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Project internal note  
WP5  
Report on action for EuroCP concept sustainability

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## Abstract

EUROCPS clearly demonstrates thanks to its easiness of access funding with an opportunity to get access to technology and technical knowledge, its attractiveness for SMEs. The success stories which emerged in the project are a tangible proof of the efficiency of the approach. Making this “EuroCPS” approach sustainable is a legitimate question. In order to have this approach surviving the end of the project it is mandatory to work on the 3 EuroCPS pillars: technical knowledge, CPS platforms, funding. Looking at each of them, the solution toward sustainability is more or less simple but one thing is now obvious, there is not a single solution which fits all. The only approach is to implement this “EuroCPS approach” in the various regional eco-systems taking advantage of the already existing local solutions and leveraging on larger European initiatives like SME instrument or DIH.

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## 1. Introduction

The objective of this document is to look at the conditions for sustainability of EuroCPS. More precisely it is intended to discuss what should be put in place, and more importantly to leverage on existing solutions to make the “EuroCPS model” sustainable. It is clear from the IE success stories and the feedback we got all along the project from project partners and granted SMEs that this model is very suitable and valuable for SMEs.

The document will address in first the strengths and weaknesses of the EuroCPS project. This will be an extract of the experience acquired during the 3 years of the project.

Then the various and major instruments available at European level to help SMEs will be described. The objective is to extract from these instruments the parts which are of interest for EuroCPS and the missing element which are present in EuroCPS.

Chapter 4 will browse a rapid overview of the local instruments existing in the different geographical areas where are located the project partners. The interest is to make a rapid snapshot of what is existing. The action to leverage the local ecosystem regarding EuroCPS sustainability will be more addressed in chapter 6.

Chapter 5 will present a first analysis of the conditions to make the EuroCPS model sustainable. This will be based on the “EuroCPS model” key characteristics which need to be present in order to have a chance to ensure the sustainability of the model. This will propose paths to explore and it will need further investigation to reach the point where a solution could be implemented taking into account the specificities of the various geographical contexts.

## 2. EuroCPS strengths and areas for improvement


EuroCPS gathers a certain number of advantages which have been instrumental in order to attract SMEs in the three open calls organized during the project.

Basically EuroCPS success relies on 3 pillars which are: i) easy to access, ii) focussed funding, iii) technical knowledge. All of these aspects have been benchmarked during the duration of the project with adequate surveys for which results are compiled in deliverables D5.4a and D5.4b.

- **Easy to access**

The proposal submission process has been tailored to make it as simple as possible while always following the EU rules. The size of a proposal is limited to the strict minimum (a dozen pages) and it is in anyway related to the level of funding the SME is expecting from the EU. The proposal template is well documented and what is expected for each paragraph is clearly explained, and the most important points regarding the proposal evaluation are well documented. The capacity for a SME to interact directly with the networking partners of competence and platform partners is also very valuable as it helps building the best proposal from a technical point of view (quality, excellence, impact).

Once the submission and selection phases are done, the project management process implemented for every granted project is also as light as possible, and always in the respect of EU rules. This is a very important point for SMEs as they really focus in developing their solution/product and spend very limited time on pure administrative tasks. EuroCPS is clearly an efficient shield able to cope with the burden of the European administrative reporting and therefore to lighten significantly the SME’s reporting (EC reporting is seen as a major drawbacks for SMEs which do not have the resources and time to deal with it).

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- **Focus funding**

In EuroCPS project, by construction, the granted projects are built in order to maximize their impact. Competence partners provide know-how and expertise to support the SME through their disruptive technology breakthrough. The industrial platform partners propose industrial products available on the shelf (not R&D experiments) which pave the way towards pre-industrialization. This combination of expertise and industrial product access guarantees a good support for the SMEs and maximizes their opportunity in term of business success for the products developed on these industrial platforms.

Another area of focus in EuroCPS is the type of project that could be addressed by EuroCPS. Only 3 type of projects could be addressed, in accordance with the initial proposal, in order to be sure that the stakeholders of the project will be able to support at best the SME which will build proposal in tone of these 3 categories.

The third area of focus is the funding procedure by itself. The funding procedure was built in order to let the SME focus on its technical work associated to the proposal, with the support of both the competence partner and the industrial platform. There is no need in EuroCPS to build a complex consortium to have a chance to get funding, but the SME with its ideas. A dedicated, small size consortium is built around the SME including the cascade funding partner, the competence partner (if different from the cascade funding partner) and the industrial platform partner. This agile procedure has a tremendous impact in the attractiveness of the EuroCPS as SMEs can concentrate on their own concern and do not have to deal with other complex aspects/tasks as it is the case in standard H2020 project for instance.

- **Technical knowledge**


In EuroCPS different type of platforms have been provided depending on their market exposure.

Some of them were application domain specific (Thales, AVL, ST) while some of them were mass market oriented (Intel, Infineon, ST)

While technical information is easily accessible in the case of mass market platform, this is much more complex for application domain specific platforms. The structure put in place in EuroCPS allows an equal and easy access to platform technical information whatever their type. This has allowed some SMEs to develop solution even in the case of very complex platform. One other important element is that the support provided by the technical expert, either the networking partner or the platform partner, is focussed on the problematic of the SME and results in a direct and unique collaboration with the SME. The other very important point is the opportunity for every SME to get easy access to technical knowledge that allows the SME in a large majority of cases to propose/work on solution based on new technologies while they are not at all an expert of the domain. In many cases, the SME takes benefit of the collaboration to acquire new knowledge and grow new skills. This is really a very important strength of EuroCPS as it allows and support pervasion of CPS system in application domains not part of the high tech arena which is one of the main goals of the SAE European initiative.

Beyond these 3 pillars of EuroCPS there are other elements which are positive differentiators of the EuroCPS approach. Among them could be mentioned:

- Exposure of small SMEs to large companies.
- Creation of a network of SMEs and opportunities to share some experience or even to discover complementary business offer.
- Opportunities for SMEs to be visible at European level.
- Opportunities for SMEs to benefit from business experience from partner of EuroCPS.

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Even if EuroCPS has a lot of very positive characteristics there is nevertheless some points which are areas for improvement.

Below are listed the most important ones.

- **Loose link of EuroCPS with local ecosystem.**

Reaching the end of the project it is clear that most activities happened inside the consortium and the best support has been given to the SMEs by the different project partners. Even if the networking partners are well implemented in their local ecosystem, interaction with local ecosystems has been limited, mainly active to identify SMEs that could benefit of the EuroCPS initiative. A better connection with the local ecosystems could help in improving the sustainability of EuroCPS once the project is completed and could be most meaningful and useful to provide support to the SMEs after EuroCPS (industrialization phase), but also to the SMEs with interesting project that could not be funded within EuroCPS project.

- **Lack of a path to prepare SME toward other funding instruments.**

EuroCPS project, in a lot of cases, was the seed needed for an SME to start a new project or to help in the growth of an existing one. In any case the level of funding provided by EuroCPS could not cover the complete product development, especially in the case of project built upon the industrial platforms such as the Silicon platform, for instance, where ASIC development can cost several Millions of Euros. One area of improvement for EuroCPS would be to help an SME in identifying the best instrument they have to go for, in order to raise additional funding able to support their next development steps. This is something where local ecosystem and large companies can help.

- **Compliance to EU rules not always compatible with SME agility needs.**

It is clear that for a SME the key preoccupation is cash money. To that respect EuroCPS tried to make the access to the funding money as simple as possible for the SMEs, e.g. funding payment in line with the project timing and realization. The compliancy to EU rules where money is delivered upon completion of milestones and deliverables at given reporting period is sometimes in opposition with the SME timeline and a big brake to SME's agility. This is even truer as Industrial experiments were not aligned on EuroCPS reviews but aligned with SMEs' needs. Without a strong support from some networking partners having accepted to play the role of "bank" in delaying their funding income in order to cascade more money to SMEs, it would have been a nightmare for the SMEs. A workaround to this problem was put in place by networking partners (RTOs and Academics) but would be almost impossible to implement for large companies where accounting rules are generally much stronger. This aspect needs to be looked at more carefully in order to find a solution which is acceptable and scalable for project stakeholder and compatible with SME needs and EU regulation and timing.

### 3. Existing European instruments for SME

There are several instruments at European level to support SME's. Among all of them SME instruments and DIH (Digital Innovation Hub) are looked at in more details and discussed hereafter.

- **SME Instrument**


SME instrument is an instrument intended at providing funding for SME's. It is articulated around 3 phases.

- Phase 1: Feasibility assessment

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The project should be aligned to the business strategy, helping internal growth or targeting a trans-national business opportunity. The evaluation of phase 1 proposals is performed remotely by a panel of independent experts. The funding level is 50 k€ lump sum per project (not per partner) but a project can be made of a single partner. The duration of a project is generally 6 months and produces a feasibility study and/or a business plan.

- Phase 2: Innovation project

Innovation projects underpinned by a sound and strategic business plan (potentially elaborated and partially funded through phase 1 of the SME Instrument).

Activities funded in phase 2 can be of several types: prototyping, miniaturisation, scaling-up, design, performance verification, testing, demonstration, development of pilot lines, validation for market replication, including other activities aimed at bringing innovation to investment readiness and maturity for market take-up. Amount of funding: in the indicative range of 500 k€ – 2.5 M€ or more (covering up to 70% of eligible costs) for projects with a duration typically around 1 to 2 years.

The evaluation of phase 2 proposals happens both remotely and face-to-face (via an interview) by two panels of independent experts.

Outputs of phase 2 are:

- a greatly innovative product, process or service that is ready to conquer the market;
- a business innovation plan incorporating a detailed commercialisation strategy and a financing plan in view of market launch (e.g. on how to attract private investors, if applicable).


- Phase 3: Business acceleration

With the view of facilitating the commercial exploitation of the innovation activities resulting from phase 1 or phase 2, the SME instrument proposes business acceleration services. This includes support for further developing investment readiness, linking with private investors and customers through brokerage activities and events (including trade fairs), assistance in applying for further EU risk finance, and a range of other innovation support activities and services offered via the Enterprise Europe Network (EEN).

Focussing on the phase 1, it is something which is close to EuroCPS in term of easiness for submission, execution and level of funding. The proposal is in the range of 10 pages with clearly defined chapters close to what is expected in EuroCPS. The submission process is using EU tools and is easily accessible. The frequency of the calls is well known and regular (several calls per year) allowing submission to the next call in case you missed the current one. Project follow up during execution is light and limited to the strict minimum which is well adapted for SMEs.

The topics covered by the projects are very large and allow a wide range of project to be submitted. As counterpart the competition in each call is very strong and only excellent proposal can have a chance to be funded leading to a lower success rate than the one we had in EuroCPS.

The main difference with EuroCPS is in the lack of technical support. The SMEs submitting a project have to arrange on their own the technical support or help they could need, in defining their project. There is not such opportunity of interaction with networking and platform partners which can help from the beginning, removing some technical barrier which could encountered at the proposal stage. Some

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local ecosystems are providing support to review and improve proposal but it is not something which is well structured and in any case not largely deployed at European level.

The other risk is due to the large scope of SME instrument and then the risk of having experts not really expert in the SME's industrial domain which could end up by misunderstanding of the SME's proposal. This issue is removed in EuroCPS as the expert selection process has targeted experts well acquainted with the technologies proposed in the SMEs proposals.

- **Digital Innovation Hub (DIH)**

The main objective of DIH is expressed in the sentence below.

**“Ensure that every business in Europe, whatever its sector of activity, wherever located and whatever its size, can take full advantage of digital innovations and competences”**

This is very encouraging and extremely ambitious as it clearly targets the digitization of the European industry. One interesting aspect of the DIH initiative is in its implementation which needs to have deep roots in every region. To that respect it is very good as it is intended to be close to the local actors and SMEs. Even if attractive and potentially proposing the type of services available in EuroCPS, DIH is still a complex system and its success will strongly rely in the local implementation in the different regional ecosystems. To that respect EuroCPS demonstrated its efficiency and its capacity to drain SMEs to the use of CPS technologies, thanks to the simple way to access funding and technology know-how.

## 4. Mapping of local eco-system around EuroCPS consortium

### 4.1. Austria


AVL List has a strong footprint in the innovation landscape and is correspondingly integrated in relevant national and international expert groups<sup>1</sup>. In the context of EuroCPS, following networks should be highlighted

- **ECSEL Austria** (national, <http://www.ecsel-austria.net>): ECSEL-Austria is an industry-driven national research, development and innovation platform representing the technology areas of micro- and nanoelectronics, embedded systems and systems integration. Founded by the former technology platforms ARTEMIS-Austria (embedded software and software architecture) and ENIAC-Austria (micro- and nanoelectronics) in 2013, it was enlarged by the areas of “systems and systems architecture”, “framework conditions and visibility” and “network and network development” in 2014. AVL is ECSEL Austria chairman; EuroCPS program and especially the open calls where regularly presented in ECSEL Austria meetings in order to activate the ecosystem appropriately
- **Automotive Cluster Styria** (national, <http://www.acstyria.com>). The Styrian Automotive Cluster ACstyria was founded in 1995 with the goal of promoting automobile-industry competency in Styria, Austria. In order to strengthen the position of Styria as a leading mobility-region, ACstyria Autocluster has strategically widened its field of action to Aerospace and Rail Systems in 2012 and 2013 respectively. The mission of ACstyria Autocluster is to integrate stakeholders from the business, industrial, academic, and political communities into a robust network, and to identify areas that are ripe for innovation and synergy.

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<sup>1</sup> <https://www.avl.com/research-cooperations>



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AVL is member of the AC Styria and used this platform to promote the EuroCPS open calls and activate the ecosystem appropriately.

- **Platform Industrie 4.0** (national, <http://plattformindustrie40.at/>) The Association Industry 4.0 Austria - The Platform for Smart Production - was established to foster collaboration among all stakeholders and facilitate new technological developments and innovations in the context of digitization ('Industry 4.0') and thereby to find sustainable solutions to challenges faced by companies, research institutions and society as a whole. The Platform facilitates the implementation of digital transformation in Austria and unifies the Industry 4.0 community. It aims to secure and create highly innovative industrial production and to boost quality employment, thus strengthening Austria's future competitiveness.  
AVL is an active member and participating to different working groups such as the one on Research, Development and Innovation, where a presentation of EuroCPS program was performed.
- **A+B centres** (<https://www.aplusb.biz/>). This initiative is supported by the Austrian government and acts as start-up incubators. There are currently 7 centres in Austria. The network comprises 70 partners with more than 850 mentors. Since 2002, the centres supported 872 start-up initiatives that lead to 715 company creation – for 5180 job creation.  
AVL used this network to spread the EuroCPS calls for projects

Summarizing the mapping at Austrian (national) level, AVL could use its network to disseminate on the EuroCPS program and especially for the calls for projects. This was as well a possibility to address the ministry and national funding agency (FFG) and provide some feedback and lessons learnt about the Smart Anything Everywhere initiative – as well as related to the Digital Innovation Hubs.

It is important to mention the networking at European level as well, especially in the ARTEMIS / ECSEL community ([www.ecsel-ju.eu/](http://www.ecsel-ju.eu/)) as well as automotive community, e.g., EGVI (<http://www.egvi.eu/>), CLEPA (<https://clepa.eu/>), EARPA (<https://www.earpa.eu/>). This network is important to well understand the automotive market and increase industrial relevance of EuroCPS regarding smart transportation. Additionally, this enable us to address partners at European level that are active in the automotive domain and could be interested for the EuroCPS program.


#### **4.2. France / Rhône-Alpes region**

CEA Tech and STMicroelectronics irrigate today ecosystems of Grenoble and Saclay and their region, Rhône-Alpes and Ile-de-France. For the economic development of their environment, the CEA Tech platforms function as industrial motor source of innovation and growth for businesses:

- Integrated circuit and embedded systems design platform
- Nanoelectronics and micro- and nanosystems platform
- Technological innovation showroom (demonstrators)
- PULSE (Platform from IRT Nanoelec)

In 2017, CEA has launched the construction of an Open Innovation Centre structured around the main stages of the recovered innovation process in global standards. The OIC is conceived as a singular infrastructure providing networking, expertise, equipment, methods, innovative spaces and full range of service offerings to accelerate innovation and propose immersion in the world of innovation to technological component.

The project supports the CEA TECH recovery strategy which is envisaged in connection with its ecosystem. The OIC is strongly supported by the local authorities: the Regional Council Rhône-Alpes and the Departmental Council of Isère provide respectively 35 and 23% of

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Another major actor of Rhône-Alpes region ecosystem is Minalogic, a global innovation cluster for digital technologies serving France’s Auvergne-Rhône-Alpes region. The cluster supports the region’s leading innovators by facilitating networking, fostering collaborative R&D, and providing companies with personalized assistance throughout all phases of business growth. The products and services developed by our members address all industries, from ICT and healthcare to energy and advanced manufacturing:

- Minalogic today boasts more than 300 members, including 270 companies. The cluster has certified nearly 450 projects that have secured total government funding of €794 million of the more than €2 billion in total R&D spending these projects represent.
- Minalogic is member of the Silicon Europe Alliance, one of the biggest technology clusters in the world. In the Silicon Europe Alliance 12 leading European semiconductor clusters bring together the technological expertise and resources of Europe’s leading players in micro- and nanoelectronics, one of the recognised “Key Enabling Technologies”. This “cluster of clusters” represents over 2 000 members (over 75% SMEs) and more than 250,000 jobs.

#### **4.3. France / Ile-de-France region (Paris Area)**

Thales Research & Technology is present in the Paris-Saclay new technology area. More generally TRT is linked to the “Systematic” cluster. Within an approach of open innovation, “Systematic Paris-Region”, world-class competitiveness cluster, gathers and leads an ecosystem of more than 800 members. Systematic connects the actors of the software, the digital technology and the industry, accelerates the digital projects by the collaborative innovation, the development of the SMEs, the getting in touch and the sourcing business on the sectors of future: energy, telecoms, health, transport, information systems, factory of future, digital city, safety & security. The cluster also has for mission, to promote its actors, territory, projects of innovation to increase its fame and develop the attractiveness of the territory. More information on <http://systematic-paris-region.org>.


#### **4.4. Germany**

The Fraunhofer Institute for Integrated Systems and Device Technology IISB conducts applied research and development in the field of electronic systems for application in, e.g., electric mobility or energy technology. In this connection, the IISB extensively covers the complete value chain from basic materials to entire power electronic systems. Its headquarters is located in Erlangen, Northern Bavaria; two branch labs are located in Nuremberg and in Freiberg. IISB is part of the Fraunhofer-Gesellschaft, the largest organization for applied science in Europe, with 69 institutes.

The institute is equipped with high-class laboratories, such as a test centre for electric cars and an application centre for DC grid technology. Together with the Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), with its Chair of Electron Devices (LEB) and its Chair of Energy Electronics (LEE), it operates 1500 m<sup>2</sup> of cleanroom area for semiconductor technology on silicon and silicon carbide.

It closely cooperates with the University of Erlangen-Nuremberg and is a member of the “Energie Campus Nürnberg” (EnCN), different user groups of the GMM-VDI/VDE-Gesellschaft, Leistungszentrum Elektroniksysteme (LZE) and in the Bayern Innovative initiative. It is also a close partner for national and international industry.

Its main objective is to provide excellent research to its customers and to set technological benchmarks as one of the leading research institutions in electronic systems. Additional to the local ecosystem Fraunhofer IISB is connected to several German wide and European networks.

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#### 4.5. Hungary

Based in Hungary in East-Central Europe BME represents a special geographical area. As a CPS coaching and design house, BME will transfer the results and experience gained during the EuroCPS project to local SMEs and to the SMEs of the surrounding countries, with whom BME has regular contacts with the expectation of supporting 10-12 SMEs yearly. This will be offered free of charge during the EU supported time and will then be offered for a consulting fee. The old SME contacts and the new ones gained during the course of EuroCPS is continuously growing and giving BME a new reputation as an SME coaching institute in any question of smart system design and an expert in low power CPS, based on Intel platforms. Being an educational institute BME wishes to exploit the experiences in new courses for international students as part of our Erasmus + Master course in Smart Systems Integration. At least 5-15 new fee paying international, mostly overseas students a year who want to be specialized in CPS design are expected. Additionally, a Summer School will be developed (generating 20K€ per year) for students to learn about how to design with European CPS platforms, based on our experience and case studies on low power CS platforms. New research projects will also be created based on the new ideas and expert knowledge.

#### 4.6. Ireland

Intel is based outside Dublin in Ireland where its European based for semiconductor manufacturing is located, Along side a high volume Manufacturing facility are product development and research and development activities. There are circa 4,500 direct employee on the site along with 1,000 subcontractors. <https://www.intel.ie/content/www/ie/en/homepage.html>

Intel operates through a global ecosystem of partners and through the Intel Solution Alliance provides the Intel Solution Directory where Intel based products which are developed by our partners are exposed to make discovery easier for customers looking for specific platforms capabilities or features.

Ecosystem partners <https://www.intel.com/content/www/us/en/partner/solutions-alliance/program-overview.html>


Solutions Directory <https://solutionsdirectory.intel.com/member-roster>

In Ireland the following is the main ICT ecosystem networks.

- **Basic Research & University Education**
  - IUA is non profile organisation chartered to represent Ireland Research universities <http://www.iua.ie/research-innovation/university-research-activity/>
  - **Science Foundation Ireland** funds basic and applied research in the areas of science, technology, engineering and mathematics and it has a number of research centers supporting these research goals. <http://www.sfi.ie/about-us/about-sfi/what-we-do/>
- **Applied Research**
  - Lero is Ireland Software Research Center <https://www.lero.ie/>
  - Tyndall National Institute is a leading European research Centre in integrated ICT (Information and Communications Technology) <https://www.tyndall.ie/>
  - ICMR is Ireland center from Manufacturing Research <http://www.icmr.ie/>
  - **ICHEC** Irish Center for High End Computing <https://www.ichec.ie/> provide shared infrastructure for research purposes to the Irish universities and Met Eireann (Weather forecast).
- **SME Community**

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Ireland has a vibrant ecosystem and according to ISME (Irish Small and Medium Enterprises) there are of 237,753 SME's in Ireland. Enterprise Ireland <https://www.enterprise-ireland.com/en/> is the state agency chartered to assist these companies grow and export. The total population of Ireland is similar to Berlin (3.5 million) and so as the Irish domestic market is so small so most SME don't have the luxury of only focusing on the domestic market, they have to consider export market from an early stage in their life and Enterprise Ireland helps them to identify and address these markets. The UK being close and similar but much larger is a natural target for these exporting or service oriented companies. <http://www.worldstopexports.com/irelands-top-import-partners/>

- **Networks**

- IRDG is an innovation network connecting all organisations involved in research be they startups, SME, Multinationals and research
- TechIreland <https://welcome.techireland.org/> has a mission to “to become the definitive source of data and insights on Irish innovation globally.”

- **Multinationals**

- IDA Ireland <https://www.idaireland.com/> IDA Ireland's main objective is to encourage investment into Ireland by foreign-owned companies. Our success is measured by the impact on the Irish economy of FDI and IDA supported companies.
- 9 of the world top 10 ICT companies, 8 of the top 10 Gaming Companies, 8 of the top 10 Pharamcompanies, 6 out of the top 7 diagnostic companies, 15 of the top 20 medical device companies and 50% of the top financial services companies are located in Ireland.

Infographic <https://www.slideshare.net/IDA-Ireland/technology-sector-in-ireland-infographic>

- Over 1,000 FDI giants in ICT, Social Media, Pharmaceuticals and Finance have made Ireland the hub of their European operations, with names such as Google, HP, Apple, Microsoft, IBM, Facebook, LinkedIn, Twitter, Pfizer, GSK and Genzyme.

Infographic [https://careersportal.ie/sectors/sectors.php?sector\\_id=34](https://careersportal.ie/sectors/sectors.php?sector_id=34)

- Ireland also has vibrant indigenous industries. Companies competing on the world stage including CRH, Smurfit Kappa, DCC, Glen Dimplex, Greencore, Kingspan, NTR and Paddy Power. Ireland has a natural competitive advantage in the food and drinks sector and is the largest exporter of beef in Europe and fourth largest in the world.


#### 4.7. Italy

Over 6,000 researchers work in research and innovation at the University of Bologna, on permanent (teaching and research staff) and temporary contracts (PhD students, research fellows, etc.). Through its research activities, the University aims primarily to produce new knowledge and innovations, contributing to their transfer and enhancement to the benefit of economic, social and cultural development. The University of Bologna also support the development of new, innovative companies generated by its research and human resources. The model adopted is based on two sequential tools: the Start Cup-Spinner competition, which focuses on scouting for new business ideas, and the AlmaCube incubator, which assists start-up operations with its equipped offices and management and fundraising consultancy services. Research and innovation activities are performed in the Departments and Inter-Departmental Centres, covering a variety of subjects and working across the University campuses (Bologna, Ravenna, Forlì, Cesena, Rimini) using high level laboratories and equipment.

The University of Bologna participated to the EuroCPS project with the Department of Electrical, Electronic and Information Engineering “Guglielmo Marconi” and the **Interdepartmental Centre for Industrial ICT Research - CIRI ICT**. The CIRI ICT is one of the seven Interdepartmental Centres for

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Industrial Research that the University of Bologna created to contribute to the Emilia-Romagna High Technology Network.

The **Emilia-Romagna High Technology Network** includes Industrial Research Laboratories, Technopoles and Innovation Centres and provides expertise, tools and resources for the development of enterprises in the region.

The **Industrial Research Laboratories** are facilities mainly engaged in industrial research, development of the results of applied research and disclosure of such results. The main activities regard implementation of collaborative research projects with businesses and technological consultancy and partnership for businesses or outsourcing. 44 of the Network's 82 laboratories are facilities sponsored by regional universities and research establishments. The other 38 laboratories are privately run, their main object being research and development for business. Several of these laboratories are the result of academic spin-offs.

The Industrial Research Laboratories are located in the **Technopoles**, a network of 10 infrastructures located in 20 locations throughout the Emilia-Romagna region, hosting and organizing activities and services for industrial research, experimental development and technology transfer. The Technopoles are home to the industrial research Laboratories of the Emilia-Romagna High Technology Network equipped with state-of-the-art research tools and staff dedicated to activities and services designed to meet companies' needs, favouring also the projection at national and international level.

The **Innovation Centres** are facilities sponsored by businesses, universities, research establishments, other public and private bodies and local authorities and organisations whose aim is to promote innovation and the transfer of know-how and technological skills to businesses and the economic system in general. In most cases, the innovation centres cover their local area. The Centres offer technology-transfer and innovative-business start-up services.


More recently the Regional government supported the creation of new public private partnerships named **Clust-ER Associations**. The Clust-ER are communities of public and private bodies (research centres, businesses, and training bodies) that share ideas, skills, tools, and resources to support the competitiveness of the most important production systems in Emilia-Romagna. It is a competitiveness that no longer relies on the ability of individual research centres or businesses to operate on the global market, but increasingly on the ability of the entire local system to be innovative and attractive.

In these Clust-ERs, research laboratories and centres for innovation belonging to the High Technology Network team up with the business system and the higher education system to make up the interdisciplinary critical mass necessary to multiply opportunities and develop strategic projects with a high regional impact. With Clust-ER Associations, the regional industrial research and innovation system aims to achieve greater integration and to better place itself on the international stage.

The CIRI ICT participates in 4 of the seven Clust-ERs, with the specific aim to support the introduction of digital technologies into the main vertical sectors of the region.

STMicroelectronics NV is a world leader in providing the semiconductor solutions that make a positive contribution to people's lives, today and into the future.

Offering one of the industry's broadest product portfolios, ST serves customers across the spectrum of electronics applications with innovative semiconductor solutions for advanced applications like the Cyber Physical Systems implementation and the Internet of Things.

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To keep its technology edge, ST has maintained an unwavering commitment to R&D from the beginning with approximately 7,500 people working in R&D and product design and spent about 19% of its revenue in R&D in 2016.

STMicroelectronics srl (namely ST-I) is the Italian section of the global main company and together the ST France are the main pillars and the true technological core of the whole ST.

There are about 9800 direct employee, equally divided between the main Italian sites of Catania and Agrate-Brianza, further other 7 advanced sites of primary importance that make ST strongly present and active in the national territory, both in the North of Italy (Colleoni, Aosta, Cornaredo) both in the South (Naples, Lecce, Arzano, Palermo).

ST-I has established a strong culture of partnership and through the years and has created a network of strategic collaborations with key customers, suppliers, competitors, and leading universities and research institutes to positively support and sustain a market driven R&D founded on leading edge products and technologies

Every year, several initiatives , as “Innovative Open Day “, “Student day @ST” and specific symposiums are organized, in different ST-I sites, allowing to meet students and representatives from several Universities and SMEs and to introduce them to the advantages and the opportunity of embedded systems design in the context of the Internet of Things (IoT) with the CPS approach.

#### **4.8. Sweden**


Luleå University of technology is a major regional actor in Northern Sweden. In order to maximize commercialization and growth as a result from research and industrial cooperation, LTU has formed the subsidiary LTU Business AB. LTU Business AB is a centre of support for industry, public sector, researchers, and students alike.

For the industry and public sector, LTU Business offers for example student interaction in projects, collaboration contacts with researchers, and professional education. With focus on the growth of small business, offers include market expansion identification through the worldwide business Enterprise Europe Network, support for the application for finance and development capital, and the LTU Business Growth Academy, where CEOs are invited to learn more on how strategic decisions are taken and what they should be based on.

Luleå University of Technology has also started ProcessIT which is a collaboration centre in northern Sweden. The strategic concept of ProcessIT Innovations is to bring together the functional process and engineering industry in the region with ICT (information and communication technology) services in universities and industry.

The aim is to reinforce existing primary industries and develop the region’s ICT-industry to an internationally competitive position. This concept meets the challenges faced by today knowledge-intensive, high-technology primary industry with the extensive knowledge developed by the region’s ICT services. Process IT’s vision is therefore to establish in the area a leading European R&D centre in ICT for primary industry.

ProcessIT Innovations was started up on the initiative of trade and industry in the region. Today its activities involve the process and engineering industries, ICT companies and the universities of Umeå and Luleå. In addition, the four coastal municipalities and the county administrative boards of Västerbotten and Norrbotten are involved. The strength of ProcessIT Innovations’ strategic concept lies in the interest and power that these players have in the innovation system.

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#### **4.9. The Netherlands**

The main objective for High Tech NL is to support and boost the innovations with, in particular, SMEs by supporting them in finding new technologies as well as new markets. These activities mainly concentrate on two technology pillars: robotics and electronics and towards sectors as agriculture, (digital) manufacturing (including Industry 4.0 aspects) and smart systems. To achieve these objectives we contribute to the development roadmaps (as used by the Ministry of Economic Affairs for policy tuning) by organising workshops with the relevant stakeholders.

Secondly High Tech NL maintains strong relations with the four technological universities in order to find matches for the new technologies with industrial partners.

High Tech NL has founded the community “Holland Robotics” (<https://www.hollandrobotics.com/english>) where aspects like AR, VR, Mixed reality, connectivity, collaborativity and sensors/sensor data fusing (deep learning) all are brought together.

To further build on the experiences resulting from the EuroCPS project High Tech NL has joined an Interreg project (Be, UK, Ge, NL) that focusses on the diffusion of collaborative and connected (CPS) robotics for production in various markets towards technology providers and end-users. The project will provide limited funding to both parties to execute experiments in 4 pilot-lines facilities.

#### **4.10. UK**

Digital Catapult activities have the primary target to grow the UK economy by removing the barriers that SMEs currently face to enter new markets and to offering them the opportunity to develop new business collaborations.


It does this by working across four technology layers, including 1) Artificial Intelligence including AI and Machine learning, 2) Future networks including 5G and low powered wide area networks (LPWAN), 3) Immersive including virtual, augmented, mixed reality & haptics. Digital Catapult services focus on three sectors, including Creative Industries and Manufacturing.

At the intersection of our technology layers and reference sectors we create different initiatives, and nurture relevant ecosystems composed of large organizations, SMEs and academia. This allow us to create respectively demand and offer for new business opportunities to emerge.

Examples of them are the ThingsConnected Network, the Immersive Lab and the Machine Intelligence Garage.

The ThingsConnected network is a Low Power Wide Area testing and service network provided by Digital Catapult and other partners and open for innovation activities to SMEs and large organizations. An ecosystem of 500 SMEs developing relevant technologies is nurtured around such network, currently deployed in London and with on-going plan of future expansion across the UK. Similarly the Digital Catapult led Immersive and 3D Capturing Studios offer access to cutting-edge technologies for developing Augmented and Virtual Reality solutions. Likewise the ThingsConnected network, access to these facilities is granted without requiring small and medium enterprise to support risky capital investments in accessing such technologies ahead of being them able to validate the viability of their solutions.

In a similar way, the Machine Intelligence Garage is a partnership between Digital Catapult and other organizations offering fair access to computation capabilities to emerging SMEs. This allows them to develop new machine learning and artificial intelligence solutions without incurring in high cost for training their algorithms in commercial clouds.

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To date Digital Catapult created different programmes to allow access to the three facilities above which allowed us to map current landscape of SMEs, solutions providers and expert in the different technologies and to create relevant ecosystems. Examples of such programme are the CreativeXR, providing mentoring and supporting development of new VR tools with a network of 700 SMEs and those making use of the Things Connected network. The most recent one focused on developing new solutions for monitoring of elderly needing assistance in social housing within the London boroughs.

As part of our Open Innovation activities such ecosystems are continuously connected with problem owners and large organizations looking for solutions providers in their digitalization challenges across our sectors of interest. Through our innovation team, commercial partners in our portfolio are helped to identify innovation challenges relevant to their business and our sectors of reference. This scoping activity culminates in the organization of so called *pit stops* events where SMEs and academic organizations are brought together to co-design possible solutions with problem owners sponsoring the events. As result this accelerates market opportunities for SMEs and academia to transfer their knowledge to industry.

Additional communities and ecosystems are developed as part of Digital Catapult involvements in different European and UK projects, such as the UK Games Fund partnership for the creative sector. Digital Catapult ecosystem is further nurtured by integrating with a large network of local Digital Catapult centres spread across UK and in charge to map relevant ecosystems in their geographic area of competence, as well as with partnership with other Catapult centres, in particular those for High Value Manufacturing Innovation, involved with us in the common creation of a program to digitising manufacturing industry in the UK by leveraging innovation developed by small and medium enterprises.

The existence of a such diverse ecosystems have been beneficial for the EuroCPS Industrial Experiments co-coached by Digital Catapult, in particular for what concerned the access to partnership opportunities offered through our innovation services and the pitstops, organized until now in the manufacturing and health space. In addition access to Low Power Wide Area Network testing facilities and expertise resulted beneficial for those IE working on similar technologies (such as SparkWorks and Nquiringminds).

Digital Catapult hosts the Digital Drop In with the KTN.

## 5. Path to sustainability


The conditions for sustainability are strongly related to the three structuring pillars of EuroCPS: Easy access, focussed funding, technical knowledge. As a general comment sustainability can happen only if the proposed solutions can leverage all what is already existing. There no chance of sustainability if it is needed to deploy a complete new solution in the local ecosystem, which will make the various programs in a lot of cases even more unreadable for SMEs than they are already today. For large companies there have organization dedicated to deal with the various funding instruments, to understand their specificities, to find out the right portal to address them. Usually such a service does not exist at all in an SME. Thus it is mandatory to have simple, clear and efficient message and entry point very visible for them if we want the SMEs well using their dedicated tools.

There is a lot of conditions more or less important to guarantee sustainability but there is at least to main cause for sustainability not to happen.

The first one is the funding and the second one is the leverage of the local ecosystem.

If one of the afforded mentioned barriers are not removed then there is almost no chance to create conditions for a sustainable EuroCPS model.



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- **Funding**

This is the most important one. Looking at EuroCPS model funding went to the SMEs but also to the networking/competence partners and the platform partners: a typical EuroCPS project was built around the collaborative work of a SME, a networking partner/competence partner and a platform partner.

A sustainable model has to find a way to fund these 3 actors if we want the EuroCPS project process to continue beyond the end of EuroCPS.

- Funding of SMEs: this is not the most difficult as there is usually mechanism existing in the local ecosystems to boost innovation in SMEs. The resulting administrative work can be more or less complex but it is something which is doable.
- Funding of networking/competence partners: This aspect is a bit more complex as costs can be high depending on the targeted technologies. On the other hand these actors are usually located in the local ecosystem and moreover active members.
- Funding of platform partners: This is either very simple or difficult. It can be easy in case of mass market platforms as in this case the need of direct involvement of the platform partner is not needed and can be substituted by its own ecosystem. In this case the need for funding of the platform partner is very low and can even be 0.

The situation is rather different for application specific platforms. In this case the platform partner has to provide significant effort as the platform is not largely deployed and relies strongly on its supplier in term of support. This activity can be substantial and cannot be propose free of charge in the general case.

So a first analysis points out that a collaborative project needs to be created locally, using the local instruments, in order to provide funding to all the stakeholders, as it is not possible to ask the SME to support all the additional costs on top of its own investment.


This approach is very often supported locally and can be re-used as a sustainable path for EuroCPS but some adaptations might needed.

For instance in France there are the “Pole de compétitivité” which have been designed to facilitate collaboration inside a local ecosystem. Mapping EuroCPS needs on this type of tool is not straightforward as there are some constraints which are not compatible with EuroCPS type of projects.

The first issue is related to the geographical location of partners. There is some rules where partners have to be located in the geographical area covered by the Pole. If this constraint is not so complex for networking partner and SME, this could be an issue especially for large companies providing the platforms which could be located outside of the pole area and in some case even outside of the country.

The other issue is related to the process and the type of project. In case of EuroCPS, project duration was around 9-12 months in average. Very often the duration of the project supported by the local instruments is more in the range of 1 to 2 years.

The last issue to address is the structure of the consortium as in the “Pole de Compétitivité” like there are some rules to follow for an eligible project: the consortium has to include a certain number of SMEs, a large company and a research lab, with sometimes some ratio of eligible costs between research labs and industry to be respected. All of these rules could make implementation of a EuroCPS project type just impossible.

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This problematic cannot be addressed in a general case and each local cluster has to deal with its local instruments to see how to tune them or augment them to support EuroCPS projects. French “Pole de Compétitivité” was thus discussed to illustrate the problematic.

Another example in the UK is the Knowledge Transfer Network established by Innovate UK who provides partnering advice and promotes the funding competitions issued by the newly established UK Research and Innovation Agency (UKRI). There is also private funding clustered mainly around London (70% of last year investments were done in the London area) with initiatives such as the London Co-Investment Fund and the Innovate UK Loan Scheme.

- **Leveraging the local actors in the ecosystem.**

Another main issue to take care of the local ecosystem and to avoid distortion of competition between the local actors. It is clear that when a public research institute is funded to provide engineering services to an SME, it is then entering in an unfair competition with the other local actors able to provide the same service. One solution to overcome this issue is to provide public institute services at a higher price than the local market price. As a consequence SME will come to this public organization only because nobody else in the local ecosystem is able to provide this service. Therefore people will still have the opportunity to find better offer if one of the local actor is capable of providing the requested help. Such an approach is really acting as an additional process in the local ecosystem and not installing unfair competition but on the other hand it increases the pressure on the funding needed to operate a EuroCPS like project. Once again there is not a silver bullet which fix for all this issue. As for funding it has to be looked at in each ecosystem integrating the specific characteristics of each of them.

The recommendation from EuroCPS team regarding this aspect is to carefully look at the instruments already existing and to see how it would be able to complement them with SME instrument and the DIH initiative.

- **SAE initiative and “la suite”.**

The following steps are a bit difficult to plan for now, beyond the new wave of projects accepted in the second call of the SAE initiative. The good news is that SAE initiative and its group of projects is now clearly visible at European level and also in the SME eco-system. The move to a solid established sustainability will take a lot of time and there is no choice other than continuing advertising this approach in the new project part of SAE. It is important also to link as much as possible this initiative with other European initiatives (SME instrument, DIH) and encourage each time it is possible to leverage each other. The key question in any case remains about the scalability of the solution as when we look at the size of the SME European eco-system, there is around 22 million of micro SME (<10 people). Assuming 5% of these enterprises are funded with 50KEuros of grant, this yields a global 56 BEuros budget at European level (estimation for next FP9 program is above 93B Euros). Based on this remark it clearly shows that working with existing and local eco-system is fundamental.