IO1
GUIDE FOR COOPERATION

Final report of the Intellectual Output [IO1]: Bringing together Academia & Industry

This project received funding by the European Commission under the Grant Agreement n° 2019-1-IT02-KA203-063391

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Co-funded by the
Erasmus+ Programme
of the European Union

GUIDE FOR COOPERATION

InnoCore

ERASMUS+ project

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combines training in Advanced Technologies in Life Sciences with education in Innovation & Entrepreneurship

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Project partners:

What is it for?

There is an increasing awareness among European and international policymakers that an unmet need exists to promote a collaboration process between research institutions and industry (corporates, SMEs, and start-ups). This need becomes more imperative considering the increasingly central role of innovation in companies' competitiveness. On the other side, this convergence process is equally essential for public research institutes which struggle to access restricted financial resources.

In such a framework, bringing together industry and academia offers a compelling opportunity for industrial partners (especially SMEs and start-ups with limited resources to conduct R&D) to access high-quality research, while research institutes can share costs with industrial partners to increase their sustainability. Importantly, high-quality research results may be translated into innovative services and products that warrant the creation of ad hoc companies.

This guide will provide practical indications on how to strengthen the collaboration by bringing values to all the involved parties.

What's inside?

This guide is designed to provide tools and recommendations to facilitate collaboration among Academia and Industries, leveraging the role of the research facilities to foster innovation in the biotech field.

At the end of the guide, the results of the pilot actions tested during the Innocore project are reported

The primary users of this guide are the technology transfer and innovation managers in the Universities and facilities managers.

Contents

The model

The cooperation model is based on the identification of a trusted network including companies, research organizations and innovation facilitators to facilitate the "discovery" phase of innovation, exploiting the pivot role of R&I facilities.

Main technologies:

Proteomics and protein characterization

Advanced imaging

Genomics

HTS for drug discovery

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The network should be

simple

effective

Not time wasting

Dynamic

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Foresee a person dedicated to the animation of the network

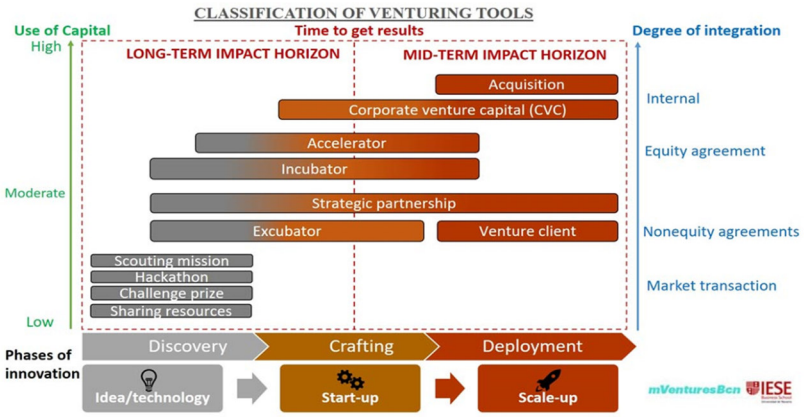

FIGURE 1: PHASES OF INNOVATIONS

The actual implementation of the model can be adapted to organization procedures and experience.

However, these main features should be addressed:

- **Simple access**
- **Of real value.** Given the high-quality innovation that is coming out of the universities and investigation centres, and the high-quality infrastructure that is available, the cooperation model should have a concomitant level of support for making these technologies available to commercial entities and guiding and supporting, both financial support and advisory support, them in the process towards the market while creating high paying jobs and wealth in the community
- **Not fragmented.** Harmonizing foundations, translational offices, agencies, institutes, etc. The Cooperation model should be a single contact point incorporating all the public facilities and entities in the University, or at least having their structures in a way that they communicate well, and that they are structured in a way that facilitates fulfilling the needs of the private Life-Science sector. This would also include ensuring that resources, particularly business and regulatory, with a global perspective are available to provide support

- **Proactive.** Knowledge in top-ranked publications, patents, projects, Electronic Health Records (EHRs), clinical digital images, etc. should be translated into technologies, products or services operating in the Healthcare Marketplace space. The cooperation model should foster this translation.
- **Dynamic,** in which public institutions themselves work together with private entities to promote the emergence of new technologies that have a global impact in the Healthcare Marketplace space. In this vision, there is a close relationship between public capacities (health networks), investment actors, Corporates & Startups, working on joint objectives, but with their own indicators for each of them.
- **Easy to implement**

The pipeline for cooperation

Mapping
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Trust creation
▼
Students wake-up
▼
Engage
▼
Activate

The suggested pipeline for cooperation can be summarized as follows:

1. Mapping process of potential stakeholders at local, national, and international levels
2. Companies' engagement and trust creation
3. Students wake up by means of business-oriented courses and challenge-based learning
4. Industry-students matchmaking opportunities in dedicated events
5. Cooperation activation in the forms of internships and joint projects

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Scouting process

The individuation of the right partners for the collaboration is a crucial step.

A first mapping can be based on direct contacts and previous collaborations, but it is very useful to connect with local innovation ecosystems and rely on the communities built up in reference networks.

The preferred stakeholders include Innovation Driven Enterprises (IDEs) and corporates, but the mapping should take into consideration also RTOs, Risk Capitals, intermediaries (innovation agencies, clusters), multipliers (associations, NGOs, networks) and government.

Profiling

The profiling step is needed to categorize stakeholder's types, dimensions, expectations and possible involvement.

The main dimensions to consider are

- type of organization: IDE, University, RTO, Science and Technology Park, core facility, incubator/accelerator, public body
- Country
- Competence and area of interest/business
- Needs (e.g., access to equipment, support for a technical problem, support for creating new business ideas, human resources, etc.)
- Willingness to be engaged in the planned activities

Profile stakeholders and create a searchable database for matchmaking

The list of stakeholders with their profiles can be inserted into a suitable database for matchmaking purposes. The database should be managed at university and technological park level according to GDPR rules.

Mapping

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Set clear rules for engagement, estimated efforts, and duties

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Share expectations and network objectives

One-to-one approach

It is important to create trust in participating stakeholders, particularly companies, by starting a constructive dialogue by means of **targeted interviews and shared activities**. The main ingredients for trust are transparency and reliability.

It is important to **share** rules, objectives, and expectations in terms of excellence and the effort required.

Terms for collaboration

It would be useful to create and share **terms for collaboration** (ANNEX 1) including:

- The context
- Mutual advantages in the cooperation
- Conditions for participation including:
  - The thematic areas in the scope of the collaboration
  - The management strategy
  - Obligations
  - Intellectual Property Rights
  - Funding rules
  - Privacy and data management

Education to innovation and entrepreneurship

Creating courses dedicated to entrepreneurship and innovation management in the biotech field is important to change the mindset of students and university departments towards the topic.

Students that have entrepreneurial and business-oriented courses in their curricula are more prone to invest time and resources in the valorisation of the research activities, in addition to being more attractive to companies offering jobs with high training profiles.

Challenge-based learning

Challenge-based learning (CBL) is a pedagogical approach inscribed in constructivism and in the self-directed learning (SDL) approach through which students are actively involved in identifying, analysing, and designing a sustainable solution that solves a challenge on current, real-world problems. Since students approach real and complex problems, the learning experience is multidisciplinary, includes stakeholder perspectives, and aims to collaboratively find a sustainable solution. Moreover, in a CBL activity university's teachers are more than expert: they are facilitators of the process of building questions, gathering information, analysing data, proposing solutions, and implementing the result. [ref. IO.4. For further educational details see IO.4]]

Change students and faculties mindset towards innovation

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Involve challenge owners in the education pathway

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Clearly set the objectives of the challenge and the results to be obtained

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Identify the activities that can be performed by students

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Launch a call for challenges and one for students (solvers)

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Select challenges and students and create teams

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Select academic mentors and industrial tutors for students

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Allow the right time for students to work

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The Innovation challenges

Open innovation and education

A *challenge* is a driven innovation initiative aiming at supporting SMEs in testing and improving products, or services. Furthermore, from the perspective of the participants (solvers), it is an opportunity to train skills and introduce new competencies related to the world of entrepreneurship, innovation and the life of a company, through a challenge-based learning approach.

Purpose

The goal of the challenge is to generate innovative ideas and foster collaboration. Students are asked to generate ideas for creating new or improving products, processes, services or customer experiences and remain engaged as the challenge progresses, through regular feedback and updates.

Realising a challenge require the following ingredients

- problems to be solved and therefore the identification of companies and their respective problems to be solved and resources (information and expert personnel) that companies can provide to help solve the problems.
- solvers, i.e., student participants from universities who bring their resources (knowledge and personal experience) to bear.
- a real or virtual environment to foster communication between companies and solvers and between solvers (in the case of teamwork).

Design and implementation

The creation, implementation and measurement of the outputs and outcomes of a challenge requires a moment dedicated to the design of the initiative. It is suggested to use a design thinking approach involving the entire team that wants to implement the challenge.

A comprehensive guide on how to design and implement an innovation challenge can be found here. (Link https://www.innochallenge-project.eu/).

We suggest using a dedicated CANVAS, validated by HIT in previous experience.

The CANVAS includes structured information about the *WHY?* the *WHAT?* and the *HOW?* of the challenge organization and roll-out.

Foresee confrontation moments with companies and dedicated time with mentors

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Allow students to present their results in a final event

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Give a prize to the winning team(s)

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Tips

Push on the added value of the challenge for companies and students

Have continuous contact with companies and mentors

Brief mentors and tutors about their role and rules of the challenge

Keep solvers engaged with checkpoints and training lessons

Teams of master and PhD students work well provided that the effort is well balanced

International teams should be encouraged but foresee a budget for travelling and spending time together.

Plan in advance follow up actions to support the implementation of

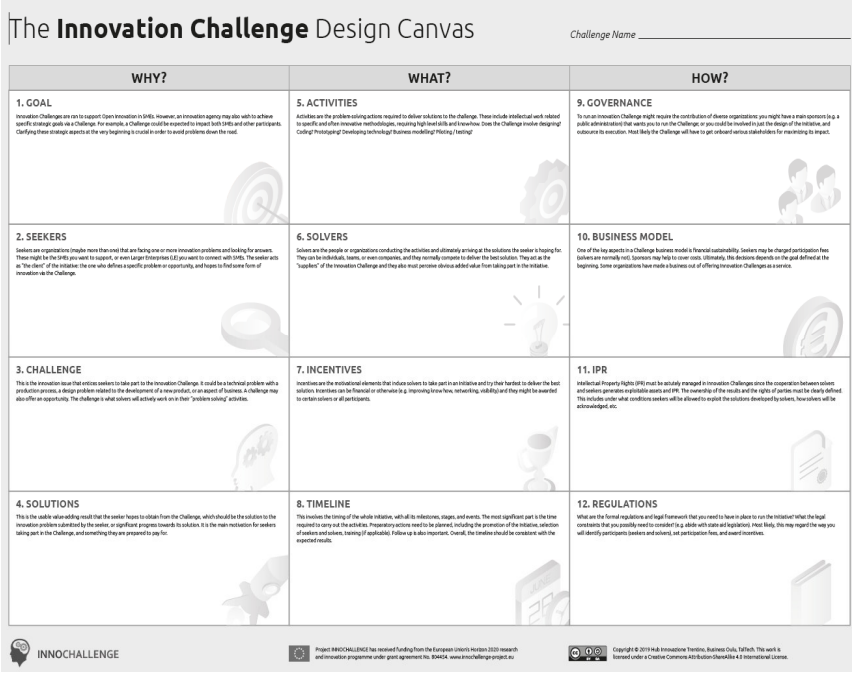

FIGURE 2: THE INNOVATION CHALLENGE DESIGN CANVAS LINK: HTTPS://WWW.INNOCHALLENGE-PROJECT.EU/

Evaluating impacts

Challenge activity can have an impact on different participants and stakeholders.

It is therefore important to include a performance measurement of the number of students and companies that were able to be mobilised through the calls and the quality of the companies that participated in order to understand whether the actions implemented were effective.

Following the quantitative evaluation, it is important to understand the level of involvement and satisfaction of the companies. In particular, it is good to monitor the progress of the solver-company relationship with meetings only with the companies. This can be done by telephone calls and does not require a scientific format.

Two other moments are important: 1. immediately after the return of the results to the company and 2. after 6 months. it is important to structure a real interview from which to highlight the strengths and weaknesses of the interaction in order to understand how to implement corrective actions in the next edition.

A different approach is the student impact evaluation. In addition to the performance related to the documents produced and the public presentation, it is important to provide a self-assessment pathway to guide them in developing the transversal skills that are implicit in this kind of initiative. In particular, we suggest an approach in which the participants are the protagonists in the development of their skills, in collaboration with their academic mentors, and are then guided in a process of self-assessment of the path undertaken. [ref. IO. 4]

A further measure of the impact on the solvers is then the relationships with companies 6-12 months later, which can be measured with a short interview with the solvers involved.

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The core facility days

The Innovation days are meetings where students, researchers, faculty members and companies can meet and talk about careers, innovation, and projects and hopefully start new collaborations**.**

SCOPE

Core Facility Days aim at presenting to the scientific community (students, researchers, industries, and local community) the importance of Core Facilities in modern Life Science, not only from a scientific/technical point of view but also in education and innovation.

STRUCTURE

They can be structured in a hybrid form, but a visit of the facilities is strongly recommended.

The speakers' program should be designed to give the audience the perspective and opportunities of industrial research, inviting speakers to approach Life Science topics from different perspectives, inspiring the audience on the huge potential of the technological infrastructure and know-how available inside the academic core facilities.

It is crucial to invite industrial testimonials and to create matchmaking opportunities (round table, coffee break, one-to-one meetings, etc.)

Sponsors like this kind of event, so it is worth putting an effort into finding a few for sustaining the event

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The Facility Day works well if all the innovation ecosystem at the local or regional level is activated, collecting all the available know-how and competencies in the selected topic

It is interesting for companies to have a complete overview of what facilities can offer for innovation

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The internships

The internships foster the students' competencies and give them the possibility to acquire multidisciplinary skills related to the professional world outside of the university. They can complement their academic

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training while cultivating a portfolio of contacts that can be of great use to them in their future professional development

Main educational purposes:

- Integration in the teams of the companies for developing projects.
- Professional development
- Exploring career options
- Professional socialization
- Promote applied research

Internships should last at least 4 months to be effective

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A digital platform can simplify the matchmaking between skills and position offer

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The meetups are a valid format for linking demand and offer

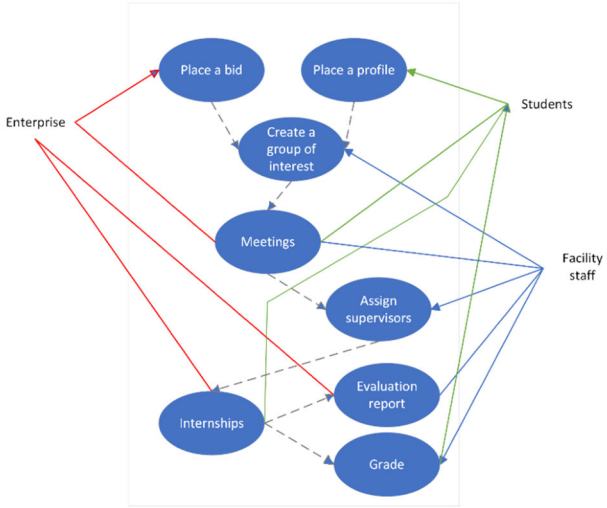

FIGURE 3 INTERNSHIPS DISCOVERY PROCESS. DOTTED LINES INDICATE THE PROCESS, SOLID LINES INTERACTIONS.

The process is as depicted in the Figure:

1- Create groups of interest
2- Meeting (meetups)
3- Assign supervisors
4- Define the project assignment
5- Define logistics
6- Internships
7- Evaluation
8- Grade

The meetups

Check meet-ups examples here:

https://ptsgranada.com/tag/practicas/

The meetups are 1-hour events in which selected companies present their activity offer to a group of students.

Each company describes the project, the number of available positions, the expected results, and the overall collaboration conditions.

Students can ask questions and start discussing with companies about technical issues and expectations.

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Joint projects

The aim of this use case is to draw up the best practices document to encourage and simplify the interaction between enterprises, universities, core facilities and research centres.

- Share R&D ideas and requests for collaboration.
- Share opinions about specific topics.
- Activate projects.
- Enterprises or academy members can start a conversation about a specific topic.

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- Enterprises or facilities staff can place a request for specific competence.

The joint projects guidelines

The aim of the joint projects is to define a collaboration framework between companies and research institutions such as universities, technological facilities, and research institutes. Thanks to the collaboration between different players in the research environment and business, it is possible to stimulate a rapid technology transfer in which the innovations generated by research would find applicability at the company level. This virtuous mechanism would allow companies to have continuous technological advancement by exploiting the results of research and universities for funding to invest in further research.

Industries could interface with universities, core facilities and research centres to obtain knowledge and innovations of products or processes that allow them to improve profitability or reduce the environmental impact of their productions.

Advantages for industry:

- Be in contact with cutting-edge research.
- Participate and contribute to educating new professional figures.
- Individuate collaboration opportunities.
- Request professional training on INNOCORE themes.
- Use collaborative projects as a recruitment tool

For the success of the collaboration, it is necessary to prepare a good legal framework that allows regular execution and the achievement of the collaboration objectives with the satisfaction of all parties. However, the road through the legal maze is not always easy and it requires the close cooperation of scientists, legal experts, technologists and business people.

To define a collaboration path or a service there are several agreements to be identified, which represent contracts to be signed between the parties, therefore it might be useful to reiterate what a contract generally means. A contract is an agreement reached between (two or more) parties, under which the parties agree on certain terms governing their relationship in a particular situation (license, service, assignment, etc.) and undertake to fulfil certain obligations

A document containing examples of best practices of collaboration between industrial SMEs, universities, core facilities and research centres can be found in Annex 2.

The Innocore pilot experience

The INNOCORE project

InnoCore is an ERASMUS+ project that will address the needs of MSc and PhD students, postdocs, researchers and professionals working in academic and non-academic research infrastructures.

Specifically, it provides training opportunities to these target groups in:

i) increasing their entrepreneurial mindset.

ii) training highly skilled professionals capable of boosting the innovation processes.

iii) improving their employability beyond the academic career as well as their self-employability (i.e., start-up creation).

For this purpose, Innocore prepared and tested a cooperation framework involving academia and industries, through 5 use cases:

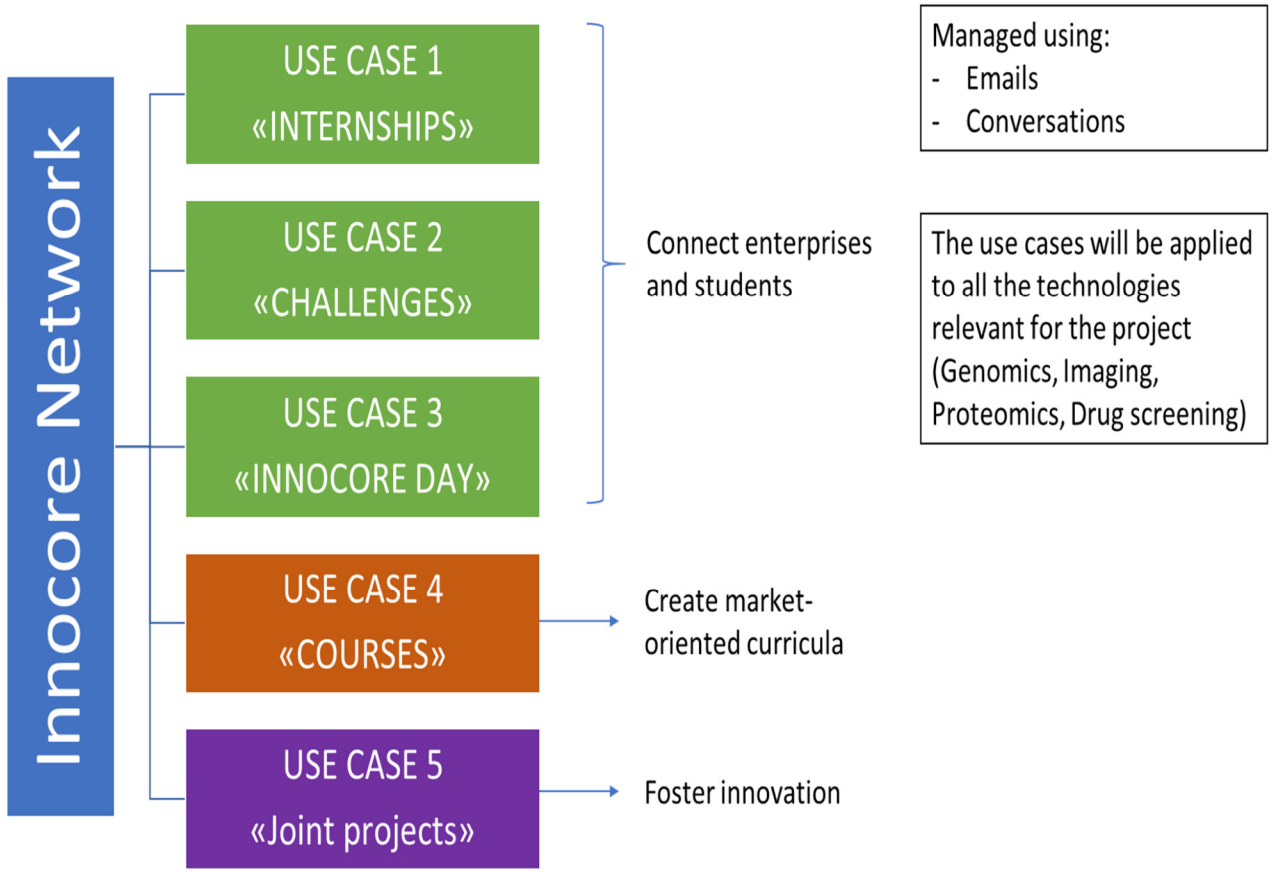

FIGURE 4: THE INNOCORE NETWORKS STRUCTURE AND PURPOSE

The main objectives of this model are to connect enterprises and students, to create market-oriented curricula in the biotech field, and to foster innovation.

Pipeline for cooperation

Mapping process of potential stakeholders at local, national, and international level

The aim of the study is the characterization of the biotech partners' ecosystems in order to create a cooperation system between enterprises and academia.

This task has been developed in 3 steps:

1. Relevant Stakeholder Mapping
2. Characterization of relevant stakeholders
3. Stakeholders' implications in the InnoCore Project

The process has been carried out during the quarters Q1-Q2 of the year Y1 of the project.

Lead partner: PTS Granada. In collaboration with CEITEC, HIT and Sanipedia

Relevant Stakeholder Mapping

A mapping of the key stakeholders in the areas of influence of the partners was done. A total of 187 stakeholders were studied. As indicated in table 1, 78 enterprises (IDE+CORP), 16 research centres, 28 investors (tsk capital companies) and 15 government agencies are a good representation of the key stakeholder in the different biotech ecosystems.

Table 1. Relevant Stakeholder Distribution

TABLE 1: NUMBER OF MAPPED STAKEHOLDERS

		IDE	CORP	RC	CAP	GOV
CEITEC	38	16	7	3		1
HIT	52	10	10	3	12	6
PTS	55	21	3	6	7	8
Sanipedia	39	7	4	7	9	
Total	148	54	24	19	28	15

IDE: Innovation Driven Enterprise; SME, Small-medium Enterprise; RC, Research Centre; CORP, Corporate; GOV, Government; CAP, Risk Capital

Characterization of relevant stakeholders

From the above stakeholders we performed a survey in order to understand their needs, especially for Innovation Driven Enterprises.

As a result, we obtained 67 valid questionnaires representative of the four academic partner institutions' ecosystems. The results are summarized in three main areas: a) the existing models of cooperation; b) the key elements for successful cooperation; c) the workforce requirements.

The results show that cooperation exists, although this cooperation does not fulfil the expectations of the stakeholders. The foundations and the interested parties manage the cooperation, with less participation of agencies and institutes and very little from universities.

Regarding the key elements for cooperation, 75% of respondents indicate that the most important element is the team. A question was about the type of team's education both scientific and business skills were the most relevant. Furthermore, it is clear that there is a need for business education for scientists.

Based on these results we elaborate a draft of the InnoCore cooperation model. A brief description is shown in figure 1.

Fig 1. InnoCore Cooperation model

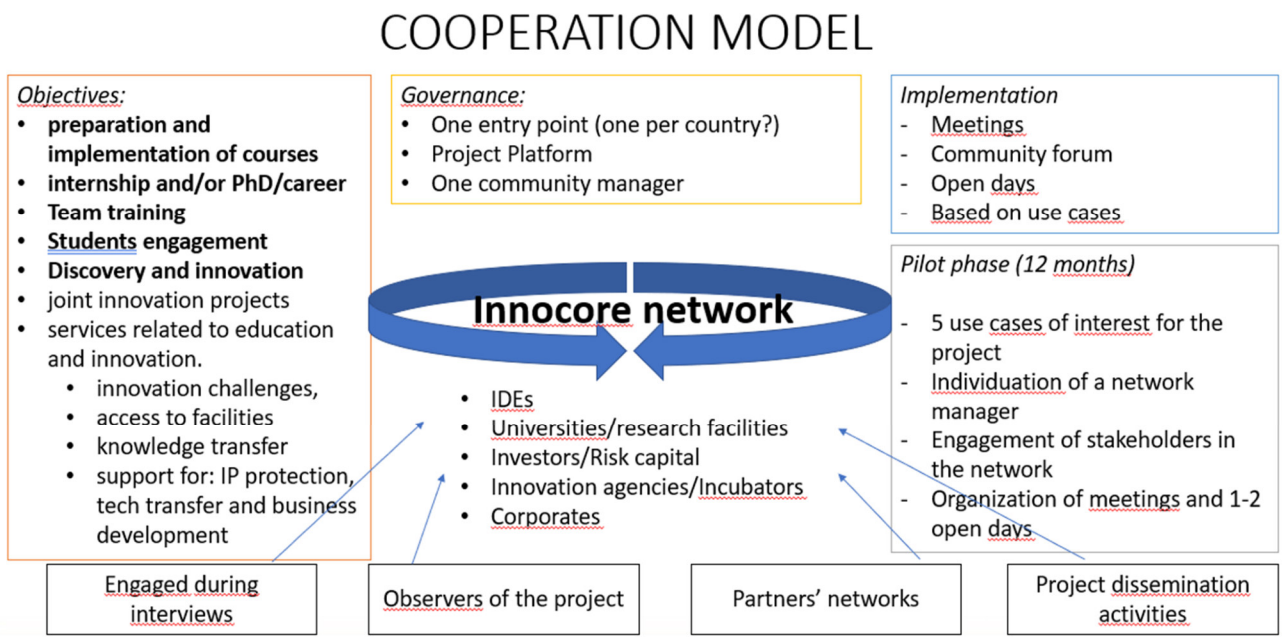

FIGURE 5. THE INNOCORE COOPERATION MODEL

Companies' engagement and trust creation

Stakeholders' implication in the Innocore Project

Selected stakeholders were interviewed using an ad hoc questionnaire in which we presented and discussed the InnoCore cooperation model and their perceptions of innovation-driven entrepreneurship and their participation in the pilot phase of implementation of the InnoCore Model.

Companies engaged in the pilot implementation: 13. There are representatives of 3 countries and of the IDE and innovation centres.

IDE

- Enantis, s.r.o. www.enantis.com
- EYEN, SE www.eyen.eu
- Flowmetric srl https://www.flowcytometryservices.com/
- OPTOI https://optoi.com/en/applications/biomedical
- INDIVENIRE https://indiveni.re/
- LentiStem https://lentistem.weebly.com
- DestiNA Genomics Ltd https://destinagenomics.com/
- IIDF Cabrera https://www.iidf.es/
- Labdeers s.r.o http://www.labdeers.com/
- Thermo Fisher Scientific https://www.thermofisher.com/
- Distefar https://distefar.com/

Innovation centres

- JIC - South Moravian Innovation Centre www.jic.cz
- Medina https://www.medinadiscovery.com/
- Genyo: https://www.genyo.es/?lang=en
- IPBLN: https://www.ipb.csic.es/index_ingles.html

The impression about the proposed model was in all cases positive, highlighting that all elements are very applicable, especially the training modules and open days. However, there are concerns about timelines and the differences in the innovation ecosystems in the partners' countries.

Figure 6 shows the elements considered for academia-enterprise cooperation.

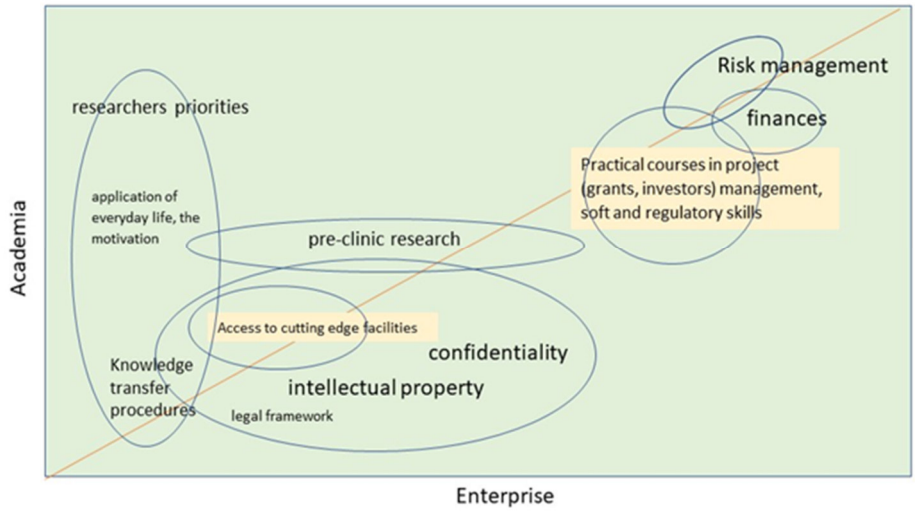

FIGURE 6. ACADEMIA-ENTERPRISE RELATIONSHIP. CHARACTER SIZE IS PROPORTIONAL TO THE IMPORTANCE OF THE TOPIC ACCORDING TO INTERVIEWS

Their vision for cooperation agrees with our model in which the two pillars are core facilities support and training. The system should be based on confidentiality and close cooperation. This is a challenge that needs to overcome barriers such as the different priorities of the research (the first priority is to publish, cooperation with the company is in the last place) and the not always clear establishment of knowledge transfer. A need for preclinical studies cooperation is envisaged.

Core facilities should provide clear information about the use, prices, etc. and be updated with cutting-edge techniques and instruments. In addition, robust business support is needed, especially for risk management.

Training should be in both technological and business areas and for both workforce and student populations. There is consensus that it is necessary to select and engage students with high potential in innovation-driven enterprises. Online education on practical issues is preferred.

The implementation must be simple, easy to find the relevant information for cross-sectoral cooperation and close to the persons. A platform and database structure seems to be adequate.

Terms of Reference

In order to engage companies and create trust, terms of reference were prepared to clarify the conditions of the collaboration including effort required, advantages, IPR management, and scope of the cooperation in ANNEX 1.

Students wake up

Innocore courses

1. InnoCore training in core technologies and innovation management integrates the complementary expertise in the education and research on technologies of core importance for innovation in life science held at the participating Higher Education Institutions participating in the project: the University of Trento, the University of Coimbra and the Masaryk University.

2. The InnoCore Courses include teaching on i) Genomics, ii) High-Throughput for Drug Discovery, iii) Proteomics and Protein characterization, iv) Advanced Imaging. An entrepreneurial course includes topics such as i) I&E and Innovation Management, ii) Regulations and Quality in Healthcare.

Innovation Course on "Regulations and Innovation Management in Life Sciences"

Contents of the course

The syllabus of the course is the result of the benchmark of the academic institution and innovation experts of InnoCore. Trainers by the consortium were involved (from UNITN, HIT, PTS). The aim of the course is to provide students with the basis for understanding the main regulatory and management processes leading research and development (R&D) in the Pharma and Biotech Industry.

To achieve this goal, in addition to the regulatory frameworks governing the R&D processes in Pharma and Biotech companies, the module will also cover the importance of intellectual property protection, project management and information management to generate valuable innovation in R&D, as well as the analysis of exemplary case studies.

At the end of this course, the student should be able to:

- Understand and describe the key steps in the R&D process in the Pharma and Biotech Industry
- Describe the role of the main health authorities and regulatory frameworks in the Pharma and Biotech Industry
- Explain the role and relevance of intellectual property protection and management to create value from the innovation process, with particular focus on the Pharma and Biotech Industry
- Recognize and recall the main databases and online tools to retrieve and manage scientific and patents information
- Acquire experience on specific case studies in biotechnology management and business fields.

The course focuses on six main Modules:

- Module 1: Introduction to Innovation and R&D in Life Sciences
- Module 2: Intellectual Property Rights in Life Sciences
- Module 3: Regulatory Frameworks in Pharma and Biotech industry
- Module 4: Business modelling in Life Sciences (that includes presentation of case studies of biotech businesses by companies.
- Module 5: Funding R&D
- Module 6: Project work

The students work on a practical exercise on the development of an R&D and/or project to apply the knowledge acquired during the course, designing a project to propose the development of a product/service in biotechnology, addressing the managerial, regulatory, IP protection and commercialization aspects.

Within Module 4, biotech and pharma companies are invited to present their business model and innovative product and were asked to launch to the students some topic/challenge for industrial problems or needs for technological innovation that are addressed by the students participating in the course

The project work and the course are finalized in a report and presentation of the solution that addresses one of the topics launched by the companies.

Pilot course implementation

Due to the health emergency in the first part of the project, the teaching activities were planned to be delivered entirely online. Thus, the InnoCore courses have been designed to be delivered through eLearning methodologies and resources and opened to access by students/participants of the three universities. Was developed a common framework for the definition of the learning objectives and syllabi and was applied a mixed modality of synchronous and asynchronous lectures with a leading institution developing the course and the inclusion of contributions from each HEI in each course. The first cycle of courses was delivered in the Academic Year 2020-2021. The second cycle of these courses was then delivered in the Academic Year 2021-2022 with the same format but with part of the class lectures. All the online lectures and materials developed from these two cycles of courses were adapted to produce online courses for self-learning made available to all the categories of target groups.

Companies engaged

Biotech and pharma companies, invited to present their business model and innovative product, were:

- Alia Therapeutics
- Immagina Biotechnology
- Crioestaminal
- Optoi Electronics
- Sybilla Biotechnology
- Dompè Pharmaceuticals

Outcomes and Lessons learned

Forty-two students were engaged to participate in the two classes held during the project lifetime. Many of these students were candidate to obtain the related ODB and, if combined with the participation to other InnoCore Courses on core technologies, were candidate for the InnoCore Innovator badge.

In general students were interested on the topic treated during the course and were motivated in the implementation of the project work assigned. Indeed, they generally found triggering to hear on the business experiences and technologies of the involved companies and, at the same time, have the chance to interact directly with them during the preparation of the project.

On the other hand, the matters related to innovation management and regulations, such as business modelling, ethical issues in health research, and technology transfer, have been found in some case topics difficult for some students. These cases need a higher engagement from the side of the trainer/teacher to lead the students more inside into the matter stimulating more their curiosity and interest in that.

From the side of the companies engaged, a high availability and motivation to talk in the classes and to interact with the students was registered. The occasion of the project work, for the companies, was even an opportunity to scout possible candidate for traineeships and/or master thesis project to be implemented at the companies' premises.

Overall, the pilot highlight positive feedback on the initiative that will continue through the access to new participants to the online courses.

Industry-students matchmaking opportunities

The Innocore challenge

The pilot Innocore Challenge was organized in the second semester of 2021.

The organization of the Challenge was preceded by two training sessions with all the partners and the preparation of the Innovation Challenge Canvas, reported in Figure.

Students with a biotech background selected through a public call from the four consortium Universities and research centres (University of Trento, University of Granada, CEITECH and University of Coimbra).

The consortium partners were active in contacting biotech companies that have business in the fields of the facilities and with R&D topics close to the educational profiles of the Master's and PhD students. An open call was also proposed to select the companies, following which 5 companies were selected.

An internal committee selected 25 solvers and organised them into 5 teams working on 5 different challenges promoted by 5 European companies. Each team was composed of at least two nationalities, and at least one PhD and a gender balance was considered.

In particular, the four universities participating in the initiative aimed to make known the potential of core facilities where students together with PhDs could develop solutions to problems presented by companies. Core facilities are centralised technology-based laboratories that maintain and support sophisticated equipment for use by their host institution's researchers and often by external customers, too. For Innocore, it is even more important that Core Facilities are externally facing entities within academic institutions. As they are frequently independent cost centres collaborating with internal and external clients, they are commercially aware and familiar with the need for efficient operation and adherence to deadlines. PhD students are usually involved in research connected with the facilities, and often also the master's students work in synergies with researchers for their graduation works.

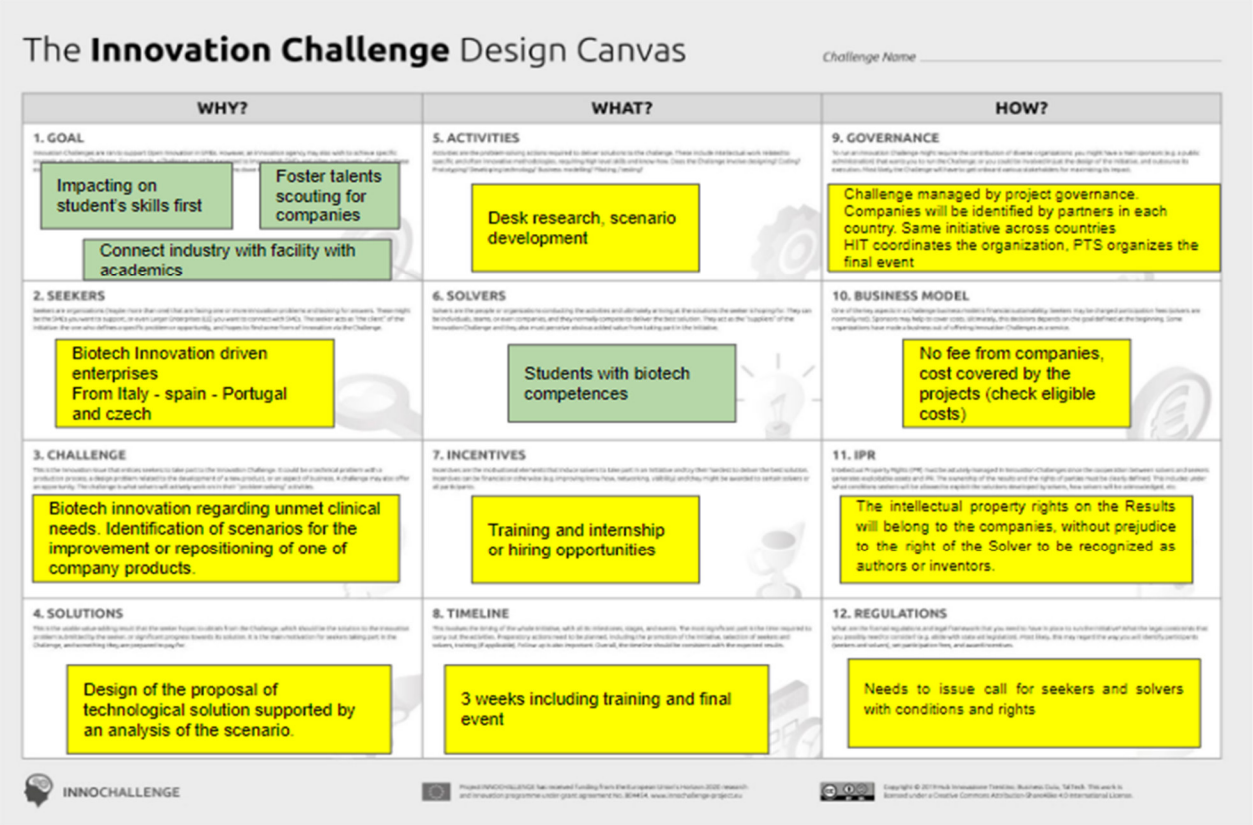

FIGURE 7. THE INNOCORE INNOVATION CHALLENGE DESIGN CANVAS

Challenge participants (solvers) were international PhD students and master's degree

On the other hand, the selected innovative companies, which participated free of charge, were interested in learning about the opportunities of core facilities and getting to know new professional profiles and potential new research partners.

The challenge was organised in four phases: in the first phase, HIT provided training on the organisation of a challenge-based event to the other project partners. Following the training in the second phase, a challenge format and a plan for the activities to be implemented was co-designed between the project partners. In the Third phase, the partners implemented the activities, which ended with the delivery of the solutions to the companies. Finally in the fourth phase, evaluation activities, follow up with the companies and dissemination were started.

FIGURE 8. THE CHALLENGE ORGANIZATION AND IMPLEMENTATION PHASES

In the first phase, the consortium participated in a training activity promoted by HIT. In particular, a two-steps seminar was held in which the first step presented the constituent elements of a challenge and used a design canvas. In the second, the partners used the proposed canvas to discuss the format of the INNOCORE pilot challenge. This activity allowed the project partners to align on some basic concepts and to have a more informed discussion on expected efforts, processes and impact.

In the second phase, the partners were guided by HIT in the design and planning of the activities necessary to carry out the challenge. In particular, rules of engagement for partners were decided and value propositions for solvers and companies were identified. The co-ordinator in collaboration with the partners prepared the calls to identify the companies, and to select the solvers. All partners acted locally to engage companies and students.

Below is some information on the five challenges presented by the companies.

TABLE 2: THE CHALLENGES OWNERS AND DESCRIPTION

Proposer of the Challenge	**Area(s) of the Challenge**	**Title of the Challenge**
ChemICare srl (IT)	Drug Discovery and Screenings; In vitro and in vivo models	Target validation of novel Store-operated calcium entry modulator and identification of specific biomarkers for tubular aggregate myopathies
Dompè Farmaceutici (IT)	Omics technologies for biotech and/or biomedical applications.	Dissecting the NETosis-dependent transcriptomic landscape
Exogenus Therapeutics (PT)	Imaging technologies for biotech and/or biomedical applications	Umbilical cord blood-derived extracellular vesicles: tolerability to digestive system characteristics and biodistribution after oral delivery
Nanogetic (ES)	In vitro and in vivo models; Imaging technologies for biotech and/or biomedical applications	Non-specific adsorption in nanosensing for biomarker diagnostics.

Toxfinder (PT)	Drug Discovery and Screening; In vitro and in vivo models.	Defined Approach for Respiratory Sensitization Hazard Assessment

Days were identified to train scientific mentors, company mentors and solvers. Tools for assessing the impact on students were identified through the collaboration of the University of Trento and HIT in the EIT project BOOGIE-U provided an analysis framework. The challenge kick-off day was identified, i.e., the day on which the solvers would meet their assigned company, learn in detail about the challenge and the company mentor they would refer to, and meet the scientific and business mentors they would have access to in the following weeks in order to best solve the challenge. The closing date of the challenge was identified, i.e., the date by which the solvers would have to present their results to the companies, and an ad hoc closing event (in presence) was organised with all the protagonists of the pilot.

The working time for participants was from March 15th to May 25th2022. During this time, participants took part in ice-breaking and seminars and were guided to find a solution to challenges by academic and scientific mentors (one expert in the scientific field, one in the business context) and corporate tutors. The challenge took place online and participants had the opportunity to follow basic training on knowledge transfer, project writing and management, and how to effectively communicate their results. The closing event was held at the Fundación Parque Tecnológico de la Salud (Fundación PTS) in Granada in a hybrid event with academic mentors and companies' tutors participating in the challenge.

Before the public presentation of results by means of a 7-minute pitch, solvers had a final pitch clinic with the coordinator and presented privately the results to the company.

The work to develop the solutions was unfortunately affected by the restrictions of travel and access to the facilities (due to the COVID-19 pandemic), so the solvers provided the companies with a project plan and feasibility study for the R&D activities to address the challenge, which could be implemented as a follow-up to the challenge in collaboration with the Consortium's Institutes and Core Facilities. The proposed solutions will have sections dedicated to the scientific, technical operational, commercial, ethical, and legal aspects of the project.

Starting the next day, the follow up phase began, in which companies and solvers supported by their universities, started to verify the opportunity to implement the projects presented as solutions through contracts, internships or thesis projects.

The 25 participants of the INNOCORE challenge (PhD and master students) were then monitored at the beginning, during, and immediately after the challenge experience (from March to June 2022), through self-assessment techniques (such as learning agreement, learning diaries, reflection report) and the EPIC (Entrepreneurial Potential and Innovation Competences) tool offered by the HEI (Higher Education Institutions Innovate) thanks to the collaboration of the BOOGIE-U project.

In particular, a set of the tools used for the evaluation are related to the self-direct learning approach. In SDL, learners control their experiences and are co-responsible for their learning processes and outcomes. In this context, participants are responsible for their learning processes, and they are invited to co-design and evaluate their experience completing a set of documents that help them to think about and be engaged in their activities.

Moreover, thanks to the EPIC tool educators have been able to measure the effectiveness of their entrepreneurship activities on five thematic areas: entrepreneurial competences, entrepreneurial intentions and attitudes, enterprising behaviours, entrepreneurial strategies and educational effects.

Here below the three main lessons learned thanks to the evaluation tools we implemented.

1. The first lesson learned is the fact that students took advantage of the teamwork in terms of gaining new knowledge and stimulating their soft skills, such as the time management, empathy and communication

skills, stress management, etc. They had the opportunity to measure themselves in a very intensive learning experience that can be easily considered as a proper “job experience” in relation with companies.

2. The second lesson learned is that participants finally tasted entrepreneurial attitude. They were mainly from biotech backgrounds and appreciated business elements provided during the INNOCORE Challenge. This showed us that the student experience can be enriched by I&E initiatives and might promote an entrepreneurial mindset that can lead them to the kick-off of a start-up, to be a proactive and highly skilled employee in a company, or a researcher with an interest in innovation and business impact.
3. The third lesson learned is the confrontation with companies which was perceived by all as an important opportunity. Initially, the cultural diversity between the research approach and the product development approach required in some cases the intervention of mentors and several meetings to initiate a dialogue with the solvers. However, at the end of the project, during the hand-over of the results to the companies and in the public event and evaluation phase, all companies, without exception, expressed extreme satisfaction with the work done by the solvers. From the very next day, many of the solvers received not only formal compliments from the company, but also encouragement to look for a way to continue the work they had started. On the other hand, the solvers also showed that they understood the importance of contact with the companies, and where the company had not taken the first step, they did so by proposing a continuation of the collaboration.

Pictures and videos from the challenge

Granada, May 25th 2022

Videos of the final event can be found at this link: https://www.youtube.com/watch?v=wVkRrI-5mVc&t=3858s.

The Innocore days

Three innovation days have been organized by the three Universities involved in the project.

InnoCore Days aim at presenting to the scientific community (students, researchers, industries, and local community) the importance of Core Facilities in modern Life Science, not only from a scientific/technical point of view but also in education and innovation.

Participants learnt about key technologies in the fields of Proteomics and Protein Characterization, Genomics and Drug discovery and Microscopy with emphasis on the important role of Core Facilities for education and innovation in modern research.

Date	Venue	Format	Participants
3/05/2022	Brno CEITEC	The event was in hybrid form The targeted group was students, the academic community and commercial R&D staff. Activities • CF Visits for students • Introduction of Innocore & Open Digital Badge • introduction of infrastructures at CEITEC MU – CIISB, EPIC, Czech BioImaging, INSTRUCT • Presentation of CEITEC MU Core Facilities and cooperation with companies • Introduction of Participating CFs • CF Proteomics – CEITEC • CF Proteomics University of Trento • CF Proteomics University of Coimbra • CF Biomolecular Interactions and Crystallization • CF X-ray Diffraction and Bio-SAXS • CF Josef Dadok National NMR Centre • CF Cryo-electron Microscopy and Tomography • CF Visits for rest of attendance The event started with a tour of the laboratories for international students from Utrecht University and cooperating students from Brno University of Technology. This was followed by a programme where the project objectives were presented. The functioning of the shared laboratories at CEITEC MU was also presented. The	64 participants, mostly academics. 2 participants were from companies.

		following section presented the individual laboratories at home and at the partners. The program can be found here: https://www.ceitec.eu/innocore-proteomics-day/a4244	
7/06/2022	Trento UNITN	The program was designed in order to give the audience a perspective of industrial research (three invited speakers were from companies of different sizes: Exsciencia (Oxford, UK), Immagina (Trento) and Sibylla (Trento). The speakers approached the topics from different perspectives, inspiring the audience on the potential of the technological infrastructure and know-how available inside the academic core facilities. Three companies were selected as sponsors of the event and were allowed to present their most innovative products related to the field of Genomics and Drug discovery during the day. Lastly, a group of students participating in the InnoCore activities, namely the InnoCore challenge, the mobility and the InnoCore courses, were invited to share their experiences with the audience, spreading enthusiastic words about the opportunity they had to learn more about the industrial research world through the courses, the challenge and the mobility. The program can be found on the following page: https://webmagazine.unitn.it/en/evento/cibio/106233/innocore-day-on-genomics-and-drug-discovery	69 participants, among which 23 from the University of Trento, 8 from companies, 10 from abroad

21-22 6/2022	Coimbra	The programme was divided in two days, to engaged two different audiences. Therefore, in the first day, the programme joined together participants from academia (students, researchers), TTOs and industry, and focused on the impact of microscopy core facilities on research and as a support of R&I in companies. The presentations were followed by a dynamic discussion of how microscopy core facilities and companies could increase their interactions. Finally, at the end of the day, students and companies enrolled in the InnoCore Challenge, were invited to share their views on the developed activities and how the programme could be improved in the future. On the second day, the programme was devoted to show to high-school students the importance of microscopy on scientific research. On this second day, together with an overview of microscopy applications, students participated on hands-on sessions on the microscopes installed at the microscopy core facility. Programme of both days: Day 1: https://drive.google.com/file/d/1UFuLdWP08IH9BqqYiDCy-amsLkH-zAMc/view?usp=sharing Day2: https://drive.google.com/file/d/1KOdp-s8KnfGimjpNg1kMLxI5J0CXAs-3/view?usp=sharing Advertising webpage: https://www.cnc.uc.pt/en/dia-da-microscopia-innocore	46 participants, among which 15 from the University, 5 from companies

Pictures from the Innocore Days

Brno, May 3rd 2022



Trento, June 7th 2022


Coimbra, June 21st and 22nd 2022



SWOT analysis of the Innocore Days

Strengths

The events were well appreciated by the attendees, especially for the balance of the contents presented

The formula is successful: an external keynote speaker is necessary to attract external and, in general, more people.

An added value was the sharing of experiences in the functioning of Core Facilities in partner organisations.

It was also appreciated the opportunity to present a comprehensive offer of protein characterization provided by shared laboratories at CEITEC MU

Weaknesses

The choice of a couple of topic or core technologies for Trento event allowed us to focus, on the other hand, it limited the participation. A broader title would have probably triggered the attention of more people.

From the researcher's viewpoint, the event was probably perceived as something specific for core facilities only.

Opportunities

For greater outreach to business partner attendees, targeted outreach and personal invitation are necessary, not just an email offer.

The event should be advertised to companies through different channels like email and social media, highlighting the added value of their activities, such as the opportunity to listen about the technologies offered by the core facilities and the networking. It might be important to add the option of a visit to the core facilities and/or a one-to-one meeting with the facility managers.

Sponsor companies are very interested in these kinds of events, but the decision-making process is quite time-consuming. It is important to start soon with the advertisement of the sponsoring opportunities because it is important for the sustainability of the activity in the future.

Personal outreach to corporate participants is recommended. The event should be more focused on a narrow target group - business partners. A more appropriate format for the event would be a round table where closer links can be established, and possible cooperation discussed.

Threats

Lack of interest from the companies or from the students can result in an unbalanced event, with a poor outcome in terms of connections.

The absence of the administrative and logistic support can make the organization of such events very difficult for the core facilities staff. On the other hand, the facilities staff must be involved from the start, in order to maintain the centrality of the Core Facility and the cutting-edge technologies as key messages of the event. It must be something that differ from the Career fair events or the purely academic conferences targeting Master and PhD students.

Cooperation activation in the forms of internships and joint projects

The internships discovery flow – pilot in Granada

The internships discovery process was designed and tested by PTS, involving students and companies from the consortium and the Granada ecosystem. The flow can be summarised as follows:

1. Enterprise places a bid on the Granada platform
2. Students share their CPD portfolios on the Granada platform
3. Responsible for the Granada Innocore Team analyses offers and portfolios and creates groups of interest
4. Responsible for the Granada Innocore Team organizes meetings for the different groups of interest to allocate students (**meetups**)
5. Responsible for the Granada Innocore Team assign supervisors
6. Students do internships
7. Supervisors elaborate an evaluation report of the students
8. Students received their grades

Meetups implementation

Seven meetups were organized by PTS, involving 19 companies. During each 1-hour online event, the invited companies have 15 minutes to present their offers. Students can ask questions and obtain useful information for their potential applications.

Results are published in:

https://ptsgranada.com/como-contratar-el-mejor-talento-universitario-post-evento/

TABLE 3- PARTICIPANTS IN THE MEETUP

1	2	3	4	5	6	7
14/10/2021	**17/11/2021**	**22/11/2021**	**29/11/2021**	**15/12/202**	**27/01/2022**	**24/02/2022**
Biomedal	Medina	FIBAO	HVN-PGx	Vitro	Limnopharma	Amifar
Nanogetic	Destina	Promega	INRAE	DOMCA	Lentistem	Vircell
Stem	Clover			MAFA Bioscience	D&B Tech	Abbot

Each of the meetups had a mean of 25 participants mostly from Spain, with small participation from the other INNOCORE partner's Universities.

The meetups launched 24 internships, demonstrating the value of such matchmaking activity.

What did we learn?

Internships are well accepted by companies provided students have an adequate background and the internship lasts more than 4 months.

Performance evaluation of use cases

PERFORMANCE INDICATORS FOR OUTPUT IO1:	Expected	Reached

Number of companies included in the mapping process	>20	40 companies answered the questionnaires
Number of companies effectively engaged in the cooperation model	>10	13 companies interviewed 19 companies involved in the meetups 5 companies involved in the Innocore challenge 7 companies participating in the Innocore days as speakers 25 companies hosting internships 6 companies involved in the courses
Level of satisfaction of companies and facilities members engaged in the cooperation	HIGH	7/7 companies would recommend others to participate in the Innocore activities

ANNEX 1 – Terms of reference

Purpose of the INNOCORE network

INNOCORE network is intended to bring academia and industries in the biotech field together and promote convergence in objectives and activities. This cooperation will be grounded on the education of new professional figures that can fill the skills gap between academia and industry.

The main objectives of the collaboration are:

- Connect enterprises and students
- Engage students in industrial activities and challenges
- Create market-oriented curricula for biotech students
- Share knowledge (and facilities)
- Foster innovation

Advantages

1. Advantages for industry: Be in contact with cutting-edge research; participate and contribute to educating new professional figures; individuate collaboration opportunities; request professional training on INNOCORE themes.
2. Advantages for research facility: Access to market-oriented organizations. Opportunity to structure collaboration between complementary stakeholders and build strong innovation clusters
3. Advantages for students: Knowledge and command of new technologies. Creation of a personal network in the Biotech industry, thanks to the possibility to engage in practical professional activities.
4. Advantages for innovation agencies: Increased competitiveness, improved productivity, reduced costs, new partnerships and relations, improved brand recognition, increased GDP and improved employment
5. Advantages for investors: An integrated system and workforce ready. Reliability of structured cooperation among relevant stakeholders in the innovation ecosystem. Deal flow to get an advanced portfolio, therefore a probable reduction of risk on future investments.

Conditions for participation

Entitled entities include innovation-driven enterprises, corporates, research facilities staff, students, innovation agencies, investors, and public authorities

3. Voluntary clause:
    - Entities will join the platform on a voluntary base, and will withdraw from it with a simple communication
    - Each entity will be allowed to exploit an independent activity in the INNOCORE perimeter
4. Thematic areas
    a. Each entity at the moment of registration will select all the thematic areas and use cases in which they would like to be involved
    b. Flexible working groups will be organized depending on preferences about use cases and thematic areas
    c. Thematic areas are
        i. Proteomics and protein characterization

   ii. Advanced imaging
   iii. Genomics
   iv. HTS for drug discovery

5. Network management
   a. Network activities will be managed following the use case structures
   b. Working groups will be structured for each use case and animated by a responsible from project partners
   c. The group animators will do their best to minimize time and effort and make communication and actions effective and of added value for all the participants
   d. A description of the use cases can be found in the following chapter (omitted here), together with the expected effort from participating entities.
6. Obligations:
   a. The participation is free of charge
   b. Entities will use all possible attention to improve the cooperation inside the INNOCORE use cases on a goodwill basis
      i. By actively participating in the working group activities including requests for information, student engagement and meetings
      ii. By sharing their knowledge (IP protected) and competencies, if needed
      iii. By making available the most relevant results of their activity (IP protected)

7. Intellectual property rights:
   a. IPR will be granted and discussed case-based
   b. **Background, foreground, and side ground rights will be shaped to**
      i. Protect inventor rights
      ii. Defining the Industrialization Rights share
      iii. Granting the existing background IP rights to the owner labs
      iv. Granting cross-license agreement needed for potential industrial exploitation rights
      v. All other specificities
8. Funding:
   a. All the activities foreseen in the use cases will be provided free of charge
   b. Possible commercial agreements to go beyond the scope of the use cases can be activated between participants according to their internal procedures.

9. Privacy and data management
   a. All data will be treated according to GDPR

USE CASES:

Selected use cases for the Innocore project are:

- Organization of Internships
- Organization of industrial challenges for students
- Organization of the INNOCORE DAY

- Involvement in the definition of business-oriented academic and professional courses
- Joint projects

1. Organization of internships

This use case fosters the students' competences and gives them a possibility to acquire multidisciplinary skills related to the professional world outside of the university. They can complement their academic training, while cultivating a portfolio of contacts that can be of great use to them in their future professional development

Main educational purposes:

- Integration in the teams of the companies for developing projects.
- Professional development
- Exploring career options
- Professional socialization
- Promote applied research

Required effort from participants:

- Availability and interest to host students for 3-6 months internship
- Participation at the coordination meetings to organize the internship

2. **Innocore** challenge

A challenge is a driven innovation initiative aiming at supporting SMEs in testing and improving products, or services. Furthermore, from the perspective of the participants (solvers) it is an opportunity to train skills and introduce new competences related to the world of innovation and the life of a company.

From the perspective of companies, challenges are an increasingly popular tool for implementing open innovation (i.e., collaboration with third parties to solve an industrial problem). From the point of view of training, we could talk about Open Education, a process in which the search for the solution to the problem is a tool to train the participants.

The pilot Innocore Challenge will be organized in the second semester of 2021.

The challenge process also includes intensive training for students and professionals related to challenge topics and innovation.

Required effort from participants:

- Sharing of industrial challenge to be presented to solvers
- Availability to support students during the challenges and to participate in relevant meetings
- Availability to share information and knowledge with students (IP protected)

Innocore courses

- InnoCore training in core technologies and innovation management integrates the complementary expertise in the education and research on technologies of core importance for innovation in life science held at the participating Higher Education Institutions participating in the project: the University of Trento, the University of Coimbra and the Masaryk University.
- The InnoCore Courses include teaching on i) Genomics, ii) High-Throughput for Drug Discovery, iii) Proteomics and Protein characterization, iv) Advanced Imaging. An entrepreneurial course includes topics such as i) I&E and Innovation Management, ii) Regulations and Quality in Healthcare.

Required effort from participants:

- Involvement in the course to engage students with industrial needs
- Participation of company's staff in training courses

Joint projects

The aim of this use case is draw up a best practices document to encourage and simplify the interaction between enterprises, universities, core facilities and research centres.

- Share R&D ideas and requests for collaboration.
- Share opinion about specific topics.
- Activate projects.
- Enterprises or academy members can start a conversation about a specific topic.
- Enterprises or facilities staff can place a request for specific competence.
- Moderator helps to find the right competences also using INNOCORE database.

Required effort from participants:

- commit to participate at the pilot
- Proposals for interaction between enterprises universities, core facilities and research centres
- Availability in the creation of price lists of the services provided
- Indicate a contact person who will take care of streamlining administrative procedures

ANNEX 2 - Best practices of collaboration between the university and industrial SMEs

OBJECTIVES AND TYPES OF COLLABORATION

Public-private collaborations comprise a broad spectrum of objectives, where the objectives of the partners are based on differing scope and incentives to collaborate. Generally, for collaborations involving academic institutions and industry partners, the most important reasons for establishing a collaboration are:

- Complementing competencies, knowledge, and technologies to boost advanced research and development
- Obtaining access to resources and cutting-edge technologies that are available only from specific partners (e.g., clinical research, core facility)
- Broadening the scope of the innovation process
- Have high-profile professional figures available as consultants
- Exploring and exploiting existing intellectual property (IP)

The type of interaction between the parties is chosen according to the purpose and extent of the collaboration. Among the various possible types of interaction, we can mention the most common:

- Single service: 1 client/user; 1 provider Fee for Service
- Master service: 1 client/user; 1 provider Fee for Service
- Collaboration project: 1 client/user; 1 provider Shared cost, IP
- Complex collaboration project: 1 client/user; 2 or more providers Shared cost, IP
- Innovation Hub: Consortium of clients and providers Several pre-negotiated terms and IP structures

A well-functioning public-private partnership requires a clear definition of the roles (who does what) and the expected benefits between the partners. Different skills and commitments are required during the various phases of the project, but the following objectives must be clear and well-defined. The client requesting a service or collaboration must Identify key needs and priorities, and promptly notify the service provider if the scope changes. The provider must deliver the services according to expectations as outlined in the Project Agreement, and promptly communicate to the customer in case milestones will not be met for unforeseen events or if it is not possible to achieve the objectives within the agreed time and manner.

Examples of what could go wrong:

- Overpromising/unrealistic timelines, too slack timelines.
- Overall aim of the project is unclear/ changing over time.
- Poor communication.
- Unclear governance.
- Milestones are not met, and deliverables are not delivered in time.
- Lack of effective fallback/troubleshooting mechanisms.
- Slow decision-making within one of the partners.
- Conflict between patenting vs publication process.
- Losing momentum, loss of marketability, novelty.

TOOLS TO SUPPORT THE EXECUTION OF JOINT PROJECTS

Below we report a series of issues to be addressed in order to regulate the collaboration path or the requested service.

Non-disclosure Agreements (NDAs)

In setting up discussions consideration should be given to signing non-disclosure (secrecy) agreements. These provide protection for confidential disclosures from any or all of the parties and can therefore make the scope of discussion more relevant.

It is recommended that NDAs should be two-way (or multiple for more than 2 parties), and that the scope of information to be disclosed (for the purpose of exploring a possible collaboration) should be carefully defined.

The duration for confidentiality should in general be finite, e.g., several years, and academic parties will not normally be allowed to accept financial penalties for non-compliance.

Some important features and issues:

- These agreements safeguard the transfer of confidential or sensitive information but do not cover rights to its use except for the, usually limited, stated purpose.
- Thought must be given to whether the agreements should involve disclosure by one or both parties ("1-way" or "2-way").
- The scope of what is to be disclosed should be carefully described. A too narrow scope can prevent useful interchange and lead to friction. A too broad scope exposes too much of a party's intellectual activity to potential disclosure and may commit research groups outside the sphere of the intended purpose.
- Another issue is often called "contamination" and refers to potential harm a party may incur by exposing itself to the other party's confidential information. If a particular subject should turn out to be at a comparable phase of development within both parties, the disclosure may have the effect of restricting a party's freedom to undertake its "own" development.
- In most cases of interaction between academic institutions and/or industry parties the parties to the agreements should be the legal entities themselves rather than individuals. Personal secrecy undertakings should be avoided wherever possible, for several reasons.
- The duration of the secrecy is often an issue. In general, the longer a party is under the obligation for secrecy the more inconvenient it may become and the greater the risk of accidental disclosure in breach of the agreement. For academic institutions with the publication of their own results likely in the short to medium term (relieving the other party of the secrecy obligation) a long duration is unlikely to be required, but industry parties may require longer periods of non-disclosure. Many situations result in a 3–5-year secrecy period.
- Finally, the issue of large penalties for a party disclosing information in breach of the agreement arises sometimes as a requirement, particularly by industry. Although there may be cases where disclosure can arguably result in substantial damage to a company, an academic party will generally be unable to entertain this kind of risk (with public funds).

Material Transfer Agreements

At an early stage of the investigation, or to explore a possible side-line to ongoing research, it may be desirable to transfer materials (substances, cell lines, biological materials, mouse models, etc.) between parties.

Material and data transfer agreements (MTA/DTA) exist to facilitate the exchange of materials and associated personal data between researchers, as well as to protect the interests of the researchers and their institutions. MTA/DTA is a type of legally enforceable contract setting the terms under which materials and associated personal data may be obtained and used. It provides a mechanism to protect the interests of the owners of discoveries and inventions while promoting data and material sharing in the research community. MTA/DTA is crucial in health research where human biosamples accompanied by associated personal data need to be transferred and made available for research. If personal data to be transferred is not fully anonymized, transfer and processing of such falls under the GDPR (Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 which came into force on May 25th, 2018) which provides for the requirements that must be observed in such transfers.

Material Transfer Agreements (MTAs) cover issues relating to the transfer and use of the materials, among which:

- The ownership and rights to the materials and any inventions resulting from their use.
- The scope of their intended use, for laboratory or clinical trials within a well-defined scope.
- Safe and ethical practices to be adopted in their use.
- Return of materials after use or agreed disposal procedures.
- Use/publication of results.

Some issues, which can arise:

Rights to any improvements, derivatives or progeny should be carefully agreed.

- Rights of the receiving party to use commercially (licenses) are generally excluded at this stage of collaboration. Nothing should be included which implies such a license.
- The party providing the samples must be clear that in so doing it does not infringe pre-existing agreements of other parties (including within its own organization) or limit its freedom to conduct its (research) operations.

License and Assignment

In the context of research collaborations, often involving various intellectual property rights (IPR), two legal instruments are worth mentioning- license and assignment. License and assignment of IPR can be executed by way of the self-standing license or assignment agreement or through assignment or license clauses contained in the other agreements.

IP assignment is like a sale, and it entails the permanent transfer of ownership of IP from one party (assignor) to another party (assignee). Consequently, the assignee becomes the new owner of the transferred IP assets and can no longer use such transferred assets after the transfer has taken place otherwise such use would be considered an infringement of the IP assigned.

Assignments are useful tools for commercialization when the IP owner does not have enough capabilities (financial, HR, marketing) to commercialize developed intellectual assets or where the owner would like to realize immediate cash flow from an IP asset. On the other hand, an IP license is comparable to a rental because it does not imply a permanent transfer of the IP in question but a grant of right to exploit certain IP assets within certain limits which are set in time (concrete licensing period in years or until IPR expires), territory (specific country, several countries, EU-wide or worldwide) and level of exclusivity (exclusive, non-exclusive, sole, or cross-license). A license is given by the IP owner (licensor) to a third party (licensee) in exchange for monetary compensation (usually lump sum or royalties) or in exchange for another right (cross-license).

Licensing can be seen as a means of turning a possible competitor into a partner as the licensor retains ownership of its IP and receives income (royalty) in return without the need to deal with or invest in production, marketing, and distribution. The choice of license type will therefore depend on the business strategy, target market conditions and the capabilities of the licensee. IP assets are often transferred to the spin-off company by a way of the assignment while technology transfer agreements (i.e. for production of products involving exploitation of given technology) often take shape of a license where the licensee produces such products. However, both – transfer of assets to spin-offs and technology transfer agreements can take shape of license and assignment.

Collaboration Agreement

A Collaboration Agreement can be concluded between parties for one, specific project. In that case, we are talking about a project-based collaboration agreement that facilitates one concrete project and provides the full details and legal framework supporting such a project.

However, a more common type of collaboration agreement is a framework type of agreement with a legal structure suitable for the execution of multiple, different projects under the pre-negotiated set of clauses. This helps save time as the parties have previously agreed on all the main features (such as intellectual property, publication, liability, etc.) that will generally be applicable to all specific projects to be executed under such framework Collaboration Agreement. In that way, only specifics of each project such as the project plan with budget, contributions, deliverables, and timeframe for performance need to be agreed upon between the parties which steer the process and enable the execution of more projects in a shorter time.

Specific projects are therefore executed by way of separate project agreements concluded under the Collaboration Agreement. Such is therefore an integral part of the Collaboration Agreement and can be executed as appendices to it. Although agreements for setting up collaborations are almost inevitably a tailor-made process, there are guidelines to help identify some of the collaboration agreement's main components.

Intellectual property

Intellectual property issues arise in research collaborations with industry and must be addressed by taking into account the rights and obligations of all parties. Although on occasions an academic party may be accustomed to operating without intellectual property, in general institutes will have the policy to establish IP protection and to realize a return on their research investments through licensing.

For industry partners IP is generally essential for their business models, usually in the form of patent coverage to secure a monopoly in the exploitation of products or services. IP is therefore an important feature to be addressed during planning and negotiation.

In the planning phase, it is advisable to discuss with the industry partner(s) and all the academic parties what IP can be expected from the project (“Foreground”) and what exists already (“Background”). It is good practice to agree beforehand on how IP will be handled, in particular patentable inventions.

Rights to patentable inventions are determined by the inventors. Inventors may be employed by one or more of the parties, including possibly the industry partner(s) if involved in the conduct of research. Care must be taken to identify correctly all the inventors and their respective contributions. Failure to do so (or inclusion of inventors whose intellectual contribution to the invention could be challenged) can have negative consequences if the invention would be challenged or if disputes arise.

The party or parties in whose names a patent application is filed are called the applicants. Applicants may be individual inventors or their employers if entitled to rights through the employment contract. In the event of different inventors, an application could be made jointly by all the parties. This has a disadvantage in that decisions must be agreed upon at every stage by all the parties, which can be cumbersome and time-consuming.

An alternative often worth considering is for a single party to file in its name, taking responsibility for the process, with an IP ownership agreement between all the parties to determine their rights and obligations.

In any event, aspects such as licensing rights and royalties should be agreed upon, as well as who will pay the patenting costs (which can mount up considerably). The patent process may also involve many decisions relating to filing and defence of the application, all requiring liaison between the parties. The governance of this process should be agreed upon beforehand. Academic parties should ensure that they retain a license to perform further research in the field.

The background intellectual property consists of pre-existing IP such as patents, know-how and copyright, belonging to any of the parties in the proposed research collaboration and necessary for carrying out the research and/or commercializing the results. All the background must be documented (for example in an Appendix to the collaboration agreement) and appropriate rights granted. It is good practice to start gathering information at an early stage. Background IP is often forgotten or incomplete.

ANNEX 3 - Companies satisfaction

Column1	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6	Company 7
In which initiative have you participated?	Meet-ups	Meet-ups	Meet-ups	Internships	Internships	Challenge	Interview/Questionnaire
What was the advantage in participating in this initiative? What were the outputs?	this meet-up was interesting to learn about other companies and their lines of research	The possibility to know the organization students that have interest in starting an internship in the company	Share ideas and Learn new techniques and topics. The output was to be more constructive	We obtained a new product for the company with which we will continue to carry out tests and, in the future, it could even be marketed. It has been very advantageous to participate in this initiative because the student can carry out a project that is of interest to the company and, at the same time, have contact with young scientists who always bring new ideas and	Students have a very good attitude, and they are prepared to lead a Master's thesis project. On other hand I think that it will be necessary to provide more time of internships for both parts company and students.	Participation in the challenge was very interesting and I really appreciated the work of the solvers. Participation in the initiative allowed me to interact with a group of motivated students who are committed to the success of the challenge.	The possibility to know the university core facilities and the services offered for potential future collaboration

				enthusiasm to the group.			
Would you recommend participation to others?	Yes	yes	Yes	yes	yes	Yes	yes
How do you plan to continue the activity in the future?	Offering new lines for the students of the internships of the next course	yes we 'll participate again	Teaching students and exchange ideas	Guiding other internships or to students, although we are open to new collaborations since the experience has been very positive	yes we 'll participate again	Future collaboration with universities on challenge for the resolution of problems related to research topics	Explore the collaboration with university core facilities for specific services related to the use of innovative instruments.