

INTERDISCIPLINARY EDUCATION AGENDA PROJECT: IMPROVING INNOVATION THROUGH ACADEMY-INDUSTRY COLLABORATION

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Abstract

Research in collaboration has increased over the last years due to the benefits associated when two or more entities collaborate. Although this research has been more focused on enterprises, collaboration between Academy-Industry is also a current research key factor, especially to carry on and improve innovation activities. Academy-Industry collaboration allows that the pioneering creativity emerged in the Academy is complemented by its implementation in industries. In the light of this, this paper introduces the IDEA project, whose main aim is to handle the knowledge triangle of Education-Research-Innovation and promote the development of Academia-Industry partnerships. The paper specifically focuses on the contribution of one of the academic partners of the project, the Universitat Politècnica de València (UPV), defining its knowledge and technology transfer models used promote Academia-Industry partnerships.

Keywords: Industry-Academy collaboration, education, innovation, knowledge technology transfer, European Project.

1 INTRODUCTION

Research in collaborative networks has increased over the last years due to the advantages associated with collaboration, such as an increased competitive advantage [1, 2]. To be more specific, collaboration benefits are led to; on the one hand, reduce the risks, costs and time-to-market; and on the other hand, increase the market share, assets utilization, skills and knowledge, innovation and improve customer services [3]. The establishment of collaborative partnerships involves entities to achieve common or compatible goals that without collaboration would never be achieved [1].

According to the definition of collaboration provided by [4], when establishing collaborative relationships, different entities can take part such as enterprises, universities, technological institutes, regional development agencies, financial and governmental institutions. This paper specifically focuses on the Academy-Industry collaboration. This collaboration allows both entities to jointly perform their business and operate to achieve compatible goals in all the areas in which they work, i.e. the innovation area.

This paper describes the work developed in the IDEA project [5] whose aim is to provide mechanisms that allow Academics and Industries to overcome the difficulties that could appear when starting collaboration. These difficulties are mainly related with the inadequacy of the services offered by the universities and the communication mechanisms between the industry and the academia entities that do not allow them to easily establish collaborative practices and collaborative agreements in the areas of investment, basic, technological and applied research.

The Academia-Industry collaboration has mainly associated the benefits derived from the innovation enhancement, used as a competitive advantage for enterprises in front of the current competitive and global dynamic markets.

In order to deal with this, the paper, first, introduces the topic of Academy-Industry collaboration and justifies how this partnership can led both entities to obtain higher profits (section 2). In section 3, the IDEA project is described as well as its priorities, to handle the Knowledge Triangle: Education-Research-Innovation. Then, the specific contribution one of the IDEA project partners, the Universitat Politècnica de València (UPV), is defined and the models and services that this Academic entity uses in order to promote collaborative relationships within enterprises are also described (section 4), some examples are also given. Finally the conclusions and future research lines are considered (section 5).

2 ACADEMY AND INDUSTRY COLLABORATION

Institutions such as universities, research institutes and centres, start-ups, etc. represent the Academy branch. Innovation diffusion, and knowledge and technology transfer (KTT) have become a priority for enterprises that are looking for new ways to deal with current dynamic markets and globalised competitors. In recent years, enterprises have realised that interconnection between the pioneering creativity of academy must be complemented by innovative business models, enabling both enterprises and researchers to increase their competitive advantages. Therefore, a strong research culture in the academy is needed to fill the industry and markets' needs, promoting new knowledge synergies.

Different approaches have been developed in the literature treating the Academia-Industry collaboration and KTT concepts [6-9]. For example, Chung [10] studies the Academy-Industry collaboration from the perspective of the Triple Helix (TH): university–industry–government relationships. Moreover, the Academia-Industry collaboration concept is also treated from the point of view of alliances. A clear example is shown in Seymour [11], revealing the importance of Industry-Academia alliances as a source for innovation. This author focuses its study in the biomedicine area, but others sectors are considered in other works, such as food industry sector [12] or the pharmaceutical one [13], amongst others.

A relevant approach, considered relevant, to deal with Academia-Industry collaboration is the Collaborative Practice Research (CPR), developed by [14]. The CPR approach brings together the activities carried out by practitioners and the work done by researchers, giving as a result innovation improvements in both collaborative partners. The CPR management is a difficult task to carry out due to the involved parts have not only to agree in their objectives but also in the relevance of the activities carried out, the duration of time, planning and results. In order to face these difficulties, Sandberg [15] provides a model to guide the industry and academia on their collaborative practice research. According to the developed model ten are the key factors identified to successfully perform collaborative projects: (i) management engagement (ii) network access, (iii) collaborator match, (iv) communication ability, (v) continuity, (vi) need orientation, (vii) industry goal alignment, (viii) deployment impact, (ix) industry benefits and (x) innovativeness. Taking into account these key factors, a CPR collaboration model is provided by [15].

Besides this, the same authors [15] have developed ten action principles to assist both practitioners and researchers on establishing collaboration: (i) address activities to ensure results that industry can associated with benefits, (ii) ensure management engagement through structured meetings, reports and rules, (iii) embrace research negotiations that equally benefit both partners through aligning research and industry goals, (iv) organise get-togethers to identify potential collaborative partnerships, (v) communicate progress and results as a motivation for continuing, (vi) attend to enterprises and researchers needs, (vii) promote agility in the current dynamic environment, (viii) carry out small research projects, (ix) allow innovation to emerge from needs, (x) realise that CPR involves learning on behalf researchers that must learn to be agile in front of industries disruptions and on behalf industries that must respect research rigor.

Academy-Industry collaboration has associated the benefits derived from the innovation activities, allowing the complementation between the pioneering creativity emerged in the Academy and its implementation in the industries (Fig. 1). Both agents are positively related since the establishment of collaborative relationships supports the improvement of innovation in the industry branch and allows at the same time to ensure the research applicability and relevance in the academic research [16]. Success factors for successful collaboration are identified by [16]: collaboration champion on site, champion's network within the company, buy-in and support from company management, buy-in and support from industry collaborators, short-term results and impact on industry, organizational stability (industry partner), researcher's visible presence in industry, regular meetings, researcher's relevant expertise, researcher's attitude and social skills, researcher's commitment to contribute to industry needs, research project's organization, research environment at the university, prior experience of industry- academia collaboration, trust and short-term result/impact on the university. Most of them coinciding with those defined by Sandberg [15].

When collaborating, apart from obtaining positive influences in the innovation activities carried out, the collaboration results are also related with the employability [17].



Fig 1. Academy-Industry Collaboration (based on Sandberg [15]).

Different models have been employed in the industry to achieve Academy-Industry collaboration feasible. Nevertheless, Garg and Manuja [17] wonder into which extent the provided models are applicable and usable to both partners and an analysis is made.

From the two studies previously [15, 16], selected as more relevant, it can be stated that the objectives alignment in industry and academia allows establishing collaborative relationships with the main result of obtaining higher levels of innovation and employability. Improving innovation is considered as a vital mechanism to achieve sustainable growth and deal with the competitive, globalised and dynamic markets.

3 IDEA: INTERDISCIPLINARI EDUCATION AGENDA – AN ESSENTIAL DRIVER FOR INNOVATION

Global competition leads to a considerable shift in the distribution of the world economic power, and the need for innovation, as a vital driver for sustainable growth is now evident.

In recent years companies realise that the interconnection between the pioneering creativity of designers and engineers complemented by innovative business models has the capacity to set their next competitive advantage. The strong research-led culture of the academic environment must be attentive to the needs of industry and markets and must promote new knowledge synergies.

In this context, the IDEA project (InterDisciplinary Education Agenda, an essential driver for innovation) finds its roots [5].

According to the aforesaid, the IDEA project emerges to handle the Knowledge Triangle: Education-Research-Innovation and promoting the development of industry-academia partnerships (Fig. 2).

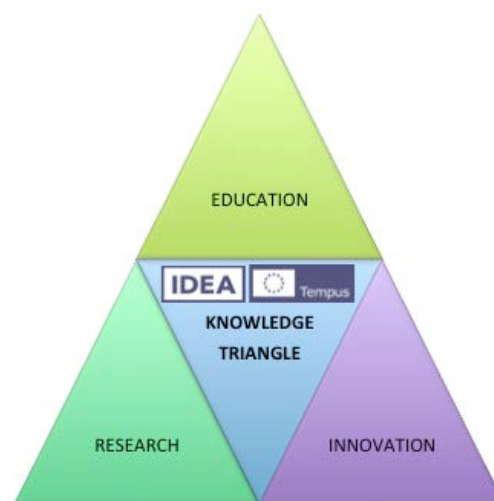


Fig. 2. Knowledge Triangle: Education-Research-Innovation.

IDEA project is part of the Tempus Programme (Trans European Mobility Programme for University Students). Tempus is the European Union's programme that supports the modernisation of higher education in the Partner Countries of Eastern Europe, Central Asia, the Western Balkans and the

Mediterranean region, mainly through university cooperation projects. Partnerships are made up of a consortium of organisations including higher education institutions, businesses, ministries, NGOs, and other organisations working in higher education.

The main motivation of Tempus Programme rises on filling three key priorities: mobility, employability and quality, and the importance of hither education for Europe's capacity to deal with the economic crisis and to contribute to growth and jobs.

IDEA project address Israeli's National Priorities for: (i) the Knowledge Triangle — Education-Research-Innovation and (ii) the development of partnerships with enterprises. The wider objectives, defined in Tempus IDEA project, are:

- To effectively bridge the gaps within the knowledge triangle and support current efforts of industry to cope with global economic challenges.
- To strengthen academy-industry collaboration in the domain of innovation and to emphasise the role of HEIs (Higher Education Institutions) in the knowledge triangle.
- To improve student employability and strengthen the capacity of HEIs in meeting labour market demands for innovation.
- To stimulate and motivate innovative integration and knowledge synergies of engineering, design and business disciplines within a wide range of projects and industries.
- To modernise the multi-disciplinary Innovation Culture in Israeli HEIs through new synergies among the disciplines of engineering, design and business involving industry.
- To create tools and methods for establishing a common framework and language between educators and students from different disciplines and to equip them with the skills and attributes needed to work in interdisciplinary environments.
- To establish institutional operational mechanism to enhance the knowledge triangle performance and Academy-Industry collaboration.

In the light of this, the main activities to cover are: (i) identifying the needs and gaps between industry and academy, (ii) introducing best practices from EU HEIs, (iii) supporting for an interdisciplinary innovation culture in the Israeli HEIs and (iv) creating a sustainable knowledge transfer between industry and academy enhancing research and innovation.

The IDEA project consists of 12 project members covering all stakeholders of the knowledge triangle: 10 HEIs (Higher Education Institutions), 1 technology transfer centre and 1 manufacturer's association (Table 1). The European HEI mentors are top management, deans and experts in the involved institutions. Amongst the Higher Education Institutions there is the *Universitat Politècnica de València* (UPV). So far, the IDEA Project has been described, in next section, one of the partners (UPV) has been selected in order to give an insight of the tasks developed in the project and describe the models used in order to deal with the Academia-Industry collaboration.

Table 1. IDEA project partners.

Organisation Name		Country
SHENKAR	Shenkar College of Engineering & Design	Israel
HIT	Holon Institute of Technology	Israel
TAU	Tel Aviv University	Israel
SAP	Sapir Academic College	Israel
NBSD	The NB School of Design	Israel
MAI	Manufacturers Association of Israel	Israel
UoB	University of Brighton	UK
POLIMI	Politecnico Di Milano	Italy
UPV	Universitat Politècnica de València	Spain
MDH	Mälardalen University	Sweden
FH Koln	Cologne University of Applied Sciences	Germany
MCI	Material ConneXion	Italy

3.1 UPV as a Higher Education Instructor

UPV [19] is one of the European HEI instructors in the IDEA programme. UPV contributes to the knowledge exchange drawing from their vast experience in research and development projects involving the public and private sectors in Spain.

The specific contributions of UPV as regards the IDEA project are to:

- Participate on the development of the theoretical knowledge of innovation processes.
- Introduce an interdisciplinary innovation management program involving academia and industry.
- Host training for staff and internship for students in.
- Supervise the creation of centres to promote research and innovation in the domains of design, engineering and business.
- Be as example in its Knowledge and Technology Transfer (KTT) program that embraces services, institutions and departments specifically designed to transfer knowledge and technological resources produced within the University.
- Help on monitoring the project performance in a structured and methodological approach.
- Ensure sustainability of the project results within the academic and industrial partners and beyond the span of the project.

4 UPV KNOWLEDGE AND TECHNOLOGY TRANSFER MODEL

UPV [19] is an innovative and entrepreneurial University, with effective mechanisms for the dissemination of scientific and technological results, and with excellence in the training of researchers and in the creation of technology-based companies. The UPV invests in society and plays an important role in research, technological innovation and development. UPV counts on the following bodies: departments, research centres and institutes and university research institutes that undertake applied research projects jointly with nation and international bodies and companies. And is considered as an *Enterprising University* due to generates applied or basic research focused on innovation processes, actively taking part in the development of its social and economic environment and co-operating with national and international partners.

The UPV focuses on five main areas in order to establish collaborative relations with enterprises: (i) enterprises, (ii) entrepreneurs, (iii) technical services for enterprises, (iv) postgraduates and professionals and (v) teaching staff and researchers (Fig. 3).



Fig. 3. Technology and Transfer innovation agents.

Amongst all the areas considered in the UPV, the paper focuses its interest on the *technical services for enterprises*, due to its relevance regarding the establishment of collaborative relationships between the private sector and the University. Hereafter the model of Knowledge and Technology Transfer

(KTT) applied in the *Universitat Politècnica de València* (UPV) is described. This model allows contributing to the economic, social and cultural development of the Spanish society in general through scientific, technical and artistic support.

The technical services for enterprises area is identified to support collaboration between Enterprises and University, and consists of four main entities (Fig. 4): (i) Centre for Innovation, Research and Technology Transfer (CTT), (ii) Continuous Training Centre (CFP), (iii) Integrated Employment Office (SIE). (iii) Institute IDEAS for the Creation and Development of Enterprises.

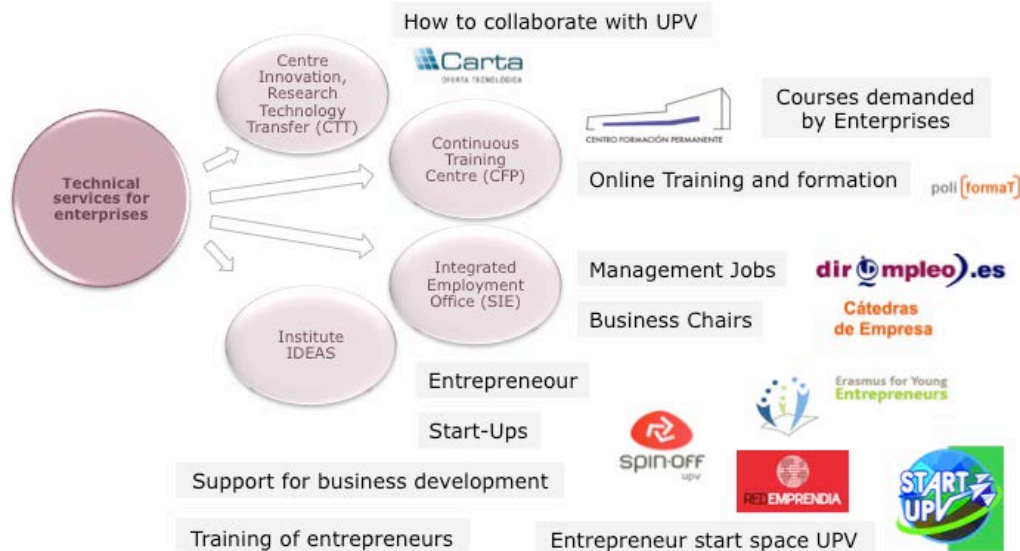


Fig. 4. Technical services for enterprises: CTT, CFP, SIE, IDEAS Institute.

4.1 Centre for Innovation, Research and Technology Transfer (CTT)

The Centre for Innovation, Research and Technology Transfer (CTT), brings together the University and the companies while carrying out joint activities in research, development and technological innovation. It offers a service to develop technological innovation projects that a company can exploit. CTT analyses the UPV competences and seeks the company needs bringing a direct interaction between the companies and university knowledge through contracts or consortiums (formalises the relationship), facilitating the technological innovation processes with the involvement of the company. The CTT advises the enterprise on the most appropriate ways of funding the project and runs it jointly with an expert team together with the company.

Moreover, CTT organises the UPV technological offer in *CARTA* a catalogue of transferable knowledge, patents, software, and skills to produce new innovation oriented research results of interest for companies. Enterprises can access and use the information available at the "CARTA" by formalising a contract for the UPV to carry out of their technological research and development work, as well as by obtaining licences to use or exploit the technology under the intellectual property of the UPV.

4.2 Continuous Training Centre (CFP)

The UPV through the Continuous Training Centre, is driving the e-learning as a useful and necessary issue for the formation, understood as a form of distance education, which creates an environment for learning, facilitating the distribution of materials training, along with communication tools (chats, forums, email, teleteaching, etc.). The CFP makes available to the university community, professionals and companies a wide range of continuing training.

4.3 Employment Office (SIE)

The Employment Office (SIE) promotes and manages all the initiatives taken in employment at UPV and aims to contribute for the better employability of its graduates, such as: (i) perform a practical work and final thesis projects in companies and institutions, (ii) give career guidance and job training,

- (iii) develop active policies of labour intermediation between supply and demand of employment, and
- (iv) make the monitor and track job placement of graduates.

SIE supports the development of *Business Chairs* as a way to establish a large and distinguished collaboration of enterprises, foundations or entities through business linkages with the UPV to develop teaching objectives, research and KTT. One example can be seen with the *Business Chair ACAL-Sustainable City* as a project that was created to make available to the municipalities the knowledge and solutions that the UPV has, in order to review, from a technical, organizational and economic, the management of municipal services. The purpose of the *ACAL-Sustainable City* was to generate and spread knowledge capable of attaining best practices and good solutions to the problems of the cities and get a proper instrumentation for effective management.

4.4 Institute IDEAS for the Creation and Development of Enterprises

Institute IDEAS, for the Creation and Development of Enterprises, focuses on helping the university community to implement entrepreneurial ideas with a technological or innovative basis. The offered services are led to: (i) disseminate the entrepreneurial culture, (ii) advice for start-ups and creation of UPV spin-off, (iii) support for business development and consolidation of companies (iv) train entrepreneurs, (v) provide an entrepreneur start space as a co-working space for startups, students and graduates from UPV.

The IDEAS program, in an effort to enhance the growth of technology-based companies, offers support to those entrepreneurs who want to:

- Launch a new technology-based business line
- Create a new company, a **SPIN-OFF** from an existing one. The UPV understand the spin-off as the most complete and effective technology transfer mechanism. SPIN-OFF companies are based on research results in the official personnel involved Universitat Politècnica de València.
- Provides to the company both research results as talent and the creators ability. Also, it contributes to the creation of innovative and economic network based on knowledge. For these companies, some participated by the UPV and others not, the UPV offers brand *UPV Spin-off*, which allows to recognize and differentiate

An example of spin-off can be seen in *EXOS Solutions* a spin-off born in the UPV for providing technological services to companies, such as operations, technology, management and training. Focusing each project value through the development and implementation of advanced technological solutions [20].

Besides the spin-off there is another service called the Entrepreneur Space *START UPV* (EE Start UPV) as an initiative of the Institute IDEAS of the UPV funded by the Ministry of Education as part of the Comprehensive Care Program and Employability of University Students. UPV *START* Entrepreneur Space is open to startups and members of the university community with entrepreneurship.

Entrepreneur projects can enjoy the facilities of the Entrepreneur Space UPV *START* and begin the first steps in his career towards business success after establishing a direct collaboration with the Institute IDEAS and successfully pass a selection process. It will be a co-working space, which will share the material, furniture, resources and even time, completely free for students of UPV and projects including any member of the UPV.

Finally the IDEAS Institute takes part in the *RedEmprendia's* proposal, Spain's Ministry of Education has included in the Strengthening Subprogram of the 2011 International Excellence Campus Programme an entrepreneurship encouragement programme whereby university professors wanting to start up technology-based enterprises or to strengthen already running initiatives are be granted financial support to spend from six months to a year developing their projects.

At the end, the IDEAS institute aims entrepreneurs and businessmen to develop entrepreneurial activities regarding knowledge and technology development, and to gain business management experience and skills.

5 CONCLUSIONS

In recent years enterprises realise that the interconnection between the pioneering creativity of academy complemented by innovative business models allows enterprises to set a competitive advantage. Therefore, a strong research culture in the academy is needed to fill the industry and markets' needs, promoting new knowledge synergies.

The alignment of objectives between academia and industry promotes their collaboration and subsequently an increase in innovation and employability. Improving both innovation and employability has become a target to be met by enterprises and public institutions in order to overcome the fateful results that the crisis is providing.

The IDEA project jointly with the supervision of UPV and the other HEIs will allow to effectively bridge the gaps within Education-Research-Innovation and support industries to deal with global economic challenges. Besides, academia-industry collaboration will be enhanced in the domain of innovation through the integration of knowledge among engineering, design and business disciplines.

Finally, the contributions of one of the project partners have been described. Showing all the technical services for enterprises regarding the technology transfer and innovation used by the UPV and the models implemented for knowledge transfer.

Future research lines are led to show how the High Education Institutions in Israel apply the guidelines defined by the UPV and by the other partners belonging to the project IDEA Tempus. And also gather information from the monitoring phase in the future the activities and KTT models that will be implemented in Israeli universities, institutions, enterprises and research centres.

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