

## **UNIVERSITY-BUSINESS COLLABORATION FOR THE TRANSFER OF KNOWLEDGE**

*Today, most experts would agree that innovation, using the knowledge generated by public and private research centres, is essential for economic and social progress. It is therefore essential to foster a culture of innovation both in the centres generating that knowledge and in the business world.*

*In truth, all public administrations, from the European Union, with the introduction of the new EU framework programme for research and innovation (HORIZON 2020), to national and regional governments, are making serious efforts to foster the advancement of the knowledge society. Universities are one of the key players in the accomplishment of this objective, as they have become a primary source of knowledge generation and innovative technology.*

### **European programmes**

*With regard to the European Union, the objectives of the EU H2020 Programme are:*

- *To foster scientific excellence;*
- *To develop technologies and corresponding applications to improve Europe's competitiveness;*
- *To conduct research into important issues affecting European citizens.*

*This last objective is intended to solve specific societal problems, such as an ageing population, digital security, transition towards an efficient economy, and reduced carbon emissions, among other things.*

*Furthermore, the segment of the H2020 budget allocated to the development of public-private initiatives (PPP and JTI) has increased significantly.*

### **Spanish programmes**

*Efforts in these areas are also being made in Spain, both with the recent reform of the legal framework for public research – promoted since the adoption of Law 2/2011 of 4 March on sustainable economy – , and Law 14/2011 of 1 April on science, technology, and innovation, both of which aim to facilitate the generation and transfer of knowledge, and in the definition of the Spanish Science, Technology, and Innovation Strategy 2013-2020 and the Spanish National Plan for Scientific and Technical Research and Innovation 2013-2016.*

*The national plan has four objectives:*

- *Promoting talent and employability;*
- *Fostering excellence;*
- *Bolstering business leadership;*
- *Promoting R&D+i focused on societal challenges.*

## **Catalan programmes**

*In Catalonia, Law 1/2003 of 19 February concerning Catalan universities notes in its introduction that one of the fundamental objectives of the public university system in Catalonia is the “creation, transmission, and dissemination of scientific, humanistic, technical, and professional culture and knowledge, as well as preparation for professional practice.”*

*The 2010-2013 Research and Innovation Plan of Catalonia, in turn, defines its objectives and strategic lines for the development of research and innovation in Catalonia.*

*Today, with the development of the Research and Innovation Strategies for Smart Specialization in Catalonia (RIS3CAT) programme, the Catalan Government (Generalitat de Catalunya), in conjunction with all other stakeholders, has defined the following strategic objectives:*

- *To strengthen the competitiveness of the business environment;*
- *To promote new economic activities emerging from research, creativity, and innovation in order to create and exploit new market niches;*
- *To consolidate Catalonia as a European centre of knowledge and connect creative and technological capabilities, both in existing and emerging sectors;*
- *To generally improve the Catalan system of innovation: strengthening business competitiveness and directing policies towards encouraging innovation, internationalization, and entrepreneurship.*

*The Industrial Doctorate Plan is a strategy of the Catalan Government, in collaboration with Catalan universities, which aims to contribute to the transfer of technology and knowledge generated by universities, retaining talent, and placing doctoral students in companies to conduct R&D+i projects.*

## **Catalan university programmes**

*All of the Catalan universities are developing new mechanisms to promote research activities within the university community and to actively involve university research staff in those activities, as well as mechanisms to:*

- *increase knowledge transfer using the results of research activities;*
- *generate new business projects based on innovation;*
- *foster greater scientific, technical, and artistic collaboration in conjunction with other public or private institutions.*

*In order to implement this transfer of knowledge, all universities have professionalized structures, transfer offices (TTOs) which are responsible for facilitating and managing the transfer from universities to the business, social, and institutional arenas. These transfer offices basically serve as mediators between university research groups and the companies and institutions which could benefit from the knowledge and technology generated. They also support teacher-researchers throughout the transfer process, negotiate with different organizations or corporations regarding the conditions for collaboration, and prepare transfer agreements, etc.*

*This cooperation in innovation between universities and companies is accomplished in several different ways, as shown in Table 9:*

- *R&D and consultancy agreements*
- *University-business collaboration projects*
- *Contracts for the provision of services*
- *Licensing agreements for the use of patents/technology*

*The above information aims to demonstrate that institutions and administrations at all levels are on the right road towards making the knowledge society a reality. It is not an easy road to travel for either universities or for businesses, but it is perfectly clear that if we want to get there, we will have to work together.*

*Therefore, this year's monograph will present several success stories of university-business collaboration involving the public universities of Catalonia in the areas of research, development, and business innovation, demonstrating that we are committed every day to delivering and transferring knowledge and technologies from universities to the business world and to society as a whole. All of this rides on the firm conviction that by working side by side it is possible to achieve an innovative society committed to the values of the 21st century.*

*Some of these success stories illustrate timely collaborations to develop business innovation projects, and others demonstrate the public-private relationship via contracts for the transfer of knowledge/technology which have resulted in the creation of new spin-off companies, arising from Catalan universities.*

*What is also clearly reflected in these stories is that the Catalan science and technology system consists of universities supported by research centres of excellence, science parks and clusters, university hospitals, technological centres, and business innovation departments.*

*For Catalan universities, the road towards innovation requires a change in mindset so that any knowledge or technology that might provide value to society (in addition to being published in internationally recognized scientific journals) is, in fact, transferred to society, achieving an economic impact and, ultimately, affecting the citizens, who can in turn generate funding to support research. We thus come full circle, and by generating wealth, everybody wins.*

## UNIVERSITY OF BARCELONA

### MARKETING A KIT TO TEST FOR HEPATITIS A IN FOOD

*Ceeram - UB*

*Certain types of food, such as molluscs and various fruits and vegetables, may become contaminated during the production process with very harmful viruses, such as hepatitis A and noroviruses. In Europe there have recently been several incidents of contamination involving imported food which have had far-reaching health impacts, resulting in financial losses for the food industry. This occurs as a result of a lack of regulation in the European Union concerning the control procedures for foodborne viruses and, so far, a lack of suitable technology capable of providing large-scale control. Ten years ago the European Standardization Committee was established in order to elect and approve a benchmark method for analysing virus contamination in food items. The defined method is based largely on the results of the Enteric Virus Research Group at the University of Barcelona.*

*The Enteric Virus Research Group of the UB, led by Doctors Albert Bosch and Rosa M. Pintó, has also adapted the aforementioned method in the form of a kit to test for hepatitis A in food. The method was protected by two international PCT patents in 2008. The first concerns diagnosing hepatitis A, and the second pertains to controls to standardize the technique. These patents open the door for the sale of the method in the EU, but reserve exploitation rights in the rest of the world. The kit for detecting hepatitis A in food is a unique product that simplifies control of possible contamination, thus avoiding the need to wait days or even weeks for results and the subsequent financial losses. Furthermore, the fact that the procedure is standardized means it can be used by people without scientific training. At the same time, it reduces the risk for importers when transporting food, preventing possible monetary losses due to the confiscation or quarantine of such products.*

*In 2006, a French company called Ceeram came on the scene, an organization involved in leading research in this field. Ceeram began its activities in 2005, with a focus on the marketing and sale of solutions for analysing viral contamination in food. Ceeram funded the research group's patents because it believed that when imposing a standard process for analysing contamination in food, having this patent would represent a significant competitive advantage.*

*This case and the research group's experience in other projects demonstrates the difficulty of transferring knowledge and patents in the industrial sector. Large companies are not normally interested in new projects until they see that they are mature enough and sufficiently tested. In fact, in the case of the test kit for hepatitis A in food, before entering into contact with Ceeram, discussions were underway with an American multinational company which refused to incorporate the patent into its portfolio. However, this multinational company has reached an agreement with Ceeram to distribute the kit, taking advantage of its international presence.*

*So far the results have been very positive for all parties, and Ceeram is about to surpass the 'friends and family' funding stage and move forward to attract further investment, presenting profits from the past two years of sales which exceed one million euros and have increased by 200% since 2011.*

*As for the university involved in the project, which has been transferred to the Bosch & Gimpera Foundation, this represents a good example of how a technology developed in a university lab can reach society. The University of Barcelona will receive a percentage (royalties) of the profits earned by Ceeram through sales of these kits which incorporate patented technology developed by the University of Barcelona.*

## AUTONOMOUS UNIVERSITY OF BARCELONA

### STUDY AND TREATMENT OF SANFILIPPO SYNDROME

*Laboratoris Esteve - UAB*

*In Sanfilippo syndrome A, or Mucopolysaccharidosis IIIA (MPS IIIA), the mutation of a gene causes an individual's cells to begin to accumulate a substance called glycosaminoglycans, which cause damage in the affected cells and degenerative disorders in the organs, primarily the brain. The syndrome is hereditary, and if both the mother and father carry the mutated gene, their children have a 25% chance of developing the disease. The syndrome appears in children starting around age 4 in the form of a neurodegenerative disease, and life expectancy is typically between 15 and 20 years. Sanfilippo syndrome is considered a rare disease since its incidence is very low and, depending on the variant, affects anywhere from 1 out of every 100,000 to 1 out of every 1 million people. There is currently no treatment available and children affected by the disease only receive palliative therapies in order to alleviate some of their symptoms.*

*In 2006, the group led by Dr. Fàtima Bosch from the CBATEG (Centre for Animal Biotechnology and Gene Therapy at the Autonomous University of Barcelona) began to study the disease using gene therapy to attack the root of the problem through gene transfer in order to correct the deficiency at the DNA level. The project started with a contribution in the form of grants provided by MPS Spain, but it soon became apparent that additional funding was needed. In 2009, the project was fully incorporated into the R&D strategy of the company Esteve Laboratories, which develops certain projects entirely with internal means and others in collaboration with external centres, as in this case. The UAB group's project posed a major challenge: gene therapy for the treatment of hereditary diseases is a pioneering area of science with an immense social impact. For the same reasons, it also carries a high risk. This is why an alliance was established in the form of a public-private partnership wherein the UAB group designs and tests therapeutic approaches in animal models, and Esteve is responsible for presenting the therapy to the regulating authorities, the EMA in the case of Europe and the FDA in the United States.*

*One of Esteve's main contributions has been filling in the gaps between the research and the industrialization of the product. The company is also responsible for the proper management of the regulatory approval process and has thus ensured the stability and quality of the product. The latter was another major challenge because the CBATEG group did not have the facilities, investment capacity, or experience necessary for standardizing the processes involved in order to go from pre-clinical testing to a product suitable for clinical trials. In the context of this partnership, it is also interesting to observe how the agreement is reflected in economic terms. The key at all times has been transparency between the two parties. In late 2013, there was a new change in the approach to the operating model. First of all, there was the process of evaluation by the regulating authorities, and secondly, a slight improvement in the economic situation led Esteve to fully assume the costs required for subsequent phases. These next steps are extremely delicate and costly, and clinical trials are expected to begin in the coming months.*

*The impact of the eventual marketing of the therapy for MPS IIIA is obvious given the nature of the problems it causes. However, this project has also impacted two other areas related to the collaborative processes between universities and companies. For one thing, the approach to therapies for genetic diseases based on the techniques developed in the MPS IIIA project will also be applicable to many other cases and circumstances. The success of the MPS IIIA project and the patents obtained pave the way for research into other genetic diseases which can also be treated. And, above all, the experience has been important because it will prevent similar projects from reaching a point when they are no longer feasible and must be abandoned, with the consequent waste of resources.*

## POLYTECHNIC UNIVERSITY OF CATALONIA

### **ALLIANCE FOR BUSINESS DEVELOPMENT: HYDROGEN CATALYSTS FOR FUEL CELLS**

#### **PIME - UPC**

*In 2008, a Basque SME specializing in engineering and designing power sources and energy storage components got into contact with the Institute of Energy Technologies (INTE) of the Polytechnic University of Catalonia (UPC). After many years working as a supplier of structures for third parties, and having acquired state-of-the-art commercial knowledge, the company saw that there was an unmet need for the telecommunications industry and data centres: power reactors running on hydrogen fuel cells, replacing independent diesel generators or electrical batteries. To develop this new technology, the company began to search for research groups or technology centres working in this area. During their search, those in charge came across a scientific paper prepared by members of the INTE which described the components of a hydrogen fuel cell.*

*The INTE had developed a new hydrogen catalyst method based on microreactors with great potential for application in the area of energy storage. The research results were published in a scientific paper that fell into the hands of the heads of the Basque company, which was interested in developing a technology that would operate its fuel cell product by incorporating hydrogen fuel. The initial contact between the SME and the INTE allowed them to validate that the solution proposed by the university coincided with what the company was looking for. Suffice it to say that the SME made it clear from the start that it did not simply want to acquire a new technology, but rather it sought a partner with the knowledge to jointly develop and integrate the solution. For this reason, an agreement also established that the intellectual property rights would be shared, the industrial property rights would belong to the company, and if at any time there were economic returns, the university would receive profits in the form of royalties.*

*The results achieved under the first agreement were very positive and led to an extension of the agreement in order to encourage further development. However, this new phase required greater dedication on the part of the group's staff. The UPC proposed and applied for a UPC-company grant, which has now run its course, that funded up to 50% of the cost for an intern, which lasted three years. This formula was highly valued by the company as it represented significant financial support for the project.*

*This case demonstrates the ability to develop innovative technology in the context of a clear collaboration between a company with specific needs and a research group with the necessary knowledge and skills to meet those needs. However, this collaboration also exemplifies how an innovative solution alone may not be enough to reach the market. In the decision to market a product, many other factors also come into play which, in this case, led the company to postpone bringing the solution to market. As for the university, it is confident in the validity of the technology and its presence on the market. The hydrogen fuel cell solution offers competitive advantages over its competitors (conventional batteries and diesel generators) as alternative energy systems for telecommunication systems, repeaters, etc. Nevertheless, the production costs are still too high. The INTE is open to finding new business partners in order to promote the industrialization of the technology as the best option before creating a spin-off. Now the main challenge is to find that partner.*

## POMPEU FABRA UNIVERSITY

### SCIENTIFIC SOLUTIONS FOR COMMERCIAL SUCCESS

#### Yamaha - UPF

*In 1997, Yamaha presented a challenge to the Audiovisual Institute (which was the seed of what would later become the Music Technology Research Group, MTG), which is associated with Pompeu Fabra University: karaoke was experiencing a golden age in Japan, and Yamaha, who occupied a leading role in the industry, planned to develop a solution that would allow any amateur to be able to sing like a professional singer. After two years, the project ended up with a prototype that was not economically feasible. However, in 1999 MTG posed a new challenge to Yamaha: a solution allowing amateur musicians or professionals who do not know how to sing to put their voices in songs through a voice synthesizer.*

*In 2003, the first version of Vocaloid hit the market, but it was not until the second version was released in 2007, coinciding with the explosion in music idols based on virtual avatars and animation culture, that it became a resounding commercial success, ending up as one of Yamaha's star products. The appearance of Vocaloid on the market was a revolution in software applications for voice synthesis because it allowed for the creation of virtual singers and contributed to a new entertainment industry. Vocaloid is marketed as a 'singer in a box', and is designed to act as a replacement or substitute for the real singer. This approach has created an industry of its own, aimed at both professional and amateur musicians, and it allows other companies to use the voice synthesizer to record, create, and shape voices which are then made available to musicians.*

*The collaboration between MTG and Yamaha began over 15 years ago. During this time, in addition to Vocaloid there have also been two or three other stable, though smaller, collaborative projects involving voice processing technologies. The collaboration method typically consists of two to three year-long projects in keeping with Yamaha's corporate strategy. The company has a clear business focus and its collaborations are based on service provision contracts. Furthermore, this consolidated relationship has led the MTG research group to act as an innovation consultant for Yamaha when analysing the company's strategies in the field of music applications in light of new technology involved in social networking, mobility, etc.*

*As a result of the main project and the accumulated know-how, new branches of research have emerged which MTG has independently developed, leading to the creation of a spin-off. This is dedicated to the creation of voice and sound 'libraries' using voice processing technology developed by the research group with the Vocaloid voice synthesizer. The results and continuity of the collaboration is especially relevant, particularly given the high degree of competition (both commercial and research) in the world of music and voice technology. However, the experience reminds us that although the relationship between universities and businesses is well established, it is always necessary to maintain excellence because a competitor could appear at any time that may jeopardize the collaboration. Likewise, the collaboration with Yamaha shows that the university needs to recognize and facilitate an approach focusing on research in the area of engineering and service. A company like Yamaha is primarily focused on the development of commercial applications, and this is reflected in the timing of projects which are normally limited to two years of development. The challenge, for MTG in this case, is to meet the requirements, quality needs, and schedules demanded by the company.*

## UNIVERSITY OF GIRONA

### COMPETITIVE PRODUCT ON THE MARKET THROUGH INNOVATION AND LEADERSHIP

*Institut de Diagnòstic per la Imatge - UdG*

*Reaction time is critical when an individual suffers a stroke. A fast and accurate diagnosis is necessary in order to ensure as few negative effects as possible in patients. In 2000, radiologists treating patients who had suffered from a cerebral infarction had to perform calculations by hand based on analyses of 30 or 40 medical images in order to detect damage. The response time to apply the necessary treatment could take up to 40 minutes. It was in this context that Dr. Pedraza from the Doctor Josep Trueta Hospital in Girona, a leading centre for the treatment of cerebral infarctions and member of the Institute of Diagnostic Imaging (IDI), and Dr. Imma Boada, a researcher from the Image and Graphics Lab (IGLab) of the University of Girona, were brought together.*

*The IDI is a public company, affiliated with CatSalut, and the first created under the provisions set forth in the law on health planning in Catalonia, with the primary mission of managing, administering, and executing diagnostic imaging and nuclear medicine services. The Image and Graphics Lab (IGLab) is a research group at the University of Girona and part of the Institute of Informatics and Applications and the Biomedical Research Institute of Girona. Since September 2010 it has been a TECNIO group under the name TIG (Graphics and Image Technology), a label awarded for the quality of the group's research and knowledge transfer. The research and knowledge transferred by the group mainly focuses on the fields of computer graphics and image processing.*

*The IDI and IGLab have initiated a collaboration agreement with the aim of developing and researching methods and tools to support and assist diagnostic imaging. A result of this cooperation is the creation of a multidisciplinary team that works to facilitate and optimize the tasks performed by diagnostic imaging professionals. The IDI states its needs and the IGLab applies the most advanced techniques in order to develop methods to meet those needs. The ability to develop custom tools using the most advanced research techniques while simultaneously meeting the needs of the specialists involved has become a source of great potential for the team. It was from this collaboration that the Starviewer project was born.*

*Starviewer is a radiological viewer which integrates both basic and advanced features into a single platform to meet the needs of non-specialist doctors, specialist doctors who are not radiologists (such as trauma specialists, surgeons, etc.), as well as radiologists themselves. Starviewer is available in different languages (Catalan, Spanish, and English), and is a multi-platform application (capable of running on Windows, GNU/Linux, & Mac OS X). It has been validated by the IHE, supports the DICOM protocol (standard for medical imaging), and includes different profiles defined by the IHE (Integrating the Healthcare Enterprise), ensuring integration with any health information system: PACS (medical imaging archiving system), HIS (hospital information system) and RIS (radiology information system), among others. Starviewer offers a very strong competitive advantage due to its reduced costs, and this is why it is now installed in most hospital centres throughout Catalonia, with over 250 users. The Starviewer team, which consists of engineers, PhD computer science specialists, and physicians, is responsible for maintenance, user and technician training, and the ongoing development of the tool.*

*The product has currently reached a high stage of robustness and stability which makes it very competitive. The economic and technical challenge is now to maintain product competitiveness and to meet the needs of radiologists. To this end, both project partners are exploring new ways internationalize and use the Starviewer, while also providing a public service at ICS hospitals. One such idea is the creation of a spin-off. They are currently preparing an open-source version which is slated for release in early 2015, thus making it accessible to a much larger number of hospital and research centres. The same group will be responsible for providing the necessary technical support.*

## UNIVERSITY OF LLEIDA

### PROVEN EFFECTIVENESS IN PLANT CULTIVATION

*Promisol S.A. - UdL*

*During the course of one of its research activities, the University of Lleida visited the company Promisol S.A., planting a seed that would yield its fruit several months later.*

*One of Promisol S.A.'s most prominent products is Bioestim Plus, which promotes and enhances natural crop mechanisms against fungal pathogens, thus preventing diseases caused by oomycetes (fungi) such as Pythium and Phytophthora. The company has never had any doubts about the benefits of its product, and despite the fact that it is non-toxic and does not require laboratory approval, heads of the company felt it was important to have scientific verification and certification for the market.*

*And thus a collaborative project began between the two organizations in 2009 which lasted three years and which aimed to study the effectiveness of the product Bioestim Plus. The study focused on comparing and examining whether this product results in better yield in the cultivation of horticultural plants, as well as greater responsiveness in such plants, when they are subjected to various environmental stress conditions, such as salinity or low temperatures.*

*The earliest contact between the company's executives and the UOL led to a first collaboration agreement between the two entities. This agreement established the task of conducting tests and analyses at various stages in order to contrast and highlight the effectiveness of Bioestim Plus in the presence of plant pathogens while following scientific protocol. On the University of Lleida's end, the research was carried out by the ETSEA Agricultural Ecobiotechnology Group. The various trials of the antifungal properties of Bioestim Plus conducted by the UOL certified and demonstrated the positive response of the products tested under controlled production parameters. It was also possible to observe and improve specifications for the use of Bioestim Plus by defining new applications.*

*Given the great results and successful coordination of the first agreement, a second agreement was signed in 2011 with the intention of verifying if the product also had positive effects on fruit and vegetable crops subjected to environmental stress, as well as to determine if its components offered a competitive advantage to the treated plants. As with the first agreement, the results were superb and made it possible to specify the applications in each case of environmental stress. With regard to management, the two agreements were structured around a work plan jointly defined by the scientific and technical teams of both organizations, as well frequent follow-up meetings by the technical team.*

**ROVIRA I VIRGILI UNIVERSITY****INNOVATIVE TECHNOLOGY FOR DETECTING INFECTIONS***Medcom Tech - URV*

*The company Medcom Tech S.A. (Medcom Tech) was founded in 2002 and focuses its efforts exclusively on the provision of innovative solutions and products, and in particular metallic implants, prosthetics and high-end devices for the fields of orthopaedics, traumatology and neurosurgery. In 2010, Medcom Tech joined the Alternative Stock Market (MAB) to access capital markets and achieve growth and investment, in accordance with its strategic plan. At the same time, the company began implementing strategic changes, directing its attention towards open innovation with the aim of incorporating new cutting-edge technology as a lever for future growth. Up until then, Medcom Tech had established a consolidated position in the market for orthopaedic surgery in Spain, Italy and Portugal, but in 2013 it became apparent that the company needed to change its business model, which was based on the provision of licensed products, to a model based on its own technology and proprietary products.*

*The commitment to open innovation got the company involved in projects being developed by Rovira i Virgili University (URV) and the Chemistry Technology Centre (CTQ), working with the Zeptonic research group (Plasmon and Ultradetection Group), led by Dr. Ramón A. Álvarez Puebla, a researcher of the ICREA (Catalan Institute for Research and Advanced Studies), in association with the CTQ. The research activities which drew the attention of Medcom Tech S.A. were those aimed at generating methods to identify the chemical components in liquids, research which is based on a system that makes it possible to know the origin of an infection through the instant detection of microorganisms, without having to perform repeated or unnecessary medical testing on patients. One of the basic needs associated with orthopaedic surgery is to reduce the occurrence of infections. It is estimated that 2% of patients who enter an operating theatre suffer infections, and that some 50,000 people in Europe die each year from complications related to hospital infections. But it is not just death from infection, but also complications which affect the quality of life of patients, especially the elderly, which makes it necessary to administer antibiotic treatments as well as other actions. Apart from the effects on patients, these complications also significantly impact hospital costs.*

*On the basis of this detection method, Medcom Tech and the URV set out to work on finding collaborative solutions and methods. Since the first meetings, during which time they verified and tested the robustness and reliability of the technology, a process began which lasted eight months to formalize the establishment of a new company, Medcom Advance S.A. (Medcom Advance), a spin-off of the URV, 75% of which is owned by Medcom Tech and 25% of which is distributed between the researcher responsible for the technology, Dr. Ramón A. Álvarez Puebla (10%), the URV (5%), the CTQ (5%), and the ICREA (5%). The process of creating a new company involved the signing of a new transfer agreement for the use of the technology. The objective was to create a joint venture between institutions and business. Currently, as of mid-2014, the project is in the development phase. Funding for this stage, which requires significant investment efforts, comes in large part from the private equity of Medcom Tech and, to a lesser extent, from loans from the CDTI (Centre for Industrial Technological Development).*

*The project reflects the desire of institutions to bring the technologies developed by their researchers to society, in collaboration with the companies involved. In this regard, the company using the technology sends royalties to the institutions holding the corresponding patents in accordance with the provisions of the transfer agreement for the use of the technology. However, Medcom Tech is convinced that the value of the product requires the involvement of the URV, as well as the other institutions, and for this reason all three organizations have decided to participate in the shareholding of the university spin-off Medcom Advance S.A., recognizing it as a corporate spin-off of the URV.*

## OPEN UNIVERSITY OF CATALONIA

### SUCCESSFUL SOLUTIONS FOR EDUCATIONAL INNOVATION

#### Diprotech - UOC

The UOC offers a Bachelor's Programme in Telecommunications Technology which encompasses practical subjects within the area of electronics. Since the courses on electronics are offered online, it can be difficult to introduce practice sessions with hardware. As such, educational innovation was needed to bring a sort of laboratory into the homes of students, with the possibility of sending them a practice kit as well. The ITOL group (Interactive Tools for Online Learning) of the UOC set out to find a solution to the following challenge: constructing a physical and virtual board so that students could perform basic practice tasks (circuit assembly, voltage and resistance measurements, etc.), operating on a very tight timetable and at a very affordable price. The ITOL came up with an initial approach to the requirements needed for the practice kit, and it got in contact with the company Diprotech to evaluate its development. Diprotech offers industrial and electrical engineering services, specializing in the development software and hardware solutions.

The head of the hardware department at Diprotech at the time was Mr. Carlos Pacheco, who served as one of the teacher-consultants for the course. He was a key player since his knowledge of the students' needs in terms of the practice and teaching format allowed for the project to move forward very quickly. Once the kit was ready, Diprotech also took charge of preparing the documentation, study guides, and user manuals, as well as the production of the kits to send them to registered students. The result was the Lab@home kit with a very low market cost and all of the features necessary for practising electronics at home.

The Lab@home kit has been successful because its initial configuration, both hardware and software, continues to be valid. It has also given rise to very few incidents, which is reflected in the high ratings students have given regarding their experience with the kits. All of this has generated optimal results in terms of training effectiveness and efficiency from savings in the training process. The academic impact has also been very positive, making it possible to ensure educational quality through these practices. The project has also led to the publication of several articles, and a paper is planned for a technology journal.

Additionally, the Lab@home kit has recently been protected by a 'utility model'. This offers protection for inventions of a lower rank than those protected by patents, for a period of 10 years, and is intended for objects which provide new tools or practical advantages as a result of their industrial design or configuration. Protection of the Lab@home kit as a utility model presents several opportunities for the ITOL-UOC and Diprotech, which are about to sign a new framework agreement. This agreement stipulates that the UOC shall provide access to the product at other centres, universities, and training centres, as well as reserving the right to use the technology for private purposes, while receiving licenses/royalties from sales. In this regard, in order to test its market value, ITOL visited several academic institutions to present the kit and get feedback in order to make it even more attractive to a potential market. During this new phase, Diprotech will be in charge of production and direct sales. This in turn implies a change in the Diprotech business model, which will transition from only offering engineering services to being an industrial company. It is a strategic challenge which the company readily accepts.