for those hubs.

- 2.1 Create synergies and alignments and limit the redundancies between the different strategies and initiatives at EU level to gain efficiency,** including for instance: DG CONNECT Digital Innovation Hubs, DG RTD Open Innovation strategy & LEIT Programme, DG GROW Clusters Policy and KETs Observatory, DG REGIO Smart Specialisation Strategy (RIS3).
- 2.2 Coordinate the efforts at EU level by using the capacities already at hand and avoiding building parallel and competing structures to those already existing.** To do so, carry out a thorough European inventory of the existing innovation hubs and their technology infrastructures by aligning the different mappings done so far (DIH Catalogue, KETs technology centres, etc.) through the different EU initiatives. This would ensure that innovation hubs are based on existing competence centres and technology infrastructures, some of which have been created with EU funds support.
- 2.3 Create a European network of innovation hubs, connecting them together at EU level to support further collaboration, avoid overlaps, and facilitate different applications of key enabling technologies in different fields.** The issue at stake today is not only to map existing innovation hubs, but also to better understand how to efficiently network those hubs and their technological infrastructures to further support innovation across Europe, especially by SMEs. This need is already recognised and partly addressed at EU level, efforts should be further continued.

- 2.4 Give RTOs a clear mandate to drive the development of innovation hubs, supporting them in their crucial role as orchestrators to accelerate the uptake of innovation by large and small industry.** With their Open-Innovation business model, RTOs create a critical mass of research in specific technological fields, and very often undertake the important role of hub manager and ecosystem integrator. They efficiently connect and facilitate the relations between all the relevant actors that are essential for technology maturation and to enable efficient and sustainable technology uptake and scale-up, boosting industry productivity and competitiveness with high impact for society. This includes competence centres with key technology infrastructures and test and demo facilities, but also universities, incubators, science parks, investors, etc.
- 2.5 Strengthen consistent mixed-funding schemes at European, National and Regional levels to support existing innovation hubs as well as create new ones.** This needs to include **(1) "seed" public support** with a minimum of 3 to 5 years guaranty promoting the strong commitment of regions & cities linking with European Structural Funds, to secure the long-term sustainability of those hubs. This will in turn enable to leverage **(2) private sector support**, via collaborative contract research and potential revenues from commercialisation, with the involvement of local industries. To complete the mixed funding scheme, **(3) Public competitive grants** as well as competence centres' own investments sources are also crucially needed.

Recommendation 3 - Within Innovation Hubs, ensure the long-term sustainability of the Technology Infrastructures managed by competence centres with a strategic approach based on Industry's needs.

- 3.1 Prepare for the future with a strategic approach based on the industry needs and RTOs' anticipation of such needs, gaps and related opportunities, and accordingly support the upgrade and creation of new technological/innovation infrastructures** offering capabilities for the most pressing technological challenges. Develop an ESFRI-like roadmap for European Technology Infrastructures to strategically focus EU investments within FP9 and beyond. This effort should be linked to the work of the future new [Strategic Forum for Important Projects of Common European Interest \(IPCEI\)](#) launched by DG GROW that will define future key industrial value chains for Europe.
- 3.2 Create a new European investment fund for competence centres' technology infrastructures, which are essential to support the development and industrial uptake of key enabling technologies, and therefore boost competitiveness.** No suitable instrument is available so far in the cross-regional, pan-European setting. New solutions are needed to close the remaining critical financing gap. The investment in these infrastructures should be enabled by a workable funding mechanism allowing the funding of capital-intensive expenditures covering the initial costs, which cannot be supported by the private sector alone.
- 3.3 Evaluate the EU regulatory framework for the RD&I sector, particularly considering the specificities of activities such as the investments in excellent technology infrastructures, to prepare future revision of the EU RD&I State-Aids Rules.** For instance, the main competitors of EU RD&I organisations come from outside the EU and are not subject to such regulatory framework, giving them a competitive advantage on European competence centres when it comes to building a large-scale research infrastructure.

EARTO and its members remain ready to continue the dialogue with EU institutions and provide additional input on these topics to boost innovation-led growth in Europe.

EARTO - European Association of Research and Technology Organisations

Founded in 1999, EARTO promotes Research and Technology Organisations and represents their interest in Europe. EARTO network counts over 350 RTOs in more than 20 countries. EARTO members represent 150.000 highly-skilled researchers and engineers managing a wide range of innovation infrastructures.


RTOs - Research and Technology Organisations

From the lab to your everyday life. RTOs innovate to improve your health and well-being, your safety and security, your mobility and connectivity. RTOs' technologies cover all scientific fields. Their work ranges from basic research to new products and services development. RTOs are non-profit organisations with public missions to support society. To do so, they closely cooperate with industries, large and small, as well as a wide array of public actors.


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Annex 1 - Examples of Innovation Hubs with RTOs as competence centres and Orchestrators

<p>DIGIHALL - CEA (France)</p> 	<p>DIGIHALL is a Digital Innovation Hub for the Ile-de-France Region, launched by the regional government, managed by CEA (LIST) and federating research, education, and innovation actors around an industrial ecosystem that includes platforms and initiatives with regional, national and European reach.</p> <ul style="list-style-type: none"> Key partners: <ul style="list-style-type: none"> CEA (LIST) - project management, federation of competence centres and links to other DIHs in Europe Systematic industry cluster – animation of support actors and industry ecosystem Mines Télécom Institute, Paris-Saclay University, Inria, Paris-Sud University, SystemX technology research institute, Paris-Saclay SATT, Incuballiance startup incubator, ASTech aerospace industry cluster Key domains: Artificial Intelligence, robotics, digital technologies – manufacturing, transport, health, agriculture Key infrastructures: Factorylab (national testbed/program for the Alliance Industrie du Futur), DOSEO, GERIM, FFLOR testbeds, Open innovation centre, design centre, Additive Factory Hub (in construction) <p>Other Innovation Hubs with CEA involved include for instance CEA (LETI) Medical Device Development and CEA (LITEN) Hydrogen Production and Storage platform</p>
<p>Energy Storage platform - CSEM (Switzerland)</p> 	<p>In collaboration with Berner Fachhochschule, BFH-CSEM Energy Storage Research Center develops solutions for renewable energy storage:</p> <ul style="list-style-type: none"> Testing platform for several energy storage solutions Assessment of potential and impact of grid-tied electrochemical storage Predictive modelling Development of system solutions based on PV-tied storage <p>Key infrastructures include: BMS HIL Test Platform – Cell, module and pack simulation environment; Battery Lifetime Assessment through High-Precision Coulombic Efficiency Measurements; Multi-MPPT PV Inverter Test Stand; etc.</p>
<p>5G Testbed – Digital Catapult (UK)</p> 	<p>The testbed is designed to create an ecosystem that allows local SMEs to engage with the new technology and test its capabilities prior to nationwide rollout which is expected to be 2020. Working in conjunction with its partners that include the local Digital Catapult Centre and the University of Brighton, the 5G testbed will lay the foundation for UK businesses to develop a new level of B2B digital innovation and deliver it in the most cost-effective way. Funding for this key initiative has come by way of a £1.2 million Government grant which is intended to create an ecosystem where SMEs can engage with this new 5G mobile network technology and its advanced capabilities in a controlled environment. Digital Catapult has committed further investment to increase SME engagement.</p>
<p>Plastic Processing Pilot Plant - EURECAT (Spain)</p> 	<p>An international benchmark for plastic transformation</p> <ul style="list-style-type: none"> Key infrastructure: largest pilot plant for new plastic transformation technologies in Southern Europe Barcelona, Spain Sonorus, the first commercial machine for micro-piece moulding by way of ultrasound launched on the market by the spin-off Ultrason (finalist of EARTO Innovation Awards 2016): up to 300% increase in productivity thanks to this technology
<p>Fraunhofer Innovation Clusters - Fraunhofer (Germany)</p> 	<p>Linking skills and pooling resources are the right way to meet the challenges posed by globalization and the increasing dynamism of structural change. Knowledge-based industries, in particular, develop very successfully in regional clusters, which facilitate knowledge exchange and generate a critical mass of skills that complement one another. Geographical proximity between research organizations, investors and companies can produce networks that lead to new business ideas and the foundation of new enterprises. Up to now Fraunhofer has 19 Innovation Clusters initiated.</p>
<p>Basque Digital Innovation Hub (BDIH) – Tecnalia (Spain), IK4 (Spain)</p> 	<p>BDIH is a connected Network of Advanced Manufacturing systems. BDIH is a public-private scheme of partnership established to guide the Basque manufacturing ecosystem and support business fabric in the experimentation of digital innovations. BDIH, provides industrial enterprises, especially SMEs, with the technological capabilities to meet the challenges of 4.0. BDIH is a digitally linked network of R&D infrastructures, pilot plants and specialized know hub in different areas of advanced manufacturing. BDIH develops RTD projects, scales up industrial projects, exhibits cutting-edge technologies. It is also a resource for training and acceleration of startups.</p>
<p>Smart Machines and Manufacturing Competence Centre - VTT (Finland)</p>  	<p>SMACC is:</p> <ul style="list-style-type: none"> one-stop-shop to a network of research infrastructures and test facilities of 3 partners: VTT, Tampere University of Technology and Tampere University of Applied Sciences. Supported by participants, City of Tampere and the Council of the Tampere Region aim of boosting Finnish exports, increasing the competitiveness of the ecosystem, linking scattered research and development environments, easier access to the top infrastructures, and building closer collaboration links between research and industry. 5 themes: Digital Factory, Robotic Village, Digital Systems, Material Insight and Smart Machines and offers unique services for SMEs in machinery and manufacturing. key features: rapid solutions, cutting-edge research expertise and extensive partnership networks.

<p>ROBOTT-Net - DTI (Denmark), Fraunhofer (Germany), MTC (UK) and Tecnalia (Spain)</p> 	<p>ROBOTT-NET is a robotics Digital Innovation Hub operated in collaboration between 4 EU RTOs. This DIH operates as a one-stop-shop offering industry access to both commercially available and upcoming technologies, state-of-the art test and demonstration facilities and expert competences. Currently funded via an H2020 ICT project, ROBOTT-NET has already supported 64 companies through the next stages in their technology development and/or automation. It is on track to become self-financing by the end of 2019.</p> <p>ROBOTT-NET is now carrying out 8 pilot projects lasting up to 18 months, where new technologies and end-user automation needs are matched, developing a medium-scale research prototype installation of a new technology at the end-user's site.</p> <ul style="list-style-type: none"> • Target groups: Technology developers and end-users of all sizes. • Key domains: Robot technologies, plus domain that could benefit from using them. • Key infrastructures: robot halls functioning as test sites, living labs, research labs. Rapid prototyping facilities, mechanical, electronic workshops and more.
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Annex 2 - Examples of Technology Infrastructures within competence centres

<p>Austrian Scanning Transmission Electron Microscope - ACR (Austria)</p> 	<p>The ASTEM is the only ultra-high performance Scanning Transmission Electron Microscope (STEM) in Austria. It provides a common platform for advanced material characterisation and is widely available to the materials and nanoscience community in Austria and Europe. It is jointly run by the Graz Centre for Electron Microscopy and the Graz TU.</p>
<p>Photovoltaic Solar Platform - CEA (France)</p> 	<p>An Industry Ripe for Growth: One of Europe's largest Photovoltaic (PV) R&D facilities.</p> <ul style="list-style-type: none"> • The platform's silicon R&D focuses on materials and cells, with the particular goal of yield enhancement; its solar module research aims to optimise performance. Later-stage R&D takes place at experimental PV facilities and at reduced-scale and life-sized solar power plants. It also works on scaling up the technologies developed for industrial rollout. • The platform runs its Heterojunction LabFab, a pilot production line capable of manufacturing heterojunction PV cells under a European partnership • 15,000 sq. m of facilities, including 2,000 sq. m of clean rooms • 200 research scientists and technicians • 100 M€ in equipment • 30 new patents filed per year, portfolio of more than 100 patents <p>Other technology infrastructure of CEA includes the Cybersecurity platform.</p>
<p>Center of Excellence in Characterisation - CSEM (Switzerland)</p> 	<p>The Center of Excellence in Characterization (CEC) brings together experts and methods from CSEM, the Haute Ecole Arc (HE-Arc) and the Paul Scherrer Institute (PSI) in order to meet industrial requirements with</p> <ul style="list-style-type: none"> • Easy access to the instruments used for materials characterization • High-resolution 3D imaging • Dimensional measurement, real-time analysis and failure-mode analysis.
<p>Things Connected - Digital Catapult (UK)</p> 	<p>Things Connected is an initiative by Digital Catapult, to support UK businesses using LPWAN technologies. LPWAN enables long-range wireless data communication between connected devices ("things"), even in hard to reach areas. Its versatility combined with its low running costs presents opportunities all organisations – from enterprises interested in asset tracking and inventory control to councils looking to monitor social infrastructure. It is a free LoRaWAN™ network and it is intended for the prototyping of new products and services that can benefit from the unique features of LPWAN.</p>
<p>Nano for Production - Fraunhofer (Germany)</p> 	<p>Nano for Production is a facility for accurately adjusting structures smaller than 100 nanometers and using them in industrial applications.</p> <p>Thematic areas</p> <ul style="list-style-type: none"> • Nanofilms for surface finishing • Nanoparticles (carbon nanotubes CNT) • Nanostructuring of surfaces
<p>AstaZero - Active Safety Test Area - RISE (Sweden)</p> 	<p>AstaZero is the world's first full-scale test environment for future road safety. A unique feature of the facility is the different traffic environments that make it possible to test advanced safety systems and their functions for all kinds of traffic and traffic situations.</p>
<p>Bioruukki Pilot Centre Infrastructure - VTT (Finland)</p> 	<p>Former printing plant transformed to world scale R&D centre for bio-circular economy & cleantech (thermochemical conversion, energy storage, biomass process, green chemistry).</p> <ul style="list-style-type: none"> • Currently 40% of total turnover from projects with industry. • Customers on yearly basis: 40-60 companies from 10 different countries including 20-25 SMEs, 20% from out of Finland • Annual SME share of sales (turnover): 7-10% • Annually around 50 public collaborative projects with SMEs