I2Tech- CAMPUS MONTEGANCEDO
Universidad Politécnica de Madrid

POLITÉCNICA
"Ingeniamos el futuro"

CAMPUS
DE EXCELENCIA
INTERNACIONAL

QUALITATIVE AND QUANTITATIVE DESCRIPTION OF THE PROGRESS

Montegancedo Campus of International Excellence (CIE)

2010-2013

September 2013

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMIA Y COMPETITIVIDAD

GOBIERNO DE ESPAÑA
MINISTERIO DE EDUCACIÓN, CULTURA Y DEPORTE

INFORME DE PROGRESO

"CAMPUS MONTEGANCEDO:

CEI orientado a la innovación tecnológica internacional I2 Tech"

Periodo: 2010-2013

Project data: CAMPUS MONTEGANCEDO: CEI orientado a la innovación tecnológica internacional I2Tech

Type of CIE: **Global** + **Regional** ☐

Acronym: I2 Tech Campus Montegancedo

collaborating university: UNIVERSIDAD POLITÉCNICA DE MADRID (UPM)

Participating University: UPM

Other promoting entities of the CIE: not applicable

Year: **1º (2012)** ☐ **2º (2013)** + **3º (2014)** ☐ **4º (2015)** ☐

Period: 2010-2013

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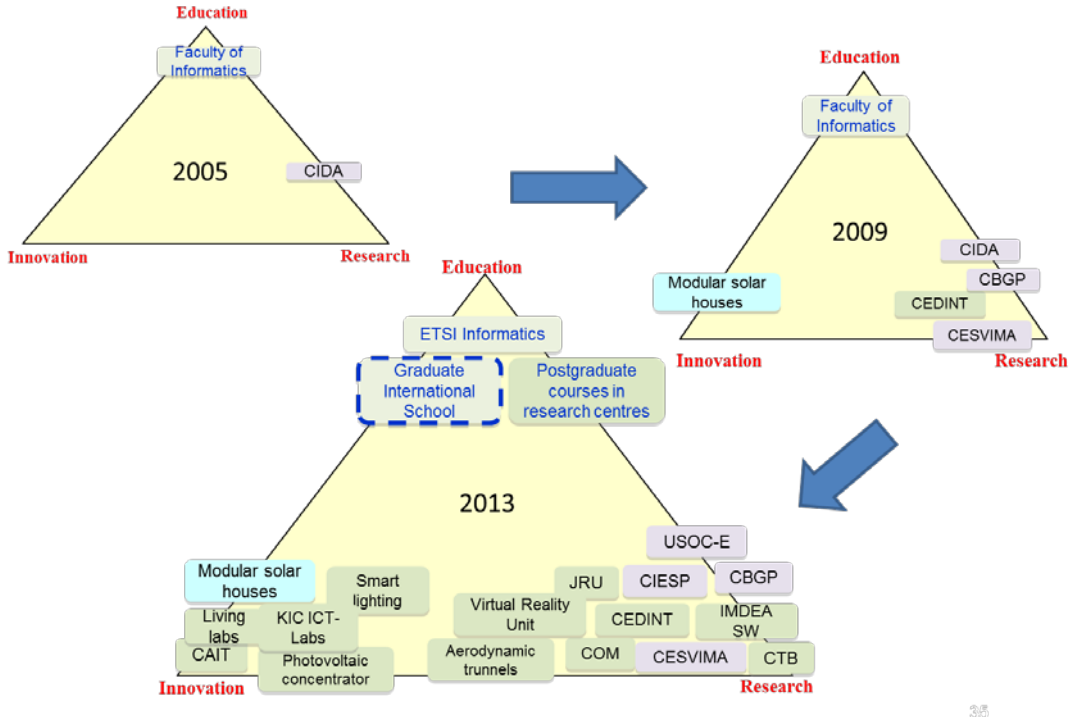
Ratification of the objectives

The essential objective of the CIE Montegancedo remains valid: **support to technological innovation jointly with the business sector**, by using information and communication technologies (ICT) as a backbone and catalysing element through the empowering of the research activity.

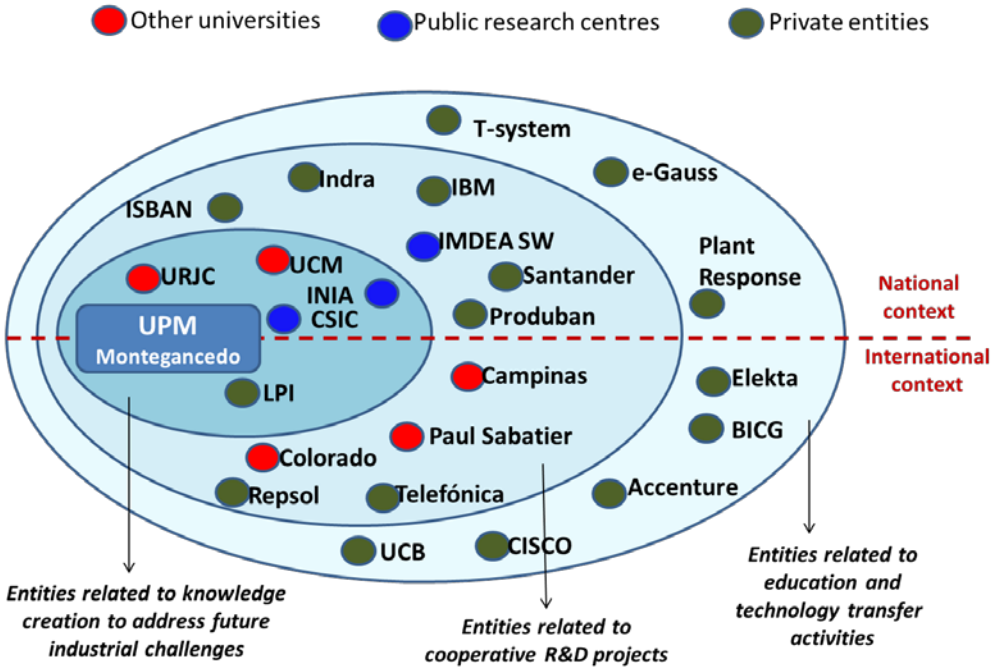
The **CIE Montegancedo** is a key element to become an open innovation ecosystem by itself where the UPM and other aggregated entities jointly generate value through the combination of teaching, research and innovation. Its privileged relationship with the business sector, makes the CIE a **strategic business partner to accelerate the innovation process.**

The institutional objective to increase the "**excellence in technological innovation as a signal of identity of the UPM**" is possible thanks to the research activity. Specifically, it aims to combine the **education axes** with the **research axes** of those potential marketable results.

The "units" available at the ICE Montegancedo by September 2013 and their main relationship with perspectives of the **knowledge triangle have strongly evolved over the time:**



The recent inclusion in this period of **additional private entities** such as ICE aggregations reinforces the relationship with the launching of new projects. It has made the creation of an **open innovation ecosystem** around the intensive use of the ICT. The figure corresponds to the **conceptual vision of the ecosystem** around the ICE Montegancedo.



Evolution of the main results obtained to date

The UPM has kept the economic investments effort as planned and today that figure is over **120 M€**. In this sense, the physical development and the research abilities of the Campus have evolved with the construction of buildings for R&D centres:

1. The business centre and its extension for the Support Centre for Technology Innovation (CAIT) and the Research Centre for Heritage Studies (CIESP).

2. The Centre for Smart Homes (CEDINT) and the The Madrid Centre for Supercomputing and Visualization (CESVIMA)

3. Centre for Biomedical Technology (CTB) y the Centre for Open Middleware (a joint centre with ISBAN, PRODUBAN and Santander).
4. Centre for Plant Biotechnology and Genomics (CBGP).
5. Building for the headquarters of the IMDEA Software Institute



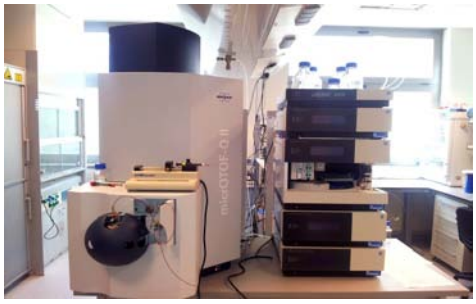
These activities have been accompanied by the different **acquisitions of new scientific equipment such as the** virtual reality cave of CEDINT, the Magneto-encephalography system of the CTB, the **Magerit 2 supercomputer** at CeSViMa, the astronomical observatory of the ETSI Informáticos, the greenhouses of CBGP or the cross-beam microscopy of the CTB. The main equipment acquired in 2012-2013 is as follows:

1. Acquisition of the **Magerit 2 supercomputer** and its location in the CeSViMa


2. Facilities for the **cultivation of plants under controlled conditions at the** CBGP.


3. Acquisition and installation of a **P3 level biological security laboratory at the** CBGP

4. Acquisition and installation of a **metabolomic platform** at the CBGP



5. Installation and putting into effect of new **wind tunnels** at the IDR/UPM
6. Installation of a **clean room for trials** at the CIDA for the USOC-E, oriented towards experimental flight model trials of the International Space Station.

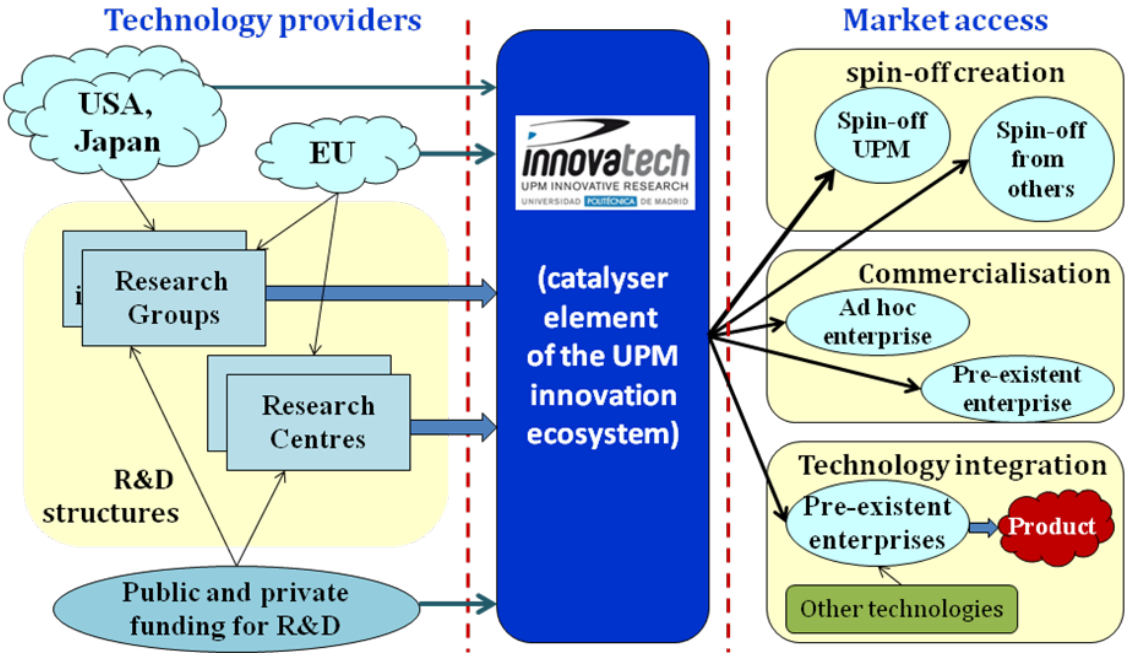
7. Installation of the *Functional Characterization of Magnetic Nanoparticles Platform* (CIBERbbm-UPM).

8. **Pilot Fermentation Plant** at the CBGP, installation financed by the *Bill* & *Melinda Gates* animal facilities foundation
9. **Concurrent engineering room at the** IDR/UPM (CIDA)


Evolution of the ICE in the exploitation of results

The evolution in the number of the **patents granted to the UPM** by the OEMP, the incomes derived by **knowledge and technology licenses** and the evolution in the number of **technological companies created by the UPM** indicate a significant increase. Specifically the UPM has obtained 50 patents in OEPM and they created 17 technological companies during 2012.

During 2013, the construction process and the occupation of the **Support Centre for Technology Innovation** (CAIT) and the launch of the *Innovatech* programme for the UPM technology commercialization have finished satisfactory.



The access to the market has been conceived from three complementary approaches: **creation of technology-based businesses, commercialization of the technology through agreements with already created businesses and integration of the technology of the UPM with other actors.**

There are a living lab and technological demonstrator of 3D TV and a Laboratory for experimentation on "spaces of the future". A new living lab with Santander, ISBAN and PRODUBAN in technologies and services for bank sector that will be culminated at the end of 2013.

The **Photovoltaic concentration pilot plant** is in process (October 2013) as well as the **demonstrator of intelligent illumination in open environments (November 2013) and finally the demonstrator of modular constructions with photovoltaic solar energy** designed by the UPM for the Solar Decathlon competition.

Evolution of the internationalization process of the Campus

The results obtained by the CIE Montegancedo were very positive, from 12.36% foreigner students in 2009 to 21.08% in 2011 and 49.52% in 2013. Likewise, the number of FP7 international projects captured by the CIE Montegancedo was from 4,497,682 in 2009 to the accumulated figure of 10,590,953 in 2013. New highlighted actions are:

1. Creation of a **European Laboratory Associated to the CNRS and the Universidad de Toulouse in the area of computer engineering**.
2. Creation of a **Joint Research Centre in Bio-energy with the *Universidad de Campinas*** (Brazil)
3. Agreement signed with the **University of Colorado in Denver (USA) on the subject of health.**
4. Agreement signed with the **Forschungszentrum Jülich - FZJ (Jülich Research Centre) in Germany and the visualisation and analysis of data**.

5. **Creation of a Node Associated with the "Community of de Innovation and Technology" (KIC) ICT-Labs** of the European Institute de Technology and Innovation (EIT)
6. Agreement with the **Bill & Melinda Gates Foundation**
7. Agreement with the **Research Centre in Complex Systems** of the **CNR (Florence, Italy) FET**
8. **Flagship of the European Commission with the Human Brain Project proposal**

Consolidation of the relationships with the aggregations

The **differential reality of the CIE Montegancedo** has been centred on the orientation towards alliances **with the business sector**. The following elements of an institutional character can be highlighted in this line of activity:

1. Joint unit for the exploitation of the **virtual reality cave** with the company **T-Systems**
2. Joint unit for the exploitation of the magneto-encephalography system with the company Elekta for the training of technicians in MEG and the development of medical protocols.
3. Collaboration agreement with ESA for support for the use by the Spanish business of the concurrent engineering hall.
4. Collaboration agreement with the company **IBM** for the use of the **Magerit-2 supercomputer** for the advanced simulation in areas of neurosciences
5. Collaboration agreement with the ***grupo Santander*** for the promotion of an **innovative "open middleware" ecosystem** (linked to the COM).
6. Institutional agreements with the following entities: INDRA (in the area of health platforms associated to the CTB), **ITP** (in the area of aerodynamic trials associated to the CIDA), **Telefónica I+D** (in the area of the advanced development of software constituting a JRU with the UPM and Institute IMDEA Software), **frontiers research** (the project for the creation of the Spanish node for the development of open publication software platforms), **CISCO/CITRIX** (agreement for the virtualization of laboratories by means of the installation of servers in the CESVIMA cloud), REPSOL (implementation of a collaboration project with the Universidad de Campinas within the Inspire program with CBGP and CESVIMA)**, KIC ICT-**Labs (associate Partner Group) of **INDRA , Telefónica, ATOS** .

The effective setting up of an Advisory Board of the Montegancedo ICE with the incorporation of representatives from all of the aggregations. The work Group of “Commercialisation of technology” and Work Group of “Internationalization of the R&D&I activity” have been set up in 2013.

Policy for human resources and advanced training

The relevant activities carried out in this period have been as follows:

1. Agreement with the **BBVA Foundation** for senior researchers: computational biology (CTB), bio-computing (CBGP), medical Imaging.
2. COFUND-UNITE UPM: incorporation of 18 PhD graduates (FP7 “People)
3. AMAROUT I and AMAROUT II: the Instituto IMDEA Software has attracted nearly 12 international researchers to the Campus.
4. Internal program for the contracting of PhD graduates at CIE Montegancedo (CEDINT, CBGP, CESVIMA and the ETS de Ingenieros Informáticos).
5. Contracting pre and post doctorate engineers and researchers (350 during 2013)

The PhD Degree programs related to the Montegancedo ICE (in some cases the impartation is total and in other cases partial with the implication of different schools at the UPM) which have achieved the recognition of PhD Degree with **the Seal of Excellence** are as follows:

1. At the ETSI Informática: PhD in Advanced Computing for Science and Engineering, PhD in Artificial Intelligence and PhD in Software and Systems
2. At the CBGP: PhD in Biotechnology and Genetic Resources of Associated Plants and Microorganisms - Seal of Excellence
3. At the CEDINT: PhD in Photovoltaic Solar Energy, PhD in Communications Technologies and Systems
4. At the CTB: PhD in Biomedical Engineering
5. At the CIDA: PhD in Aerospace Engineering - Seal of Excellence

Likewise, an effort is being made to widen the range of **official Masters’ Degree programs**, and are as follows:

- At **CBGP:** Erasmus Mundus: *“Plant Virology in the new era-breeding for resistance”* (BRAVE).
- At the **CTB:** Preparation for a Masters’ Degree in "Translational Research" promoted by the CTB together with the UAM and the University of Colorado.
- At the **CAIT, ETSI Informáticos** and **IMDEA-Software:** a. Preparation for a Masters’ Degree related to the Spanish node of the KIC of the ICT-Labs

Finally, the program for the ***actúaupm*** Creation of Businesses has been consolidated as a fundamental program of the entrepreneurship activity at the UPM along with Commercialisation Courses.

Interaction between the Campus and territorial environment

A specific activity has taken place in 2013 to hold different international conferences and seminars on the Montegancedo Campus to increase the visibility of the Montegancedo ICE in the area of research: ***New Frontiers in Plant Biology*** **(CBGP), XXXIII** ***Dynamic Days Europe (CTB),*** **3rd EWPC** (*European Workshop on Plant Chromatin*) **(CBGP), 4th JVRC** ***Joint Virtual Reality Conference*** (CEDINT) and it is envisaged for December the **1st International** ***Workshop on "Innovation and Entrepreneurship"*** as well as a new design of the website: www.upm.es/Montegancedo.

Likewise, **'Open Doors' days** within the framework of the Science Week from the Madrid regional Government were celebrated at the ETSI Informática as well as a **Summer School Campus** for **s**tudents from the 4th year of ESO and the 1st of Baccalaureate. Besides, the **Museum of Computer History** has been improved its facilities thanks to the CIE.

This external visibility is also linked to the international recognition that the E-USOC team has obtained from the European Space Agency (ESA) for its work and the GEOFLOW-2 experiment carried out on the International Space Station. This recognition has also been specified in the recognition awarded to Professor Juan Carlos Miñano from CEDINT in the "A.E. Conrady Award" from SPIE (International Society of Optics and Photonics) for their work on High Performance Photovoltaic Concentration Cells.

Envisaged future evolution

The UPM had to **adapt the rhythm of the development of the ICE** to the current economic resources available without altering the essence of its strategic objectives.

1. **Increase the number of students** at the CIE Montegancedo
2. Increase the number of **research or technological centres in conjunction with other public or private entities** which will make the research activity more dynamic.
3. Establish **close relationships with the ICE Moncloa and the other campuses of the UPM** (specifically Campus Sur and Tecno-Getafe).
4. Develop around the Montegancedo ICE a **technological ecosystem of open innovation**
5. Complete the setting up of **scientific infrastructures of the Campus**

6. Increase in the participation in **large international research projects**

7. **Launching of two micro satellites** designed and integrated in the UPM

As this report demonstrates, **a large part of the strategic objectives proposed by the UPM in the initial proposal of the I2Tech project have been achieved** through which demonstrating the validity of the institutional commitment made. As regards the **2012 Progress Report,** evaluated positively by the International Commission, it must be noted that the only observation made as regards the finalization of some of the activities pending is that it was achieved in spite of the complex economic framework that has had to be generated.

In short, we find ourselves before a **Campus, original in its conception**, **promoting an international excellence based on technological innovation, promoting alliances with private entities, incorporating one of the seats of the UPM Park, and developing harmoniously with an area of natural beauty in the upper basin of the River Manzanare**s.

Summary of key indicators for the Montegancedo CIE

Indicador	2009		2011		2012 y 2013		Commet
	Totales	CEI	Totales	CEI	Totales	CEI	
UPM publications in JCR journals	1,348	79	1564	144	1.321	216	Data 2012
Nº of research centres or technological	8	3	13	4	12	6	Without counting the Faculty or the USOC
Nº of international projects obtained	61	21	72	18	155	35	Taking to account the main researcher. Data 2012 y 2013
Costs of international projects obtained	9.961.660	4.497.682	19.533.618	6.885826	23.391.814	10.590.953	Taking to account the main researcher. Data 2012 y 2013
Costs of projets with companies	56.058.699	11.156.096	48.816.316	6.855.350	30.075.606	5.460.548	Data 2012
Official Undergraduate students	37.285	2.232	38.566	1.592	37.838	1.658	Year 2012-2013
Master's degree students	3.280	196	3.689	234	3.453	210	Year 2012-2013
PhD graduated incorporated	105	14	166	16	196	22	Year 2012
Research staff in training	437	22	504	47	550	64	PIFs with a grant or official contract
Phd students	3.280	196	3.689	234	3.453	830	Year 2012-2013
Number of PhD theses read	203	20	117	15	249	31	Year 2012-2013
% non Spanish students	7,12%	12,36%	9,51%	21,08%	24,04%	49,52%	Year 2012-2013
Patents conceded by the OEPM to the UM	25		39		50		UPM total data 2012
International extensions	44		81		66		Total UPM data 2012
Patents licensed	29		57		72		Total UPM data 2012
Spin-offs businesses created	15		17		17		Total UPM data
University –	81		84		81		Total UPM data

business chairs				2012
Total R&D contracting	45,96	44,04	38,26	It is not possible to divide/ Just Art. 83 and Foundations signed per year
Accumulated investment*	55,4	11,4		The initial construction of the ETSI Informáticos is not considered

Overall evolution of the Montegancedo Campus

Centre or unit located on the Montegancedo ICE	Investment in Infrastructure made * (€M)		Number of researchers (staff, post-docs)		Nº of Masters' and PhD Degree students		Agreements with aggregations
	2005-2011	2009-2013	2009	2013	2009	2013	
ETSI Informáticos*	1,6	0,1	203	262 (170 PDI)	378	375	1
CEDINT	8,6	0,6	24	27	137	238	2
COM	1	-----	0	50	0	0	3
CBGP	12,8	0,8	50	78	74	44	2
CTB	11,7	1,6	32	47	73	92	4
IMDEA Software	10	13	17	29	9	17	4
CIDA-IDR	2,5	0,2	19	29	153	184	2
CIDA-USOC-E	0,2	----	----	----	----	-----	1
CESVIMA	2	2,7	8	12	-----	-----	1
CAIT		5,7	----	----	-----	------	
Centro de empresas	5	---	-----	-----	No aplicable		
TOTALES*	55,4	24,7	353	534	824	950	20

Summary of the key landmarks in the evolution of the activities at the Montegancedo CIE

Annual payment Type of activity	2010	2011	2012	2013
Teaching				
New undergraduate programs (year of creation)	Biotechnology Biomedical engineering			
New postgraduate programs				Masters' Degree in Computer Engineering Masters' Degree in "City sciences"
International PhD Degree School			Erasmus Mundus	KIC ICT-Labs PhD Degree program
Training towards entrepreneurship	7th Creation of businesses	8th Creation of businesses	9th Creation of businesses 1st Course in the Commercialisation of technologies	10th Creation of businesses 2nd Course in the Commercialisation of technologies
Research				
R&D centres created on the Campus	CTB CEDINT IDR CBGP	COM CIDA (IDR+E-USOC)		CESVIMA CIESP
Joint	Elekta	CSIC	COM	Telefónica (JRU-

UPM-entity units	T-Systems CIBERbbn	UCM	URJC Hospital Puerta de Hierro Telefónica (JRU-IMDEA SW)	UPM)
University – business chairs	Clarke & Modet FDI			eGauss (substituting FDI)
Innovation				
Commercialization	Marcelino Botín Foundation		AJ Calero	Plant Response
Agreements to support technology licences			e-Gauss Plant Response	Calero AJ Clarke & Modet
Putting into effect of living labs and demonstrators	Efficiency	Solar dwellings	TV-3D	Spaces of the future intelligent Illumination Photovoltaic demonstrator Bank of the Future
Spin-offs generated on the Montegancedo ICE	15 5 CEI	17 6 CEI	17 7 CEI	10 (up to 30 June) 4 CEI
Internationalization				
R&D agreements signed with non-Spanish entities	Université du Toulouse (France)	University of Colorado (Denver, USA) Universidad Campinas (Brazil)	Julich Centre	CNR (Florence) UCB Pharma Philips ICT-Labs-EIT Frontiers-Nature

				ETH Zurich Roskilde U.
International Congress and Workshops			4th JVRC	XXIII Dynamic Days 3th Plant Chromatin 1st Innovatech
Improvements to the Campus				
Additional car parking spaces	30 (CTB)			30 at the CAIT 25 exterior
Accessibility and security		Barriers to entry		Biometric identification
Signposting	Sign panels on the M-40			Informative panel Information stands
Relationship with the socioeconomic environment				
Summer school	Sí (20)	Sí (20)	Sí (20)	COM (10) Camping
Science week	Yes	Yes	Yes	Envisaged
Spin-offs housed in the ICE with R&D agreements	LPI Algenex	Artificial vision		e-Commerce Frontiers
CEI Reception office	Faculty of Computer Engineering			CAIT ETSI Computer Engineering

Museum	Museum of Computing			
Governance				
Advisory Council of the CEI			Creation of the Advisory Council	Advisory Council Work Groups "International Advisory Board" (CAIT)
Entities allied to R&D centres	LPI T-systems	CSIC UCM URJC	Hospital Ramón y Cajal	Vivaki Communications SLU y Mimétrica SL (in process)
Delegate of the Rector	Vice-Rector for Research	Vice-Rector for Research	Vice-Rector for Research	Deputy Rector for strategic programs

Table III. Progress indicators

Area	Indicator	Initial situation	present situaion	% progress
Improvements directed at the adaptation and implantation at the EEES	Number of undergraduate and master's degree students at the CIE	2232	1868	-16,31
Improvements directed at the adaptation and implantation at the EEES	Research staff in training at the CIE	22	64	190,91
Improvements directed at the adaptation and implantation at the EEES	Number of Phd students at the CIE	196	830	323,47
Improvements directed at the adaptation and implantation at the EEES	% of non Spanish Phd students at the CIE	12,36	104,00	741,42
Improvements directed at the adaptation and implantation at the EEES	Number of of doctors and research staff incorporated in training	36	86	138,89
Scientific improvement	Number of publication in JCR journals at the CIE	79	216	173,42
Scientific improvement	Nº of international projects obtained at the UPM	61	155	154,10
Scientific improvement	Nº of international projects obtained at the CIE Montegancedo	21	35	66,67
Scientific improvement	Costs of international projects obtained at the UPM	9.961.660	23.391.814	134,82
Scientific improvement	Costs of international projects obtained at the CIEMontegancedo	4.497.682	10.590.953	135,48
Scientific improvement / transfer of Knowledge	Number of PhD theses read at the CIE	20	65	225,00
transfer of Knowledge	Nunmber of patents concede by sthe OEPM to the UPM	25	50	100,00
transfer of Knowledge	Number of spin-offs busnesse created at the UPM	15	17	13,33
transfer of Knowledge	University- Chairs at the UPM	81	81	0,00
Scientific improvement / transfer of Knowledge	Total R&D contracting	45,96	38,26	-16,75
Scientific improvement / transfer of Knowledge	Accumulated investment UPM (2005-2011) with CIE 2009-2011 programmes	55,4	67	20,58
Scientific improvement / transfer of Knowledge	Number of research centres	3	4	33,33
Scientific improvement / transfer of Knowledge	Institutional agreements with the aggregate entities	0	18	

Table I. Description of project activities

Scope	Adaptation to Higher Education European Space
Activity	Acquisition and implementation of infrastructure for a training laboratory in the field of Biotechnology
Objectives	To establish and optimize the use of training labs for teaching in the area of Biotechnology at the level of the last year (Course on biotechnology) and Master (Official Master on Forest and Agricultural Biotechnology) taught currently or in the future at CBGP

Progress towards objectives

Acquisition of the necessary equipment, already proposed, will allow to start operation of training labs at CBGP starting the 2013-2014 academic year. This equipment has been chosen and acquired so as to allow teaching of the maximum number of subjects in the same laboratory.

Description of work carried out and role of participants

A study has been carried out to identify those Degree and Post-Degree subjects most appropriate for teaching at CBGP rather than at a conventional Teaching Centre because they can benefit from interaction of the student with research teams. The laboratory teaching of these subjects has been defined, as well as their material needs. As a results, the equipment listed below has been acquired.

Most significant results

The necessary equipment has been purchased. Part of it is already in place, the rest will be deployed along September 2013.

Explanation on the use of human, material and economic resources

CBGP has implicated teaching staff responsible for the different subjects in the Grado de Biotecnología and del Master Oficial in Biotecnología Agroforestal, specifically both coordinators (J.M. Palacios y S. Sacristán, respectively) to define needs. Also, members of the Direction board have researched market and chosen specific brands and models for purchase. All these are human resources provided by CBGP and are not financed by CEI

The following equipment has been acquired:

3 Pipettes Handrop Digital SC, 2 – 20 µl, ref 770080
3 PipettesHandrop Digital SC, 20 - 200 µl, ref 770070
3 PipettesHandrop Digital SC, 100 - 1000 µ , ref 770060
2 Magnetic stirrers with heating (Temp. 300ºC),ceramic plate, ref 1203-C
1 Vortex saker LBX V5, with speed control , ref LBX V05
1 Refrigerator Combi Laboratory Liebherr , ref LCv4010
2 Incubators Nüve, 120 L, ref NU-EN500
1 Orbital shaking incubator for microorganism culture in liquid media, mod. Mini Shaker , Shel Lab, ref SL-SI2-2
1 Nucleic acid electrophoresis system Maxi Duo Uniequip (20 x 10 cm & 20 x 20 cm) , ref MaxiDUO

1 Power source for electrophoresis UNIPACK500 V/ 600 mA/ 300 W , ref UNIPACK 500 1 Centrifuge UEC15 rotor 18 x 1.5/2 ml.Max. 15.000 rpm , ref UEC 15 1 Sonic disruptor for nucleic acid preparation Sonifier Untrasonic Desintegrator S-450 CE Analógico, ref 159-063-675 1 Extra tip for Sonicator Double step 1/8" (3,2 mm)micro-tip with coupler & lower portion , ref 101-063-212 1 Image acquisition systemGel Doc XR+ System with Image Lab Software,PC/Mac-Version
Most important deviations in the progress towards objectives Does not apply.
Proposal for correcting measures Does not apply.

Table I. Description of the activities of the project

Area	Improvements directed at the adapting and implementation of the EEES, including the corresponding adaptation of the buildings
Activity	Creation and rehabilitation of university accommodation
Objectives	Complementing the transformation of the Campus was envisaged in the construction of the university accommodation. This action requires the creation of ***feasibility studies, the basic project and implementation plan.***

Progress towards the objectives

Agreement on principles with the Pozuelo de Alarcón council for the construction of university accommodation.

Description of the work carried out and the role of the participants

The competition for the adjudication of this Residence through the administrative concession for a residence with 100-120 places was pending the definitive agreement of the Pozuelo de Alarcón council due to the need for a modification of the initial existing residential area to be able to locate it in a central area of the Campus. There was a modification of the area proposed for the construction which is why the University also negotiated with the Pozuelo de Alarcón council for a change in the development potential between plots, in such a way as to be able to build it in another area of the Campus of Excellence. Finally, no agreement was reached.

Because of all of this, the university has not been able to undertake the construction of this residence in the Montegancedo Campus, since the only possibility would have been that of making an administrative concession to a company that builds it, and with this solution it is not possible to use the financing of the Campus.

Most significant results

Not appropriate

Explanation of the use of human, material and economic resources

The work carried out has not given rise to significant costs. The studies carried out have been drawn up by the staff of the university.

The financing corresponding to the Strengthening Program of the MECD was paid back on the 10th December 2012.

Proposal for corrective actions Impossibility of carrying out the activity
Proposal for corrective actions Not appropriate

Table I. Description of the activities of the project

Area	All
Activity	Governance
Objectives	Government of the Campus. Clear definition of the functions and responsibilities of all of the participants in the Campus. Organization. Decision making. Project management.

Progress towards the objectives:

The **I2Tech** project of the Montegancedo **Campus of International Excellence** is an initiative of the Technical University of Madrid (UPM) to which several public and private entities have been added with the objective of strengthening **technological innovation** by taking advantage of the intensive use of information and communication technologies based on the results generated in the R&D and training activity of the University.

The **strategic plan for the development of the Montegancedo CIE,** updated from the initial proposal presented by the UPM in 2009, is defined by the management teams and governing bodies of the university itself with its general coordination the responsibility of the **Deputy Rector for Strategic Programs and Delegate for the CEI Montegancedo** with the support of the Vice-Rectorate for Research at the UPM in its interaction with the remaining units operative in the University.

It is also significant to know that the Campus is mainly located in land owned by the UPM in the municipality of Pozuelo de Alarcón (Madrid) and in that of Boadilla, therefore, it is not necessary to reach agreements on its use with another entity beyond those restrictions existing in the regulations and urban planning of the municipalities and Madrid Regional Government for the obtaining of the construction licences and use corresponding to the activities set out in the partial plan.

As a result, the **governance model of the Montegancedo CIE** has been developed based on the following premises:

1. Maintaining **strategic decision making** relative to the development of the Campus in the **Management Council** of the UPM

2. Activity from the 1st January 2013 to the present time of the Deputy Rector for Strategic Programs as **“Delegate for the CEI Montegancedo".**

3. Creation of a **management structure of the Campus** in accordance with the regulations approved by the Governing Committee of the UPM on university campuses and adapt to the characteristics of university campuses, adapted to the characteristics of this Campus.

4. Inclusion of the activities of the Montegancedo Central Office of the **Science and Technology Park of the UPM** (UPM Park) in the strategic plan of the Montegancedo CIE.

5. The establishment of a specific relationship with the **Rector’s Council of the Moncloa CIE** with the objective of promoting and facilitating the synergy between both Campuses of International Excellence in which the UPM is involved.

6. Creation of an Advisory Board of the Allied Entities of the CEI Montegancedo.

Description of the work carried out and the role of the participants

Governance structure:

These aspects as well as their evolution from the achievement of the recognition of the Campus de Montegancedo as a Campus of Excellence are detailed below.

Figure 1 details schematically the interaction between the aforementioned different bodies and each individual position.

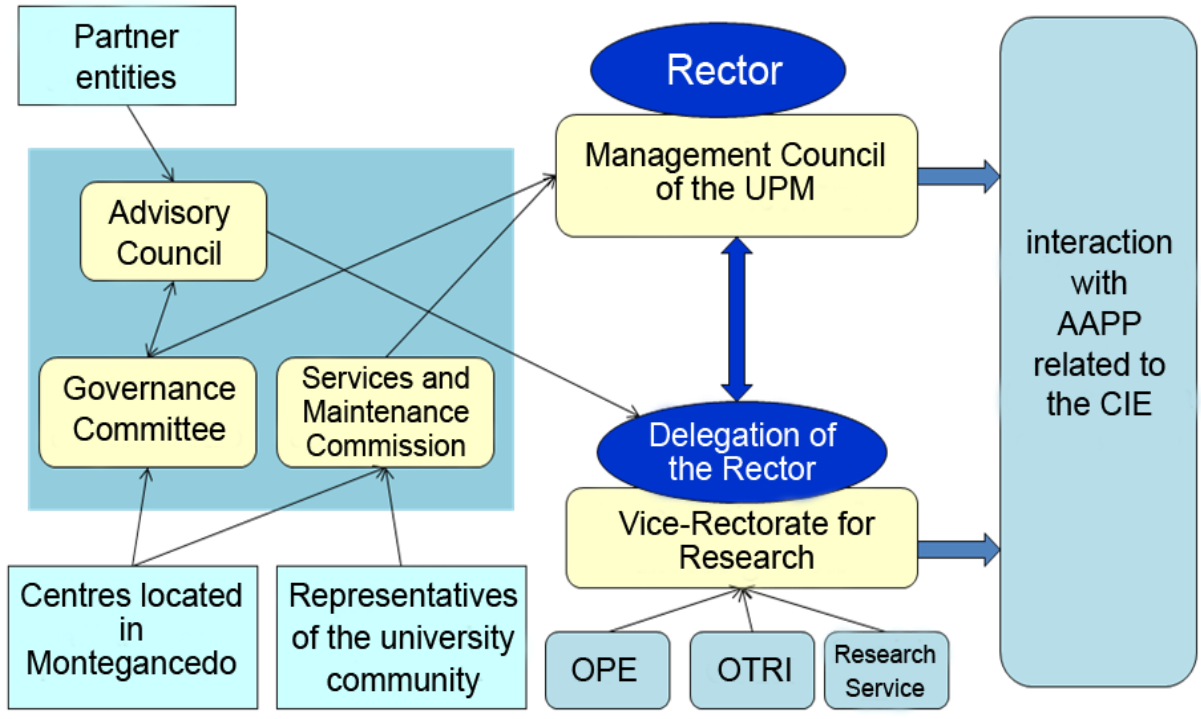


Figure 1. Scheme of the Governance of the Montegancedo CIE

Rector's Delegation for the Montegancedo CIE

The function of the **"Rector's Delegate for the Montegancedo CIE**" was assumed directly by the Vice-Rector for Research from the beginning to the 2nd January 2013. From this moment, coinciding with the reorganisation of the Rector's team, the figure of **Deputy Rector for Strategic Programs** who assumes the responsibilities of **Delegate of the CEI Montegancedo**.

Given that the Montegancedo CIE is directly tied to technological innovation, there is a direct interaction with different units that are organisationally accountable to the Vice-Rector for Research:
The UPM Park, the **Office for the Transfer of the Results of Research** (OTRI), the **Office for European Projects** (OPE), the **Research Service.**

Likewise, the interaction with other units of the UPM is carried out through the intermediation of the Vice-Rector for **Financial Affairs, Manager**, Vice-Rectorate for **PhD and Postgraduate Studies,** Vice-Rectorate for **Students,** Vice-Rectorate for **International Relations,** Vice-Rectorate for **Computer Services and Communications**, Vice-Rectorate for **Organizational Structure and Quality.**

Governance Committee of the Montegancedo CIE

The **Governance Committee of the Montegancedo CIE** is the basic body for the coordination of the activities carried out in the Campus. Specifically, in 2013 it is constituted by the representatives of the following entities located in the Campus:

1. Representative of the **Vice-Rectorate for Research (President)**
2. Representative of the **Vice-Rectorate for Organizational Structure and Quality**
3. Representative of la **Faculty of Computer Sciences**
4. Representative of the **CBGP**
5. Representative of the **CEDINT**
6. Representative of the **CESVIMA**
7. Representative of the **CTB**
8. Representative of the **USOC-E**
9. Representative of the **IDR**
10. Representative of the **COM**
11. Representative of **IMDEA Software**
12. Representative of the **Business Centre / CAIT**

A Representative of the **CIESP** will be added in January 2014 to these people in 2013 once the

aforementioned mixed centre has been constituted.

The specific functions assumed by the **Governance Committee** are as follows:

1. The drawing up of proposals or modifications to them that are presented to public calls in a coordinated way (not those carried out directly by the research groups of each of them).
2. Financial monitoring of the actions financed by the interaction with the research service of the UPM and the services of the Vice-Rectorate for Financial Affairs.
3. Discussion of the proposals for activities to improve the campus and whose interaction with the governing bodies of the UPM as necessary.
4. Knowledge of the agreements on the location of new entities or centres
5. Knowledge of the institutional agreements that affect the activity of the CIE
6. Discussion and proposals on PhD and Masters' Degree programs or undergraduate programs as regards schools and faculties
7. Organization institutional events (conferences, seminaries, institutional visits)
8. General information and maintenance of the Web page.

Services and Maintenance Commission of the Montegancedo CIE

For a better and simpler administration of the aspects related to the services **of the Campus** a **Services and Maintenance Commission of the Montegancedo CIE** is constituted.
The Commission will be presided over by the **Vice-Rectorate for Financial Affairs** and will be made up of the representatives of the different centres housed in the Campus and contemplated in the Governance Committee. It is likewise aimed to count on the following representatives of collectives of the university community:

1. A **Representative of the Students** (initially, the Student Delegation of the **Faculty of Computer Sciences** as it is the only undergraduate teaching centre,
2. A **Representative of the Teaching and Research Staff** (PDI) of the UPM based in some of the units at the Campus.
3. A **Representative of entities external** to the UPM based in the Campus
4. and a **Representative of the Administrative and Service Staff** (PAS) based in the Campus

The **Functions** of the Services and Maintenance Commission of the Montegancedo are as follows (the list is not exclusive):

1. Look after the maintenance of the general facilities of the Campus at the service of the university community (sports areas, garden areas, common facilities, etc.).
2. Agree the activities necessary to guarantee the security and perimeter and buildings vigilance.
3. Establish and agree the needs for the contracting of services: cleaning, electricity, gas, water,

telecommunications, etc.

4. Establish the plans for the collection and treatment of waste products
5. Support and negotiate the transport services with the Transport Consortia
6. Undertake the actions for necessary accessibility and signposting
7. Put into effect specific activities in these areas that have been proposed and agreed by the Governance Committee.

Advisory Board of the CEI Montegancedo

The importance that a close relationship with the business sector and the different public and private entities linked to the different degrees of implication in the development of the CIE has for the development of the Montegancedo CIE makes it very advisable to establish an **Advisory Council** with the following functions:

1. To know and have an opinion on the activities of the development of the Montegancedo CIE. It is expected that with this there is sufficient information to allow possible interests to be identified.
2. To know the activities carried out in the different research centres and units located in the Campus with the objective of establishing possible scientific and technical cooperation agreements.
3. Propose and state new possible activities in the forthcoming years given that the Campus still possesses great expansion possibilities.
4. Consolidate mechanisms for joint activities for the R&D activity or the commercialization of the results.

The **partner entities** in September 2013 are as follows:
AMETIC, the Pozuelo de Alarcón local council, BICG, Clarke-Modet & Co, CSIC, FDI, ISBAN, Elekta, IBM, IMDEA software, INDRA, INIA, LPI, Plant Response, PRODUBAN, Repsol, Santander, Telefónica, T-Systems, UCM, Zeiss, Accenture, GMV, Hospital Ramón y Cajal.

In September de 2012 **a joint meeting with of the Advisory Council and the Governing Council** was held to present the ideas on the future evolution of the CIE and the possible deepening of the joint activities carried out to date.

Two plenary meetings were held in 2013 for the constitution of two work groups of the Committee: The Commercialization Group and The Internationalization Group which have held two meetings and with both drawing up documents which will be debated in the plenary to be held in December 2013.

Throughout 2013 a boost has been given to the obtaining of licences for the working of the centre built in recent years. The situation is regularized in the cases of CBGP, CTB, IDR, CEDINT y CAIT. It is necessary in the case of CBGP where the license for the operating of the P3laboratory of biological security is still to be obtained.

Explanation of the use of human, material and economic resources

The UPM has considered it advisable for the first phase in the development of the Campus characterized by the construction and putting into effect a series of buildings whose culmination has taken place with the handover of the "extension of the business centre" at the beginning of 2013, the decision making at the CEI is directly linked to the Rector's team given the serious economic implications that this phase brings.

With the second phase commencing in 2013, the construction of new buildings is considered as finished and hence the campus has entered into a new, more operative phase in which the main object is to consolidate the activities implemented and meet the objectives of excellence in technological innovation aspirations in the campus. Thus there are still investments to be made linked to the acquisition of equipment and the putting into operation of technological demonstrators and experimental laboratories. The interest in finding financing, especially private, however, has not been lost, marked by the construction of new equipment to the most feasible degree in the next few years.

The Delegate of the Rector for the CEI Montegancedo has also assumes the Management of the Support Centre for Technology Innovation (CAIT). The work on the coordination of the programs relative to the **commercialisation of technologic** (Innovatech) and **the creation of businesses** (actúaupm), as well as the **support for the internationalisation** of the innovation technological activities has likewise begun from this point. From the staffing point of view, the CAIT has 10 people from the central services of the UPM and the General Foundation of the UPM.

Specifically, the *"International Advisory Board" (IAB)* has been constituted with members from different countries with the aim of orienting the implementation of the activities in the context of the CAIT. The first meeting of the IAB will be held in November coinciding with the organization of the 1st Innovatech International Workshop.

Given that the CEI Montegancedo is directly linked to technological innovation, there is a direct interaction with different units that are accountable to the Vice-Rectorate for Research:

1. The **UPM Park** through its implication in the development of centres financed through calls for aid to Science and Technology Parks and the management of the business greenhouse.

2. The **Office for the Transfer of the Results of Research** (OTRI) in its activity relative to intellectual property, the creation of technology-based businesses and the commercialisation of technologies.

3. The **Office for European Projects** (OPE), in its support to the internationalization of the campus and the participation in international research projects.

4. The **Research Service** which had given direct support to the management of projects and public calls for research.

    a. In this case there are two specific people

Likewise, the interaction with other units of the UPM is carried out through the intermediation of the Vice-Rectorate for Research. These are:

1. Vice-Rectorate for **Economic Affairs** (OTT, financial management service, office for technical works)

2. **Manager** (cleaning services, security, contracting service)
3. Vice-Rectorate for **PhD and Postgraduate Studies** (PhD Programs, Masters' Degree programs, PhD School)
4. Vice-Rectorate for **Students** (Sports facilities)
5. Vice-Rectorate for **International Relations** (Student services and foreign contracts)
6. Vice-Rectorate for **Computer Services and Communications** (telematic services and communications infrastructures).
7. Vice-Rectorate for **Organizational Structure and Quality** (teaching activities related to Schools and Faculties of the UPM)

The most significant deviations in the progress of the objectives

The construction of a residence for teachers and researchers at the CEI Montegancedo has been postponed given the difficulty in obtaining financing for it. Equally, the initial objective of re-urbanising the Campus has not continued as finance has not been obtained from official calls from the Campus of Excellence program.

Proposal for Corrective actions

En extension has been requested for implementation to December 2013 and June 2014 for the finalisation of the technological demonstrators.

Table I. Description of Project Actions

Scope	Scientific and other improvements aimed to adaptation and deployment of EEES including building conditioning.
Action	Green Labs – Evaluation and design
Objectives	The objective of this action is to developed the first phase of "evaluation and design" within the initiative of modernization of the CEI Monteganceda laboratories (Green Labs) in order to transform them into sustainable research and experimentation centers. As a starting point two buildings have been chosen, CBGP (Center for Biotechnology and Plant Genomics), and CeDInt (Center for energy efficiency and home automation) due to the unique nature of its facilities.

Progress to objectives

In order to achieve the above objective, the "Evaluation and design" of buildings and selected laboratories is structured into three sub-phases:

1. Initial evaluation of buildings and laboratories.
2. Definition of requirements for significant energy aspects.
3. Development of a global diagnosis and proposal for actions, measures and indicators.

The three previous phases have been successfully completed.

To complement this action we are currently working on the evaluation of improvements in the energy behavior of buildings and laboratories after the GreenLabs actions have been executed on these infrastructures.

Description of accomplished work and role of participants

The project was initiated by the Group of Energy Efficiency and Smart Cities of CeDInt-UPM, as a prior step to the laboratory modernization initiative of CEI Monteganceda Green Labs.

The work carried out to achieve the above objectives has facilitated the characterization of CeDInt and CBGP buildings prior to the implementation of any physical technical action.

The characterization of these buildings has been executed on the first four months of of 2012.

In parallel with this action, CeDInt participated in 2012 as representative of the UPM in the Spanish Network for Sustainable Laboratories (Lab * s), driven by MAITE Foundation (Environment, Innovation and Technology) in the Working Group of Facilities Engineering, in order to validate the procedures and evaluation methods applicable to research laboratories.

We are currently working on two tasks to complete the project:

1. The definition of a methodology to perform energy audits of laboratories and buildings to quantify the energy savings achieved. Once the methodology is defined research team intends to apply it during a full climatic year to attain rigorous empirical results

2. The development of a consumption optimization application for users. The idea is that researchers and technicians are able to program their experiments with plants in the greenhouses of the Center for Biotechnology and Plant Genomics and from these data the system will configure the electrical and electronic elements to ensure the minimum energy consumption and at the same time ensuring the necessary conditions for proper execution of the experiment. The system will act on the air conditioning and lighting systems of greenhouses, which are those that have been identified as the highest consumers of electricity in these infrastructures.

Most significant results

Along with the implementation of the tasks set as initial part in project CEI Montegancedo Green Labs (Action F-A7c), this action has served to identify areas of potential interest to develop in the future, provided that they have the necessary funding.

In this sense the main opportunity identified is the definition of a specific methodology for the improvement of energy efficiency in R & D laboratories, leading to the development of a certification of adaptation to energy efficiency standards for laboratories through obtaining a "seal certifying" and ideally be completed with the elevation of the methodology to the UNE standards in order to generalize it as a national certification system.

The definition of a methodology for improving energy efficiency in R & D laboratories, and associated certification, in combination with BMS platform design and integration of monitoring and control devices, would provide a commercial audit theoretically adaptable to any environment, which is an additional incentive to channel this activity through an UPM spin-off as a plus to the opportunities identified in the action F-A7c

Explanation of the use of human resources, material and economic

The funding received by the Ministry of Education for this action amounts to **€ 18,000.00.**

This funding will be used entirely on two concepts:

1. Definition of the necessary methodology for carrying out the energy audit required to quantify the savings from the actions taken in the CEI-Montegancedo facilities, with particular attention to improving the energy performance of the greenhouses of the Center for Biotechnology and Plant Genomics.

   Estimated Cost: 5,000 €

   Execution in progress in 2013

2. Development of an application to allow users to automatically adapt the electrical and electronic elements of the greenhouse to the needs of the plant experiments performed in them, to minimize energy consumption of the facility.

   Estimated cost: 13.000 €

   Execution in progress in 2013

Please note that all the actions carried out in 2012 within the framework of this project has been funded from UPM budget.
Important deviations preventing achievement of objectives Does not apply.
Proposal of correcting actions Does not apply.

Table I. Description of the activities of the project

Area	Improvements directed at the adaptation and implantation at the EEES, including the corresponding adapting of the buildings
Activity	Space for the Personalised Student Attention.
Objectives	The objective is to provide the students of the School with new group work spaces This service will be the main point of contact between the student and the School. The students will be able to come to this service to resolve and type of question as regard their teaching activity and to get an assessment on the planning of their studies. Likewise, they will be able to carry out different administrative tasks in the teaching environment.

Progress towards the objectives

The envisaged objectives will be able to be reached with the carrying out of this work.
The work will begin in October this year and its finalization is envisaged within a maximum of two months.

Description of the work carried out and the role of the participants

On the first floor of Block 3 the two spaces previously dedicated to a Journal Hall and a research laboratory will be refurbished.
The work will consist mainly of the unification of these 3 spaces and the furniture necessary for the staff of the new service.

Most significant results

The creation of an office for the personalised attention of students of the School. The students will have a team of staff dedicated to the support of their studies.

Explanation of the use of human, material and economic resources

The economic resources are dedicated to the work necessary for the construction of the new space.
Likewise, as regards the support of an Architect who will carry out the work and its later monitoring.

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropriate

Table I. Description of the activities of the project

Area	Improvements directed at the adaptation and implantation at the EEES, including the corresponding adaptation of the buildings
Activity	Rooms for the students to work in groups at the *ETSI Informáticos*.
Objectives	The objective is to provide the students of the School with new group work spaces. The collaborative work is a basic piece of the new methodologies of the EEES. To be able to provide new spaces for the carrying out of this type of work is fundamental in the adaptation of the Centre to the reality of new teaching

Progress towards the objectives

The envisaged objectives will be reached with the carrying out of this work.

Description of the work carried out and the role of the participants

The first floor of Block 1 of the *ETSI Informáticos* was previously dedicated to the administrative services and was located in the Meeting Room. After the relocation of these services it has been converted into 5 medium-sized meeting rooms and a large one. The medium-sized meeting rooms are dimensioned to hold groups of 8-12 students, whilst the large one will have a total of 64 places. All of the rooms will have reconfigurable furniture so as to adapt to the size of the groups.

The most important part of the work consists of the substitution of plasterboard walls for glass partitions, and the implementation of electrical facilities to provide light sockets for all of the work stations.

All of these new rooms will also be usable for the staff of the Centre. It will have a web-based reservation service, which will be managed by the library staff of the School.

Most significant results

The creation of new spaces for team work will facilitate the carrying out of collaborative work.
Work that the students used to have to do in the cafeteria or away for the School can now be carried out in the Centre.

Explanation of the use of human, material and economic resources

The economic resources are dedicated to the work necessary for the construction of the new space.
Likewise, as regards the support of an Architect who will carry out the work and its later monitoring.

Most significant deviations in the progress towards the objectives. Not appropriate
Proposal for corrective actions Not appropriate

Table I. Description of the activities of the project

Area	Scientific improvement/Improvement in teaching
Activity	International agreements with the Universities of Colorado and Paul Sabatier de Toulouse: Drawing up of a postgraduate training program on Transactional Research
Objectives	The holding of these activities in line with the strategy of the ICE to promote the transfer of knowledge, the attracting of talent and the internationalization of its activity and that of its researchers. These activities allow vanguard information to be accesses which will be of clear benefit to the Spanish system of science and technology, promoting its line of work and collaborations with other European centres and other regions of the world

Progress towards the objectives

1. Agreement signed with the **University of Colorado in Denver (EEUU) in the area of health**

    a. This activity has been developed since 2012 with financing from the 2011 Call for support for the ICE of the Ministry of Education and with the support of the Health Committee of the Regional Government of Madrid who has also signed a MoU with the University of Colorado.

    b. To date, three lines of activity have been identified for which contacts with investors and possible financing agencies are developed:
        a) New technologies for Neuro-regenerative Medicine. Creation of a joint Laboratory with the Centre for neurosciences at the Anschutz Campus in Denver
        b) Health Computer Systems to configure Rapid Learning Networks. Initial applications: 1) analysis of the capitative costs and the optimization of clinical guides for the treatment of cancer and 2) quality control and extraction of knowledge in hospital management
        c) Development of health and Wellness units. Technologies for applications for the promotion/prevention of health and la management of chronic patients. Specific program on Obesity

2. Creation of a **European Laboratory associated to the CNRS and the University of Toulouse in the area of computer sciences**.

    a) This activity initiated in 2012, with financing from the 2011 Call for support for the ICE of the Ministry of Education.
    b) On the part of the UPM the activity has been centred on the *Facultad de Informática* in areas of approximated reasoning in its spaces

Description of the work carried out and the role of the participants

University of Colorado in Denver (USA) in the area of Health

1. The training in translational research is estimated to be one of the elements with the most impact of the productivity of the systems of health and in the health industry, especially the pharmaceutical industry. This activity in Spain is motivated by the new and successful experience in the USA with the postgraduate program on Translational Research, and is protected on the collaboration agreement existing between the University of Colorado, Health Committee of the Regional Government of Madrid and the UPM (CTB-Montegancedo Campus).

2. Description of the training programs. A double degree program has been configured in which the students can train in the technological aspects implied and carry out specialised courses in clinical sciences and support methodologies of the translational research. The objective and content are as follows:

- The ethical conduct of research in humans
- Legal questions and regulation related to clinical research
- Clinical evaluation of the existing literature
- Application of the principals of practices based on evidence
- The appropriate use of the study designs and methods to deal with questions / hypotheses
- Measuring and evaluation of the clinical results
- Preparation and presentation of peer reviewed manuscripts
- Preparation and presentation of subvention proposals
- Constructive criticism and feedback to colleagues

University of Toulouse in the area of computer sciences.

1. From the creation of the LEA, the collaboration between the IRIT and the UPM in research has centres on three thematic areas:-

    1. In the area of ontological engineering work has been carried out on the integration of new tools in the evaluation methodology of OOPS! ontologies of the UPM.

    2. In the area of Answer Set Programming (ASP) work has been carried out on the extensions of the ASP logical language which admits modal operators or intentional functions and logical modelling has been studies on the molecular interactions, permitting inhibitions.

    3. The subject of Social Intelligence us dealt with by the two institutions within the framework of a European SINTELNET (European Network for Social Intelligence) program in which the UPM is the coordinator and the IRIT is the participant responsible for the area of collective attitudes.

2. The collaboration between the *Université Paul Sabatier*, Toulouse, and the UPM within the framework of the LEA has been extended to the implementation of a common Masters' degree in

Artificial Intelligence with the participation of the Department of Artificial Intelligence of the UPM and teachers from the the IRIT and the UPS. The program is constructed on the basis of common subjects as well as special modules in the two universities. The students enrol and choose subjects in both places. The preparative phase has been carried out in the 2012-13 academic year with the objective of initiating the course in September 2013.

Most significant results

University of Colorado in Denver (USA) in the area of Health

After the two visits to Denver and the person responsible for the course from Denver to Madrid, as well as the multiple videoconference sessions the following situation has been achieved

- Precise description of the structure of the course
- The institution in charge of the clinical subjects has been identified, the *Universidad Autónoma de Madrid* (UAM)
- The descriptors of the program have been defined. The technologies are completely finished and the clinical ones are in the final phase of definition.

The administrative aspects are equally in the final phase of the agreement: Admission profiles, formula for the sharing of resources and regulations for validations.

This is the structure of core subjects and optional ones:

Masters' Degree	**credits**	**credits**	**ECTS**	**ECTS**
Applied Biostatistics I	3	3	5	5
Applied Biostatistics II	3	3	5	5
Designs of experiments and clinical trials	2	3	4	5
Seminar: Research into clinical science /translational	1	1	2	2
Seminar: Critical revisions on clinical science /translational	1	1	2	2
Writing of financial proposal	1	1	2	2
Ethics and in research on human subjects	1	1	2	2
Epidemiology	3	3	5	5
Project / Masters' Thesis *	4	6	10	12
Optional	9	11	18	20
TOTAL	28	33	55	60

Likewise the process of specifying the formal aspects for a double degree is underway.

University of Toulouse in the area of computer sciences.

The collaboration between the MELODI team from the IRIT and of the OEG of the UPM continues on the subject of the evaluation of ontologies after the visit of Mari Carmen Suárez de Figueroa to Toulouse. In order to extend the OOPS! method of the UPM, the advantages of including more language processing tools to verify ontologies has been evaluated. The consequences of ontological errors in the search for information have also been evaluated. A report has been drawn up to evaluate this work. The study of the relationship between the competency questions and the SPARQL patterns used in SWIP (Semantic Web Interface Using Patterns) has been outlined. N. Aussenac-Gilles (IRIT) and G. Aguado de Cea (UPM) collaborate in the scientific management of the TIA 2013 (Terminology and Artificial Intelligence) conference which will take place in Paris from the 28 to the 31 de October 2013.

In the area of computational logic, several significant results have been obtained:

- The presentation and study of a new logic system (entitled *bi-state logic*) for the analysis of intentional functions in the ASP language. A first joint work of David Pearce (DIA, UPM), Luis Fariñas of the Cerro (IRIT) and Agustín Valverde (University of Málaga) was published in a book edited by other editors from Pearce in honour of Vladimir Lifschitz. The research continues with the preparation of a second article on the bi-state logic of the first order.

- The extension of the ASP language with flexible functions. This work has been published in the IJCAI international conference, the most prestigious conference in the AI domain.

-An analysis of the modal operators in the ASP language is the subject of the research of Ezgi-Iraz in his PhD work co-supervised by David Pearce and Luis Fariñas of Cerro, Several articles have been published, in particular in the LPNMR international conference in 2013

-A logical analysis of the metabolic cellular interactions is the subject of the research of Naji Obeid, in his PhD work supervised by Luis Farinas of Cerro, Several articles have been published, in particular in the BIOCOMP'13international conference.

- Dr Levan Uridia (Tbilisi) obtained his PhD Degree in 2012 under the supervision of David Pearce and is collaborating in both groups. Significant results have been obtained as regards modal logic, group attitudes, and non-monotonous reasoning.

- Within the framework of the common European SINTELNET project, the IRIT group has organized several international workshops. Cognitive Foundations of Group Attitudes and Social Interaction, Toulouse, 31.5 – 1.6. 2012. The results of the workshop form the basis of a book in preparation for the *Studies in the Philosophy of Sociality* study published by Springer (The Cognitive Foundations of Group Attitudes and Social Interaction, Andreas Herzig & Emiliano Lorini (eds)).

-Another workshop has been organised in Toulouse from 5-6 July 2013 on "Believing, planning, acting and revising".

Other common activities:

- Meeting in Madrid, 13-16 June, 2013 with the participation of Pearce, Fariñas of the Cerro, Agustín Valverde (Univ. Málaga) and Pedro Cabalar (Univ. Coruña).

International workshop on the Equilibrium Logic, in Toulouse 28.9.12

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M. Carmen Suárez-Figueroa, Camille Pradel and Nathalie Hernandez, Verifying Ontology Requirements with SWIP, 18th Int. Conf. On Knowledge Engineering & Knowledge Management, poster proceedings of EKAW 2012.

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Explanation of the use of human, material and economic resources

University of Colorado in Denver (USA) in the area of Health

- Trips to Denver.
- Contracting of Consenting services (Alberto Calero)
- Drawing up of two projects

University of Toulouse in the area of computer sciences.

- Ezgi-Iraz has been contracted as a PhD researcher by the UPS within the framework of the LEA. His thesis will be supervised by Pearce and Fariñas of the Cerro.
- Naji Obeid has been contracted within the framework of the LEA by the university UPs as a PhD student under the supervision of Luis Farinas of the Cerro.
- Luis Fariñas of the Cerro visited the UPM. 10-19.2.2013.
- Luis Fariñas of the Cerro visited the UPM. 13-16.6.2013.
- Levan Uridia visited the IRIT, Toulouse and DIA, UPM in July-September 2013, with the support of the common SINTELNET project.
- Nicolas Troquart visited the UPM. 9-22.4.2012.

A common workshop is envisaged on computational logic and the representation of knowledge at the UPM in November 2013.

The purchase of computer equipment is envisaged (computers, printer) to equip the offices at the LEA in the *Facultad de Informática* of the UPM.
Most significant deviations in the progress towards the objectives. Not appropriate
Proposal for corrective actions Not appropriate

Table I. Description of the activities of the project

Area	Improvements directed at the adaptation and implantation at the EEES, including the corresponding adapting of the buildings
Activity	WiFi on the Campus
Objectives	The objective of the activity is a total deployment of WiFi in all of the R&D centres and the *ETSI Informáticos* situated on the Campus. The current level of WiFi coverage on the Campus is very uneven, with the R&D centre having no WiFi at all and others with WiFi deployment not compatible with the central systems of the UPM. Likewise, the current deployment existing in the *ETSI Informáticos* does not cover all of the areas necessary. Additionally, a WiFi deployment will be carried out in the common, open air, areas of the Campus.

Progress towards the objectives

An exhaustive study is currently taking place on the WiFi Access Points necessary in all of the Centres, as well as exterior Access Points.

The progress is suitable, with the installation of the Access Points envisaged for the month of October.

Description of the work carried out and the role of the participants

By means of the plans of every Centre a study is taking place on the WiFi Access Points necessary. This activity is essential at the time of calculating the totally necessary infrastructure, for its later deployment.

Most significant results

All of the buildings on the Campus will have a suitable WiFi deployment, compatible with the central systems of the UPM.

Explanation of the use of human, material and economic resources

The budget of the ICE will be used to carry out this deployment. It will be necessary to by the materials for their later installation. Its putting into operation will be the responsibility of the Central Computing Service of the Rectorado of the UPM.

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropriate

Tabla I. Descripción de las actuaciones del proyecto

Ámbito	**Researching and innovation**
Actuación	**Develop of the 3D TV Demonstrator**
Objetivos	The main target of the 3D television Demonstrator (Dem-3DTV) is to have an infrastructure that gives support for research, development and testing of three-dimensional television equipment considering the whole chain of signal manipulation, composed of: • **Capturing**: camera systems to capture visual information in multiple views. • **Representation**: set of procedures and standards for characterizing signals uniquely and jointly, allowing the exchange, storage and transmission of them. • **Coding**: set of procedures and standards for reducing the volume of data required to represent the signals, to achieve both a more efficient storage and transmission. • **Post-production**: 2D and 3D post-production system to resolve problems in capturing three-dimensional video sequences both in stereoscopic compact cameras as in cameras configured on rig. • **Distribution**: 3D real time transmission system over IP networks allowing a communication that provides the feeling of real presence. • **Display**: display systems for the visualization of signals, both stereoscopic and multiview, that show different views depending on the position of the observer, allowing them to perceive that the visual information provides depth and perspective.

Progreso hacia los objetivos

The main target of equipment acquisition, conditioning and start-up of the Dem-3DTV is fulfilled, being in operation since early this year. The progress in the corresponding stages of the chain of signal manipulation is as follows:

Capturing: The Dem-3DTV was equipped with a complete system of 3D compact cameras (semi-professional and consumer) and 2D cameras configured on rig, allowing acquiring visual content under multiple views. In this way, the Dem-3DTV can generate their own digital content used, among other tasks, for the publication of their research results.

Representation: The research staff participating in the Dem-3DTV developed several auxiliary programs for the composition of sequences of 3D stereoscopic video sequences for different 3D representation formats (Side by Side, Top and Bottom, Line by Line, etc.). These programs are being used in various stages of the manipulation chain, such as in distribution and display, modifying the signals acquired by the capturing systems to obtain a more efficient storage and transmission.

Coding: Real-time encoding and decoding software was developed based on the MVC (Multiview Video Coding) standard, which has been integrated into the encoders and decoders of SAPEC company. Besides multiview coding, the Dem-3DTV has focused its expectations in the encoding of depth maps, optimizing the computational burden and maximizing the perceptual quality of synthetic views generated for FVV (Free Viewpoint Video) environments.

Post-production: Several systems, both educational and professional, for stereoscopic signal manipulation were acquired, providing the opportunity to train students and professionals in an experimental and more complete way in the problems of stereoscopic signal generation (the stereographs who adjust and calibrate the rigs between shots in 3D productions) and their correction in post-production.

Distribution: A real-time 3D transmission system over IP networks for commercial stereoscopic devices to set communications with feeling of real presence was developed. Currently, this system is moving toward real-time 3D transmission over IP networks for 3D autostereoscopic devices (glasses free), going beyond 3D telecommunications with real presence.

Display: The Dem-3DTV was equipped with a wide range of 3D display systems: several stereoscopic (two views) monitors and TVs for shutter and passive glasses up to 55", a stereoscopic projector of passive glasses and an autostereoscopic monitor of 28 views that offers different images depending on the position of the observer, allowing to perceive visual information with depth and perspective. These systems can be used in the demonstration of new technologies and research results, as much for own results as for companies that need it.

Descripción del trabajo realizado y papel de los participantes

Conditioning and start-up of the Dem-3DTV

The acquisition and setting-up of the equipment and infrastructure necessary to the creation of a 3D TV demonstrator laboratory were carried out, offering a service of demonstration of the research and developing results using a complete chain of equipment.

3D video subjective quality testing

Subjective quality testing of new standard 3DVC for 3D video coding

Many aspects of 3D video technology go on being a focus of important research works in order to provide the viewers with high-quality contents that will significantly improve their visual experience compared to traditional video. Nowadays, MPEG is leading the development of a new 3D video coding standard, named 3D Video Coding (3DVC). This standard is in full development after the first proposed coding algorithms have been evaluated by the scientist community. The Dem-3DTV was one of 13 ITL (Independent Testing Laboratory) worldwide that MPEG selected for carrying out subjective quality tests of the various proposals of 3D video formats and associated compression technology. The Dem-3DTV was specially equipped according to international standards, evaluating the encoding algorithms for the MPEG selected monitors (stereoscopic and autostereoscopic). The group of observers had to assess, as well as the quality of the sequences, other aspects such as the feeling of discomfort that sometimes produces 3D video content.

Project JEDI: "Just Explore Dimensions: End to End High Definition 3DTV for Consumer"

The main objective of JEDI project was the study and development of an end-to-end 3D television (3DTV) to the consumer. In particular, it was developed a stereoscopic end-to-end chain of high quality based on the use of multiview coding and using satellite broadcasting networks and IP networks. Within the JEDI Project, the Dem-3DTV conducted a set of 3D video subjective testing, where it was analyzed the overall user experience with 3DTV. This time, it was chosen to get away from the traditional environments defined by the ITU for conditioning testing laboratories, which seek to minimize the elements that distract the observer: the surrounding objects, the display position, the distance to the screen, the brightness setting, etc.., which are far away from the home environment to which usually directs the 3DTV. For this reason, it was conditioned a space to recreate a domestic living room in which to perform the tests.

Support to companies and organizations in the audiovisual sector

The Dem-3DTV, due to similar synergies to those considered in the Living Labs, has the reason for living to collaborate with the audiovisual sector companies in all states of the innovation activity to generate a cross-fertilization. It has organized and provided support to the execution of demonstrations of 3D video technology and the elaboration of small reports to the audiovisual sector companies, letting them use the existing equipment within the Dem-3DTV to evaluate those ones. In this sense, due to its recent creation, it currently collaborates with schools and companies in the Community of Madrid opening its horizons to major Spanish companies leading the audiovisual technology.

Design, development and optimization of algorithms

The advances in stereoscopic technology in representation formats and in efficient coding systems, along with the transmission channels that send information at very high speeds, are allowing that the spectacular nature of 3D is applied also in live transmissions, giving way to surprising possibilities. Since live 3D content transmissions over IP networks are still in an experimental phase, the Dem-3DTV is researching and developing new methods and algorithms for high speed 3D video transmission using efficient 3D video coding systems over existing IP networks. Inside the Dem-3DTV, a platform of

stereoscopic 3DTV transmission over IP has been developed, that can prove the viability of such transmissions with existing equipment on the market.

Finally, it was implemented a real-time coding and decoding software, based on the Multiview Video Coding standard, and multiple auxiliary programs for the composition of sequences of stereoscopic 3D video for different 3D representation formats.

Generation of digital contents for the 3D equipment testing

The Dem-3DTV has detected the lack of 3D contents suitable to perform research within projects, both European as national. On a regular basis, a series of sequences from MPEG are used, or even some demo content of commercial products, with the consequent problem that entails due to copyright when using for publishing results. Because of this, the contents available in MPEG are often used, which are not the most suitable, but allow the repetition or comparison with other researchers and projects.

Thanks to the acquisition of the advanced production system, the Dem-3DTV has taken its first steps in 3D content generation. Initially, these contents have been used in the publication of its own research results, but long term will be made available for audiovisual companies and researchers from universities and research projects both national and European.

Training of personnel in 3DTV

The Dem-3DTV is using its equipment to train UPM students. In the course that begins, grade students will make practices of generation and manipulation of 3D digital contents within the current subjects: “3DTV” and “Digital Television Laboratory” of the Telecommunication Engineering studies, and the future subjects in the itinerary of Specific Technology of Sound and Image in the title of graduate in Telecommunication Technologies and Services Engineering. Furthermore, both undergraduate students as master students make use of the equipment for conducting the research jobs leading to the completion of, respectively, Thesis and Master's Thesis work. Finally, Ph.D. students are also making use of the equipment for research leading to the completion of their Doctoral Thesis.

Resultados más significativos

Among the tasks performed in the Dem-3DTV, include the following for their relevance and their widespread within the sector:

3D transmission system in real-time over IP networks demonstration for stereoscopic and autostereoscopic (glasses free) devices
Several demonstrations of this transmission system have been carried out to companies such as Alcatel-Lucent, Banco Santander or Indra, and representatives of European and Asian universities. Also, a demonstration at the Satelec exhibition, organized by the School of Telecommunications, was performed, where the signal stability and the high quality that had the encoders developed in the Dem-3DTV, enabling real-time transmission over the IP network, could be seen.

3D video subjective quality testing
The 3D subjective quality tests carried out have provided the Dem-3DTV international recognition through the publications done by its own researchers and by standardization bodies such as MPEG.

Explicación del uso de los recursos humanos, materiales y económicos

Use of human resources

- **PhD staff.** The Principal Investigator of Dem-3DTV leads and coordinates the research team, organizing and managing the resources (human and technical) allocated to different projects.
- **Technical support staff.** The main objective is to support the needs of the Dem-3DTV and thus increase and improve the performance of the scientific-technological infrastructure and the transfer of research results.
- **Research staff in training.** The research staff of Dem-3DTV conducts research activities in capturing, representation, coding, post-production, distribution and display of 3D video sequences.

Use of material and economic resources

- **Demonstration.** The Dem-3DTV has organized and provided support to the realization of demonstrations of existing 3D video technology within the Dem-3DTV, giving audiovisual sector companies consultancy in the adequate generation of 3D digital contents.
- **3D Transmission.** The 3D video transmission system developed in the Dem-3DTV has been improved, being able to capture the 3D video through any 3D capture device, either a 3D compact camera (for semi-professional or consumer) or 2D cameras configured on rig, transmitting over IP networks in real-time, generating feeling of presence.
- **Quality testing.** The Dem-3DTV has carried out different studies regarding to quality of experience of user inside various testing environments, not only analyzing the 2D or 3D video quality, but also going in depth too in others aspects as the impact of the environment, the technology used, etc**.**

Desviaciones más importantes en el progreso hacia los objetivos

No deviations are contemplated.

Propuesta de Acciones correctoras

No corrective measures are provided.

Table I. Description of the activities of the project

Area	Scientific improvement and the transfer of Knowledge
Activity	FACILITIES FOR THE IMPROVEMENT OF THE SUSTAINABLE ARCHITECTURE PLATFORM: Installation of "Casas Solares" modular dwellings.
Objectives	1.- Rehabilitation of the prototypes installed in the platform to be able to continue on them with different areas of research which is being carried out at the *Escuela Técnica Superior de Arquitectura*. 2.-Have a platform of facilities for research to be developed, as well as implementing solutions for taking advantage of renewable energy.

Progress towards the objectives

Installation of modular dwellings fuelled by photovoltaic solar energy coming from UPM designs from the Solar Decathlon. Three dwellings designed and constructed by the UPM have been constructed on the Campus and were constructed for their participation in the competitions in which they participated. There is also a fourth, energy efficient, modular prototype dwelling which was donated to the UPM (ECHOR prototype) which was the central module of the Solar Decathlon Europe 2012.

Figure 51. The UPM dwelling and the modulo donated to the UPM by ECHOR (installed in 2013)

Description of the work carried out and the role of the participants

Contacts have been made with all of the enterprises necessary for the achievement of the objectives described.

An adjusted program has been implemented based on the aforementioned conversations and the proposal adjudicated for the INNOCAMPUS 2010 del MICINN call.

Most significant results

The management of institutional relations has been achieved with the intervening enterprises in such a way that the collaborative way contributes to the development and improvement in the facilities and equipment that make up the Sustainable Architecture Platform of the Montegancedo ICE.

With all of this, it has been possible to maximise the scope of the work to be carried out by optimising the facilities, implementing different systems and equipment and allowing the smart control of all of it in such a way that that they will allow research to be developed in an open environment.

With the installation of the houses fuelled by photovoltaic solar energy as a "solar hamlet" the aim is its suitable use for the demonstration of new constructive, energy efficient, technologies.

Explanation of the use of human, material and economic resources

The human team assigned to the management of the project is in charge of achieving the best collaborations possible to guarantee the achievement of their objectives within the budget and even exceed them.

The assigned economic resources have been adjudicated by the different collaborating enterprises.

The initial economic estimation of the work has reached 270.000€.

Thanks to the financing from the INNOCAMPUS Program (€40.000) and the collaboration of the enterprises has made it possible to achieve the initial objectives. To date their only remains the improving and adapting of the final aesthetics pending.

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropriate

Table I. Description of the activities of the project

Area	Improvement in Teaching / Scientific improvement
Activity	Attraction and motivation of Talent
Objectives	It has as its objective the attraction of talent to incorporate international PhD graduates in the areas of up-to-date knowledge in research.

Progress towards the objectives

The contracting of 2 PhD graduates has been increased with a strong specialisation in TIC, to promote the visibility of talent and to continue positioning the UPM as a leading research centre framed within the People program of the FP7. It is an activity that reinforces the collaboration and integration of the Campus and promotes internationalization

Description of the work carried out and the role of the participants

Throughout 2012, The TALENTO program has provided CeSViMa with two posts for Post-Doc researchers, The 2 PhD graduates are:

- Dinora Morales (12 months) [dmorales]
- Santiago Muelas (6 months) [smuelas]

Throughout which the following tasks have been tackled with the corresponding results.

Tasks carried out

Data mining [dmorales]

The tasks carried out during this period focused on the design and development of services using techniques for automatic learning and data mining applied especially to the handling of large volumes of data in the area of health and biomedicine.

New methodologies have been applied and developed to research how computational techniques together with different mathematical models can help to resolve the different problems related to the large dimensionality of data as well as their analysis. Among other designed services, connectivity techniques coming from these functional magneto-encephalography (MEG) studies are of particular interest with the objective of identifying and analysing connectivity networks in minor cognitive deterioration. For this reason a framework has been developed to discover new spatial-temporal patterns as biomarkers and connectivity network patterns, with special interest in multi-variant dependencies immersed in the data that are still to be discovered.

Heuristic optimization [smuelas]
During the six months in duration of the contract associated to the TALENTO program, significant advances have been made in the field of the heuristic optimization for the resolution of large-scale logistical problems. Specifically, the efforts have centred on the optimization and resolution of low-demand transport system problems.

This new transport system has gained popularity in recent years due to the limitation in traditional public transport systems which have not been able to be adapted to particular events that significantly affect the demands generated by users. Likewise, these systems offer an attractive alternative for those peripheral areas in which the density of the population is lower thus making it difficult to offer collective transport solutions of a quality sufficient for an elevated number of users. Finally, these systems are especially useful for the organization of health care for the elderly who are difficult to attend to efficiently because of traditional public transport services.

Main collaborations and technology developed

Neuro-imaging
A collaboration with CeSViMa-CTB has been established, specifically with the Neuro-computation group led by Fernando Maestú. Within the services provided, we have developed different tools for the pre-processing and classification of connectivity data. Specifically, it has come from the pre-processing and analysis of the magneto-encephalography (MEG) data. Both this technique (MEG) and electro-encephalography (EEG) are non-invasive cerebral imaging techniques that provide high-resolution temporal measurements of the magnetic and electric fields on the scalp generated by the synchronous activation of neural populations. It has been estimated that a detectable signal may be registered if only one in every thousand mil synapses are activated simultaneously in an area of approximately 40 square millimetres of the cerebral cortex. The exceptional temporal resolution of these techniques offer a unique window into the dynamics of the neuronal process that cannot be achieved using other types of neuro-imaging, such as functional magnetic resonance (fMRI) and la tomography through the emission de positrons (PET).

The work carried out has had several development contexts, one of the most relevant being the MAGIC-AD consortium, made up of six MEG centres (University of Utah, University of Pittsburgh, Helsinki University Central Hospital, MRC Cognition and Brain Sciences Unit Cambridge, National Centre for Gerontology and Geriatrics Obu-Aichi, Centre for Biomedical Technology) of five countries: Finland, The United Kingdom, Spain, Japan and The United States.

Technology and services

1. [dmorales] Pre-processing of data: The use of new techniques have been explored for the identification of outlier periods with the objective of characterising each subject.

2. [dmorales] Reduction in the large dimensionality of data: Multi-variant analysis techniques have been applied considering the large dimensionality of the data and the methods for selecting the variables.

3. [dmorales] Supervised classification: A system for support to the early diagnosis of dementia has been developed using MEG connectivity data in a state of rest. Different methods of supervised classification have been applied for this task. This task has been divided into two steps. The first

step consisted of the construction of classification models with MEG data coming from the CTB-UPM. It obtained very good results when classifying the subjects with minor connectivity deterioration versus controls with 89.71% of the cases well classified using connectivity data with mutual information. In the second stage different classification models were constructed from data coming from different centres. The complexity of the problem lies in the large variability of the data, produced by the different acquisition systems together with the anatomical difference between oriental and western subjects. The results obtained in this step were not very satisfactory. However, it provided us with a wide vision of the problem.

4. [dmorales] Within the collaboration framework, CeSViMa-CTB has participated in the MAGIC-AD project and presented the classification results for the early diagnosis of Alzheimer's disease in the *Symposium Magneto-encephalography International Consortium on Alzheimer's disease* (June 13-14, 2012) held at the CTB-UPM Madrid.

5. [smuelas] Detection of sources: The development of optimization algorithms for the calculation of electrical dipoles of a series of sources that produce a magnetic field measured by magneto-encephalography (MEG). The location of active regions in the brain through MEG and EEG requires the inverse neuro-magnetic problem to be resolved, which consists of the estimation of the current underlying cerebral distribution in a temporal series of measurements on the scalp through a series of sensors. To resolve this problem, several optimization meta-heuristics have been developed and analysed even achieving an improvement in the result obtained through the most used technique in the literature of the domain: the beamforming technique, offering an interesting and promising alternative for the resolution of the inverse problem of calculating the sources.

Optimization of low-demand logistic services

This research work has arisen as a result of a collaboration agreement with the company Skybus, a company in charge of providing low-demand transport systems, with the aim of developing new optimization algorithms for the resolution of routing problems of low-demand requests in real scenarios, centred on the Madrid Regional Government, of high complexity (several thousand requests a day) .

Technology and services

1. [smuelas] Variant of the "Variable Neighbourhood Search (VNS)" algorithm which thanks to the combination of efficient different mutation operators, it is able to offer solutions in a specified period of time for the problems posed by the company. Furthermore, it has demonstrated that very promising results are obtained by the most used algorithms in the state of the art.

2. [smuelas] With the aim of being able to offer solutions for the resolution of the transport problem of all the demand that may be generated in a city such as Madrid, a new VNS parallel algorithm has been developed based on the previous one, which by using division of solution space techniques by means of partitioning algorithms, it is capable of resolving the routing problem in a distributed way. For this reason a central node assigns a subset of nodes, which have a space-time relationship between them, to the rest of the nodes. At every certain time, it sends the routes that have been optimized to the central node for redistribution between the rest of the nodes with the aim of improving the quality of the solutions. This algorithm will allow problems with a high complexity to be tackled such as the resolution of problems of more than several hundreds of

requests.

International projection in scientific competitions

Finally, significant advances have been made in the field of the hybridization evolutionary algorithms for the resolution of high-dimensionality problems. In the last two decades, deferent types of bio-inspired optimization algorithms have been developed and applied to resolve optimization problems such as, for example, simulated annealing (SA), evolutionary algorithms (EAs), differential evolution (DE), optimization based on the cumulus of particles (PSO), ant colonies (ACO), etc.

1. [smuelas] High-dimensionality problems: Even though these methods have demonstrated an excellent performance at the time of resolving small or medium-sized problems, many of encounter grave difficulties in their application to large-scale problems (i.e. problems of up to 1,000 variables), due, mainly to two fundamental problems:
    a. In the first place, the complexity of a problem, generally, increases with the number of variables, the number of restrictions, or even the number of objectives (for multi-objective optimization). This emergent complexity may prevent the search strategy from being able to find the optimum solution.
    b. In second place, the solution space of the problem increases exponentially with the number of variables which is why it is necessary to define an efficient search strategy to be able to explore all of the promising regions with limited computational resources.

    [smuelas] Hybrid algorithms: Historically, the extension of the EAs is a large-scale problem which has attracted a lot of attention both in theoretical and practical studies. However, there is a reduced number of works that centre on analysing this aspect in EAs. With the aim of looking deeper into this problem, new hybrid algorithms have been developed using sophisticated combination mechanisms, which are able to offer a very competitive performance in High-dimensionality problem benchmarks.

Associated CeSViMa services

1. [smuelas] The result of the collaboration agreement with the company Skybus, the development of a computation service has been planned for a supercomputing and visualization centre in Madrid (CeSViMa) for the daily resolution of the low-demand transport problems of the company Skybus. This service will allow the company to use, exclusively and for a specific period of one day, (from approximately 00:00 up to 04:00) a certain number of Magerit nodes with the aim of implementing optimization algorithms which are developed to be able to obtain one or several solutions which satisfy the requests for every day of the week.

2. [dmorales] Catalogue of supercomputing services de for the health sector:
    a. Integration de clinical and functional data oriented at developing applications for the extraction of knowledge by applying automatic learning and data mining techniques.
    b. The development of a system that manages and integrates large volumes of information coming from different sources such as clinical records, structural images (magnetic resonance, tractography) as well as neuro-functionals (functional magnetic resonance,

EEG, MEG), genomic information, epidemiology, among others in a digital repository.

c. Integration with processing systems for the processing of medical images (extraction of cerebra structure measurements such as volume and area).
d. Adapt and implementer new methods for the multi-variant, multidimensional and multimodal analysis of large volumes of information.

To develop methods for the visualization of data as well as the result of the analysis of the information.

Collaborations established with external agents

Skybus

As has been described in the previous section, a working collaboration has been established with the company Skybus to offer solutions, not only in the research and development of new optimization techniques for the real problems that arise daily in the company, but also for the establishing of a computing service by CeSViMa, in which they can implement the techniques developed.

Associated projects

- INTI Project ("Synergic Integration of flexible Urban Mobility Models") (€60,000/Skybus)
- ADITI European Eurostars Project ("Advanced High-Performance Vehicle Routing & Scheduling Through Emerging Parallel Computing Architectures") (€100,000/EC)

CTB (Centre for Biomedical Technology) – Hospitals

A collaboration has been established with the MIDAS group of the CTB-UPM and deferent hospitals in Madrid amongst which are: *Hospital Puerta del Hierro, La Paz and Hospitales de Madrid*. For this reason a portfolio has been developed with the services offered by CeSViMa in which a system has been proposed and designed in interactive modules to act at three levels: Hospital, clinic and research Management.

Associated projects

- Elekta Neuromag funding Consorci MAGIC-AD (60.000€/Elekta)

Nissan Ibérica – UPC (*Universidad Politécnica de Catalunya*)

A collaboration agreement has been reached with the team led by Dr. Bautista Valhondo, a Professor from the *Universidad Politécnica de Cataluña* (UPC) and director of the Prothius industrial organization, a result of the collaboration agreement between Nissan and the UPC, for the development of a series of heuristic optimization techniques for the resolution of the following problems: optimization of the availability of machinery and modules in workshops, orientated at the product, processes and flexible cell manufacture and the determination of the positions of the electric chargers of internal logistic vehicles, location of service stations with an electric charger, design of internal routes for industrial plants and, finally, for the design of production networks for the regulation of product flows conditioned by the sequence of products on the JIT context and Douki Seisan.

Associated projects

- Pending definition.

DECIDE
It is also worth mentioning the collaboration agreement with the company DECIDE solutions for the resolution of problems in the optimization of continuous values and for the giving of the training seminary in the area of optimization.

Associated projects

- Pending definition (training activities and strategic partnership)

INNAXIS
Finally, a line of work with the company INNAXIS has been initiated, within the European Resilience 2050 program, for the analysis of data carried out within the European Union on flights taken within the European Union with the aim of identifying robust patterns of the system and its application within the air control system.

Associated projects

- European Resilience 2050 program (€120,000/EC)

INDRA
The joint development, together with the CTB, for a series of storage, access and manipulation of a bank of images services designed to manage large volumes of information is proposed. Additionally, the system will have visualization and integration methods with systems of the processing of medical images and their integration with data analysis systems. The system will have the backing of the processing and storage infrastructure of the CeSViMa (Centre for Supercomputing and Visualization in Madrid).

Associated projects

- Proposal for financing INDRA of the prototype of a Bank of Images (Negotiations are expected to conclude very soon) (€90,000/INDRA)

Skybus
As has been described in the previous section, a working collaboration has been established with the company Skybus to offer solutions, not only in the research and development of new optimization techniques for the real problems that arise daily in the company, but also for the establishing of a computing service by CeSViMa, in which they can implement the techniques developed.

Associated projects

- INTI Project ("Synergic Integration of flexible Urban Mobility Models") (€60,000/Skybus)
- ADITI European Eurostars Project ("Advanced High-Performance Vehicle Routing & Scheduling Through Emerging Parallel Computing Architectures") (€100,000/EC)

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Associated projects

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Associated projects

- Pending definition.

DECIDE
It is also worth mentioning the collaboration agreement with the company DECIDE solutions for the resolution of problems in the optimization of continuous values and for the giving of the training seminary in the area of optimization.

Associated projects

- Pending definition (training activities and strategic *partnership*)

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Associated projects

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The joint development, together with the CTB, for a series of storage, access and manipulation of a bank of images services designed to manage large volumes of information is proposed. Additionally, the system will have visualization and integration methods with systems of the processing of medical images and their integration with data analysis systems. The system will have the backing of the processing and storage infrastructure of the CeSViMa (Centre for Supercomputing and Visualization in Madrid).

Associated projects

- Proposal for financing INDRA of the prototype of a Bank of Images (It is expected to conclude the negotiation very soon) (€90,000/INDRA)

CBGP (Centre for Biotechnology and Plant Genomics)

- The CeSViMa-CBGP collaboration with Pablo Rodríguez Palenzuela, Juan Imperial and Mark Wilkinson from the Centre for Biotechnology and Plant Genomics has been established. Vicente

Martín, Gabriel Rucandio, José María Peña and Dinora Morales on the part of CeSViMa. With the objective of applying different automatic learning and data mining as support to the discovery of knowledge related to the lining up of gene sequences to help in the research related to the process of the bacterial infection of the plant.

Associated projects

- Calling for nationally financed projects.
- Extension pending definition.

Human Brain Project

Within the framework of the Human Brain Project, divisions of the High Performance Computation (HPC) and Neuro-computing and making use of the Magerit-CeSViMa will participate in the:

1. Visualization and interaction in Exascala.
2. Analysis of large volumes of data coming from structural and functional data

Associated projects

- HBP FET Flagship (€350,000/EC ramp-up phase, more the €1M planned in the consolidation phase)

Most significant results

- 8 research articles in preparation/sent to JCR journals.
- 4 congress papers.

Explanation of the use of human, material and economic resources

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropriate

Table I. Description ofproject activities

Scope	Scientific Improvement
Activity	International Symposium on Translational Research in Plant Biotechnology and Genomics: fundamental research meets the agriculture, environmental and industrial demands (1º Semestre 2013)
Objectives	This activity is in line with the CEI's strategy to stimulate knowledge transference, to attract talent and to internationalize its activity and that of its researchers. These activities allow access to information at the forefront of knowledge, which results in a clear benefit for the Spanish Science and Technology system by empowering its research lines and its collaborations with other European and International centres.

Progress towards objectives

The Symposium took place on the planned dates (January 31, February 1, 2013). Its objectives have been clearly attained: presentations by invited speakers has allowed access to the most recent advances in the areas covered, the symposium has facilitated interactions with researchers from other institutions (not only with invited speakers), which in turn has resulted in new scientific collaborations and has achieved an increase in visibility of CBGP and CEI Montengancedo.

Description of activities carried and role of the participants

Workshop on Translational Research in Plant Biotechnology and Genomics: fundamental research meets the agriculture, environmental and industrial demands (1st Semester 2013)

The International Symposium “New Frontiers in Plant Science” took place at CBGP the days 31st January, 1st February, 2013. One hundred and seventy scientists in the area of plant biology attended, of which 40% were external to CBGP, coming from Spanish centres (OPIs and Universities) and companies. Gonzalo León, Adjunct to UPM's Rector for Strategic Programs, opened the sessions giving a presentation on the International Excellence Campus and on UPM policies regarding this campus. Fourteen invited speakers, all of them highly relevant scientists in their areas, were invited from american and European institutions (see program below).

The workshop centered on the new opportunities created by "omic" approaches (genomics, epigenomics, proteomics, metabolomics, ...) as applied to plant biology. New concepts in systems biology, plant comparative genomics and bioinformatics were presented. All the speakers are relevant scientists working on novel aspects of plant biology in the fields of plant development, biomass production and responses to biotic and abiotic stress, as well as novel research lines realted to new technologic advances. These are all summarized in the Symposium program:

Significant results

Workshops organized within this context aim at becoming international reference meetings in their fields. In all of them, companies are brought in, in accordance with the strategic objectives of CEI Montengacedo. In the case of plant genomics and biotechnology, this Symposium is unique since it is primarily addressed to the field of translational genomics.

The wide range of aforementioned attendants implies that these objectives were clearly met. On the one hand it allowed CBGP researchers, including young researchers in their training stages, to interact with first class international researchers. On the other, it placed CBGP in the international scene, greatly increasing its visibility. The schedule, allowing ample time for session discussions and for informal talks, was clearly in line with these aims.

Description of use of human, material and economic resources

Workshop on Translational Research in Plant Biotechnology and Genomics: fundamental research meets the agriculture, environmental and industrial demands (1º Semestre 2013). Dentro de estetema el SimposioInternacional se denominó “New Frontiers in Plant Biology”

Human, material and economic resources were distributed as follows:

1. Invitation to 14 external speakers, including travel and expenses for three days in Madrid. 4.927,37 €
2. Event advertising and diverse office materials. 1.086,16 €
3. Retrofitting of Seminar Room at CBGP, increasing capacity and improving projection and audio systems 9.939,12 €
4. Supporting computer equipment. 3.081,50 €
5. Administration, clerical and audiovisual services. 5.650, 00 €

From Ministerio de Educación (Campus de ExcelenciaInternacional, Subprograma*FORTALECIMIENTO* 2011).

In addition, item 1 has been co-financed with an AcciónComplementariafinanced byInstitutoNacional de Investigación y TecnologíaAgraria y Alimentaria (INIA) and by CBGP funds.

Most relevant deviations in the progress towards objectives

Does not apply.

Proposals for correcting measures

Does not apply.

Table I. Description of actions to be executed within the project

Scope	Scientific improvement
Actions	Organization of JVRC 2012 Congress – Joint Virtual Reality Conference of ICAT-EGVE-EuroVR, during 17th, 18th and 19th October 2012, at CeDInt-UPM premises
Objectives	• Enhance the role of UPM as research reference in the area of Virtual Reality • Attract the participation of renown researchers in the area and boost the interaction among them and UPM researchers. • Promote the generation of academic and research opportunities among participants. • Attract the participation of industrial representatives to create collaboration opportunities between UPM and the participant companies.

Progress towards the objectives

JVRC Congress is an international high impact event, well known by the academic, scientist and industrial community in the field of Virtual Reality, Augmented Reality, Mixed Reality and 3D interfaces. This event provides a natural environment to exchange research results and experiences on applications and innovative use cases. Moreover, it includes practical demonstrations of those results, together with emergent technologies, thus providing an ideal platform to envisage new lines of work and collaborations in this sector.

In year 2012, JVRC 2012 – Joint Virtual Reality Conference of ICAT – EGVE – EuroVR merges in a single event the 18th Eurographics Symposium on Virtual Environments, the 9th EuroVR Conference and the 22nd International Conference on Artificial Reality and Teleexistence (ICAT). This merge enlarges the reach of the event to the Asiatic continent, with the presence of the Japanese Conference ICAT.

This will allow UPM to gather the international scientific community and the industry in the field of Virtual Reality, consolidating the role of our University as an academic reference in this area. In total, the expected number of attendees is approximately 200 people, taking into account attendees and speakers.

During the last edition of JVRC that was held in Nottingham, UK, 20th-21st of September 2011, CeDInt-UPM and "Laboratorio Decoroso Crespo" from Computer Faculty presented jointly, in representation of UPM-CEI Montegancedo, the forma candidature to host in CEI-Montegancedo the annual conference in 2012 (see attached presentation <1109_HostingJVRC2012@UPM.pdf>).

From the oficial selection of the candidature, made public in the closure event of JVRC'11, the team of CEI-Montegancedo started to work in the preparation of the above mentioned objectives. The work carried out during the following months is described in next sections.

Description of work performed and role of participants

The Organiser Committee of JVRC'12 is made up of professors and researchers belonging to the following research groups and laboratories of CEI-Montegancedo.

1. The Group of Intelligent Virtual Environments of Laboratorio "Decoroso Crestpo", from Computer Faculty.
2. Virtual Reality Laboratory of CeDInt-UPM.

Members of the Local Organiser Committee of JVRC 2012

The following section describes the preparation and support activities carried out during 2012 by the Organiser Committee to prepare JVRC'12 (for further information on organization details, see the website of the conference http://jvrc12.fi.upm.es/):

1. Preliminary proposal to organize JVRC'12 and composition of the Organiser Committee of the Conference (see attached <Draft PROPOSAL FOR THE ORGANIZATION OF THE JVRC2012.pdf>). The final composition of the Organiser Committee is published in (http://jvrc12.fi.upm.es/, section Committees)
2. Development and hosting of website of the Conference, e-mail service and lists for each Committee.
3. Preparation, publication and dissemination of Call for Contributions:
    - Call for Scientific Papers (see attached <JVRC2012_Call for papers.pdf>)
    - Call for Industrial papers (online, se http://jvrc12.fi.upm.es/, section Call for Contributions)
    - Call for Posters (online, see http://jvrc12.fi.upm.es/, section Call for Contributions)
    - Call for Demos (see attached <JVRC2012_Call for demos.pdf> or http://jvrc12.fi.upm.es/, section Call for Contributions)
    - Call for Exhibits (see attached <JVRC2012_Call for exhibits.pdf> or http://jvrc12.fi.upm.es/, section Call for Contributions)
4. Reception of proposals, coordination of evaluation process and notification of accepted/denied scientific papers, industrial papers and posters.
5. Reception of proposal, coordination of evaluation process and notification of accepted/denied Demos for Exhibit.
6. Preparation of the agenda and program of presentations of Industrial and Scientific tracks, and demos and exhibits (see available programme in http://jvrc12.fi.upm.es/, section Programme)
7. Organization, technical support and logistics management for the location and installation of demonstrations and exhibits, including the following tasks:
    - Preparation and dissemination among participants in the Demos and Exhibits Track of the rules&instruction manual to install the expositions and demos in CeDInt-UPM building (see attached <Participation Rules JVRC 2012.pdf>)
    - Dimensioning and configuration of local access points (AP) to provide internet access to attendees in the wireless network InvitadosUPM.
    - Design and programming the Augmented Reality application to provide detailed information on

Demos and Exhibit tracks to the attendees (see image and video of the application in http://www.youtube.com/watch?v=eg3dEXAXV7E).

AR application developed by Virtual Reality Lab of CeDInt-UPM for JVRC 2012

- Preparation of a three-page leaflet on Demos and Exhibit Track (see attached <triptico_JVRC2012.pdf>)
- Management of logistics and technical needs of attendees to receive, install and configure demos and prototypes for the exposition.

8. Technical and logistics support for the development of the event (see attached <JVRC 2012 Demos info.pdf>)
9. Dissemination: during year 2012, the Organizer Committee of JVRC'12 carried out an intense dissemination of the conference, including not only dissemination prior to the event (e.g. publication and dissemination of the Calls for Contribution above mentioned), but also the dissemination of the most relevant contributions (presentations, demos, etc.) during and after the event to the scientific community, industry and society. This information was distributed directly to more than 200 national and international contacts and through collaborating associations, forum and specialized communication media. These are some examples:
    - International Society for Presence Research - http://ispr.info/2012/05/09/call-jvrc-2012-joint-virtual-reality-conference-of-icat-egve-eurovr/
    - VR-News - http://www.vr-news.com/2012/05/28/madrid-welcomes-jvrc-2012/
    - WikiCFP - http://www.wikicfp.com/cfp/servlet/event.showcfp?eventid=23319&copyownerid=38218
    - EMC: Excellence in Media Computing and Communication - http://www.emc-square.org/emc2/?ai1ec_event=jvrc-2012&instance_id=
    - EuroVR: http://www.eurovr-association.org/news/upcoming-events/147-jvrc-2012-joint-virtual-reality-conference-of-icat-egve-eurovr
    - Virtual Dimension Center - http://www.vdc-fellbach.de/news/2534
    - CreativiTIC - http://www.creativitic.es/content/es/proyectos/7-formacion/54-jvrc-2012
    - Web de CeDInt - http://www.cedint.upm.es/es/noticia/2012-10-19/concluye-4%C2%AA-edicion-jvrc-coorganizado-por-facultad-informatica-cedint
    - 4th EuroVR newsletter - http://www.eurovr-association.org/news/latest

Most significant results

The Project has been successfully carried out according to the foreseen planning, without suffering time deviations.

The website of the conference (http://jvrc12.fi.upm.es/) is still working and contains the details on Committees, Programme, etc. The most remarkable results of the JVRC 2012 are listed below:

JVRC 2012 has given fruitful continuation to the collaboration initiated in Lyon in 2009 among the following events:

- Conference and Exhibition of the European Association of Virtual Reality and Augmented Reality (EuroVR)
- Eurographics Symposium on Virtual Environments (EGVE)
- International Conference on Artificial Reality and Telexistence (ICAT)

The 114 participants in the Conference (researchers on VR/AR, engineers and users) had the chance to interact, share results and new developments and to discuss emergent directions in their fields of knowledge. The composition and profile of the attendees is detailed below:

Total number of registered attendees = 114:

- exhibitors (without access to the scientific and industrial tracks): 10
- members of local Organiser Committee: 10
- Members of VRSJ: 14
- Members of EuroVR: 46
- Members of EuroGraphics: 11
- Non-members: 43
- Students = 30:
    - Members of JVRS: 5
    - Members of EuroVR: 9
    - Members of EuroGraphics: 5
    - Non-members: 11

Apart form these attendees, approximately 80 external visitants attended the Demos&Exhibits track during the days of the conference.

The conference started with two Keynote Speakers: Doug A. Bowman, from Virginia Tech University, USA and Pedro Morillo, from Universidad de Valencia. During the event a Panel was held chaired by prestigious researchers Carolina Cruz-Neira, University of Louisiana at Lafayette, USA and a Tutorial given by David Roberts and Tobias Duckworth, University of Salford, UK. Moreover, there were 53 presentations distributed as follows:

- Scientific Track: 12 scientific articles accepted out of 39 received contributions (acceptance ratio 30%)
- Industrial Track Industrial: 30 presentations from industry representatives.
- Posters Track: 11 contributions out of 19 received contributions (acceptance ratio 58%)
- Demos and Exhibits Track: 12 demos (see attached <Demos JVRC_vf.pdf> and 6 exhibitors from industry.

The scientific proceedings are available online in the Digital Library of Eurographics (http://diglib.eg.org/EG/DL/WS/EGVE/JVRC12). The industrial papers and posters have been published in a proceedings book with ISBN: 978-84-695-5470-8.
Explanation of the use of human, material and economic resources The Budget has been totally spent in concepts related to the necessary logistics to carry out the Congress, for a total of 25k€, broken down in the following concepts: Adaptation of exhibit spaces:1.685€ Installation and rental of stands: 4.325€ Rental of audio-visual equipment and 3D content: 2.905€ Logistics to support participants, speakers, exhibition and attendees: 16.154€
Important deviations in the progress towards the goals Non extant
Proposed Corrective Actions Not necessary

Table I. Description of project activities

Scope	Scientific Improvement
Actuation	Organization of the Infernational Conference Dynamics Daus Europe XXXIII
Goals	These actions are in line with the CIS strategy to boost knowledge transfer, talent attraction and internationalization of their activities and their researchers. These activities allow access to cutting-edge information that will result in a clear benefit to the science and technology spanish system, enhancing their lines of work and collaborations with European and other world regions

Progress towards goals

International Congress XXXIII Dynamics Days Europe was successfully held from 3 to June 7, 2013 on the campus of Montegancedo, with the participation of 300 experts in the fields of complex systems, especially in those related to the application of these methods to biological problems.

Description of work and role of participants

The conference has been attended by more than 300 experts from all over the world, and is organized in 13 plenary talks given by world leading scientists of the field, 120 talks organized within 30 topic minisymposia, about 100 oral presentations, and 80 in poster format.

The plenary talks where presented by the following invited speakers:

- Albert-Lázló Barabási (Northeastern University, USA)
- Hugues Chaté (Centre d'Etudes de Saclay, France)
- J. Feigenbaum (The Rockefeller University, USA)
- Jordi García-Ojalvo (Universitat Pompeu Fabra, Spain)
- Anne Ly Do (MPI for the Physics of Complex Systems, Germany)
- S. C. Manrubia (Centro de Astrobiología CSIC-INTA, Spain)
- Cristina Masoller (Universitat Politècnica de Catalunya, Spain)
- Luciano Pietronero (University of Rome "La Sapienza", Italy)
- Itamar Procaccia (Weizmann Institute of Science, Israel)
- Kenneth Showalter (West Virginia University, USA)
- Wolf Singer (MPI for Brain Research Frankfurt am Main, Germany)
- H. Eugene Stanley (Boston University; USA)
- Manuel G. Velarde (Universidad Alfonso X El Sabio, Spain)

- Oreste Piro Perusin (Universidad de las Islas Baleares, España)
- Bernhard Mehlig (Universidad de Gothenburg, Alemania)

Likewise, among the topic sessions of the congress can be highlighted:

- Control of synchronization in delay-coupled networks
- Complex networks in climate dynamics
- Nonlinear dynamics in lasers: fundamental issues and novel applications
- Longwave and multiscale pattern formation
- The critical role of dynamics in hearing
- Complex dynamics and applications in cardiac electrophysiology
- Neuronal interactions and synchronization in the brain dysfunction epilepsy
- Nonlinear dynamics of genetic circuits
- From the neuronal systems to the brain

The Conference Chair was Prof. Stefano Boccaletti, who until recently held the Isaac Peral Chair in Systems Biology at the CTB. The best posters presented by young researchers have been awarded with prizes sponsored by the European Physical Society and various scientific publishers.

he organization provided bus service between Madrid and the conference venue for all the participants, as well as catering and assistance in arranging accommodation. As social event of the Conference, it was arranged a visit to the Monastery of El Escorial followed by a Gala Dinner.

Participants of Dynamic Days Europe XXXIII

The opening ceremony of the Conference was attended by the President of UPM, Prof. Carlos Conde, the Dean of the Faculty of Computing, Prof Victor Robles and the Director of CTB, Prof. Francisco del Pozo.

Most significant results

Dynamics Days Europe international conference is the one with longest tradition in the area of Physics of Complex Systems, meeting annually, since 1980, scientists from all around the world. The participants are specialists in the most current topics of the field, as systems and complex networks, biophysical modeling or neurodynamically, among others. With the celebration of the XXXIII edition of the Conference in the CTB has provided an excellent means for the internationalization of Montegancedo Campus as Campus of International Excellence, thereby improving the future possibility of participating in European research consortia, and therefore become in condition to acces to funding

from several international programs.

As a first result in this direction that follows to the Conference, it should be noted that during the Conference it has been signed an agreement between Polytechnic University of Madrid and the Institute for Complex Systems Laboratory of Florence to activate a cojoint laboratory on biological networks that will operate inside CTB structure, coordinated by Prof. Boccaletti.

As initial dissemination of scientific results, it has been published a Book of Abstracts with all the scientific contributions of the Conference, edited by the General Foundation of the UPM. This document, the program and other information on the Cnference can be found in digital format on the web:

http://dynamics-days-europe-2013.org/

Explanation of the use of human, material and economic resources

A part of the expenses were funded by the Ministry of Education of the call Campus of International Excellence, throught a grant from the Subrogram FORTALECIMIENTO 2011.

Although CTB was the organizing center, due to the large number of participants the conference was held at the facilities of the Faculty of Computing. In addition to the FORTALECIMIENTO grant, the Conference had additional sources of funding through a grant of the URJC for meetings organization, the Italian Embassy, and input from various publishers for sponsoring prizes for the best posters. The rest of finantial resources were obtained by the participants fees.

Important deviations in the progress towards the goals

Not applicable.

Important deviations in the progress towards the goals

Not applicable.

Table I. Description of Project Actions

Scope	Scientific and other improvements aimed to adaptation and deployment of EEES including building conditioning.
Action	Green Labs
Objectives	The objective of this action is updating CEI Montegancedo research labs in order to improve both facilities and equipment transforming them in sustainable experimentation and research centers. As a starting point and proof of concept CBGP and CeDInt buildings have been chosen due to the uniqueness of their installations.

Progress to objectives

The general objective of modernization and update described above is based in the use of computer tools together with a sensor and actuator network in selected research lasb sin order to set up actions in five different areas:

- **Monitoring**. Required to raise any efficient energy management and safety action, particularly in laboratories NBC (nuclear, biological or chemical). The goal is to gather the energy consumption data of the facility from which we will define the most appropriate optimization strategy.
- **Energy efficiency**. On the basis of consumption data policies will be defined for energy optimization. Some of many possible will be lighting intensity control based on outside light and the presence of people, climate control, customization of environments, etc..
- **Security**. Among the actions planned is the installation of sensors to facilitate the control of the security parameters in research laboratories, particularly in laboratories NBC. These actions include the safety of people who use the lab, as well as the equipment and facilities.
- **Automation**. In this area the aim is to achieve a level of automation to supplement the work of the researcher and facilitate the maintenance of adequate working conditions for each installation, optimizing where possible associated energy consumption. This automation implies the installation, among others, of monitoring devices (temperature, humidity, light, noise, energy consumption) and control (lighting, climate control, presence control).
- **Computing Innovation.** The above elements will be integrated into a platform BMS (Building Management Systems) that manages the services that are to be installed in laboratories, integrating different types of devices and technologies into a single control system, and under a robust and easy to use interface. The platform will allow the control of automation devices and laboratory safety and will provide the necessary intelligent management to improve building energy efficiency (climate, electricity, water, etc.).

Description of accomplished work and role of participants

This project was initiated by the Group on Energy Efficiency and Smart Cities of CeDInt-UPM, which is responsible for its management and complete execution.

The starting point of the project is the Campus action F-B5c, focused on the initial assessment of selected buildings and laboratories, and the definition of energy requirements to consider. Thus the present Campus action in based on the previously obtained results, in order to define the following tasks:

Design of electrical consumption measurement modules. The modules have been designed in two phases. The first phase a first batch of prototypes was created for installation in electrical panel DIN rail 4 units. This model was capable of monitoring up to 7 unbundled lines allowing us to execute the first phase of testing and redesign for the second version which is the one implemented in the project. This phase has already been executed and concluded.

Design of BMS management platform for the delivery of energy efficiency and control services. The BMS software will provide users and system administrators with information related to monitored variables, statistics, and history information as well as schedule deviations or changes compared to historical data that can be caused by improper use of the devices or malfunction. The platform consists of two main parts: the management block is responsible for defining the operating parameters, and properly stores the monitored values, and the second block integrates the visualization and creation of rules that the user will use to manage laboratories. The management platform is now complete, and is in Beta-Test, and the user interface is being defined with a multidisciplinary team of laboratory users and software engineers.

Manufacturing of and validation of the first devices of consumption metering. As a result of the testing described above, there is a redesign and optimization of the measuring device in a new compact format of 2 DIN Rail units, with capacity to monitor 6 unbundled lines. The reduced size allows cheaper deployment and increases efficiency of use of electrical panel by 71%. The new design and prototype has already been designed, built and tested.

Pre-industrialization of power consumption measuring modules. The pre-industrialization phase of the device is undertaken after the redesign of the device above, and passes through the design of a specific box for the PCB device that meets all safety standards and ease of use with commercial products. Design goal is that the installation is simple and economical, and easily fits as many situations as possible. The pre-industrialization phase of the measurement device has been

completed paving the way for physical manufacturing.

Installing a pilot at the CeDInt-UPM building. The implementation phase undergoes a period of testing in a controlled environment. CeDInt-UPM building is chosen because of a highly disaggregated electrical installation, offering researchers a familiar environment, easy to modify to identify potential problems related to both individual devices its interactions. It also provides a test bench and measures batch for the development of the BMS platform. This testing phase has been initiated at the time of the report, and is ongoing as part of the project.

The next stage of the project is the installation of the measurement modules on the CBGP selected laboratories, and their integration into BMS platform developed. Thanks to this, laboratory monitoring may be performed remotely from any location and access device. This stage consists of the following tasks:

Surveying of Greenhouse facilities of CBGP including inventory of unbundled lines in electrical distribution panels to be monitored and devices to be measured.

Manufacturing of necessary measurement devices to monitor all inventoried line.

Design of additional communication elements to ensure appropriate radio coverage of the measurement network. This task is ongoing being made designs and prototypes, but not yet tested in situ in the laboratories of CBGP.

Physical deployment of measurement and communication devices.

Installation of data network hardware to ensure IPv6 packet traffic between CBGP greenhouse buildings where the measurement devices are, and CeDInt building housing the management platform, and engineering team.

BMS software integration and implementation of the user interface.

Training to CBGP users. This work will be undertaken at the end of the project when all other tasks have been completed, and the monitoring and control system is stable.

The tasks of this stage are concluded in ninety percent, some details are pending related primarily to the operation of the system.

Finally, the selected laboratories will integrate additional devices to provide security services and facilities control, completing the monitoring activity. This action consists of the following tasks:

Design of sensor devices required for the functions of monitoring temperature, humidity, light, presence, soil moisture etc.

Search and selection of appropriate lighting for controlled growth greenhouses based on LED. This task has been done although is pending review by an expert panel.

Design of a dimming device suitable for the LED lamps selected. This task is being executed pending the final selection of most appropriate lamps.

Installation of lamps and control and measuring devices into a PILOT Greenhouse containing all the new technologies described, and this in turn monitored by the measurement systems described above. This task is pending execution as it depends on the conclusion of all the previous ones.

The tasks of this action are done by seventy percent. Some of these tasks are coordinated with the previous stage, and will be completed simultaneously.

Most significant results

This action is framed within the institutional agenda with a transversal character for integrated sustainability: economic, social, and environmental, as stated in in the plan of transition to IEC. This project is a reflection of the Campus integration into a model of economic sustainability. It also maintains a strong

commitment to experimentation by considering this action as a pilot and demonstrator of actions in other CEI or general UPM buildings.

In this sense, the project is a breakthrough of great impact for the efficient management of energy resources at the University, the experience gained for research labs is extensible to other types of facilities (office buildings, schools, research centers) multiplying the impact of the project beyond the direct impact on the CEI Montegancedo.

Technologies developed for the project offer a huge potential in the fields of research and industrial exploitation. Processes for medium scale industrialization have been developed and executed in order to transform laboratory designs into practical devices; at the same time we have acquired significant data that can be the basis of any energy efficiency research. The generalization of the technologies tested in this environment is the next logical step forward from the experience gained.

Additionally, this project has revealed the potential of saving for the university in areas such as lighting of its centers, technology offers significant savings and once contrasted with usage information will help to identify the priorities for future actions regarding energy efficiency priorities.

Therefore and beyond the fulfillment of the objectives mentioned above, there is a clear opportunity for diversification of the research line, as many designed devices can be considered the embryo of commercial products, in order to pass this activity through a spin-off of UPM that can focus its commercial activity in the provision of services such as those described, expanding the impact of the project after completion.

Explanation of the use of human resources, material and economic

The funding received from the Ministry of Education adds to an amount of € 100,000.00 of the call the Campus of International Excellence (CEI), Subprogram FORTALECIMIENTO 2011. Funds will be used entirely for the acquisition of material resources for the development of the project.

Important deviations preventing achievement of objectives

Does not apply.

Proposal of correcting actions

Does not apply.

Table I. Description of the project actuations.

Scope	Knowledge and technology transfer from academic research to industry
Performance	Living Labs - Hotel of the Future
Objectives	Maintenance of the technological simulators and projects in the "Living Labs" located on the campus of Montegancedo, in order to develop and market innovative technologies created in the UPM.

Progress towards the objectives

The objective of this action is to build and maintain an environment for experimentation and demonstration of technologies and concepts for the Hotel of the Future and, in general, for the Future Spaces (Experience_Lab or ExpLab), as contextual and smart spaces.

The Experience_Lab will serve as an observatory and space of demonstration, cooperative creation and evaluation of advanced concepts of technologies and services for the Future Spaces (public or private). Among others, we are considering sensorized space concepts, technologies for advanced interaction (gestural, tactile, etc.), augmented objects, advanced personal devices, monitoring techniques and other elements capable of composing “experiences” in the smart spaces of the "smart city".

The Laboratory is intended to be a space of incubation, maturation and demonstration of technologies and services, built to facilitate creative interactions between user communities with different profiles and relevant actors (companies, administrations and research groups), in various scenarios, to support co-creation, concept and technology exploration, and experimentation and evaluation of new ideas.

Due to its general conception, in its evolution, the initiative will become multidisciplinary and open to all related UPM technologies (including design, construction, energy, materials, landscaping, ICT, etc.).

It is based on the philosophy of open innovation, in which the ideas and developments evolve in multidisciplinary environments, playing the user a central role throughout the whole life cycle of value creation.

Finally, some selected technologies, tested in the ExpLab, will be implemented on a pilot basis in certain real spaces. Therefore, the Experience_Lab will have also available resources for configuration and management of remote infrastructure.

From the point of view of the resources, as detailed below, the funds from the Campus of Excellence covered the infrastructure and material costs required for the Lab deployment. The necessary R & D is made in other projects and with other funding (mainly from CENIT projects, and private and own UPM funds).

Specifically, the objectives it seeks this action are:

• Provide a space for demonstration, evaluation and user validation of technologies and service concepts in various niches, initially oriented to the hotel but also, most importantly, to other spaces and the city itself.

• Provide a set facilities specifically deployed to analyze different functional areas of a complex smart space, as for example, interaction and communication, energy issues, smart objects or organization and productivity, from a multi-disciplinary integration perspective.

• Have a space to promote creativity for the development of concepts and services, combining open methodologies for generation of solutions by complementary groups of agents, with the end user playing the central role. Specifically, besides, the laboratory will serve as a forum to generate new ideas for R & D by UPM groups (though it is not itself a space for implementing technological R & D).

• Having a live space to maintain a regular and ongoing relationship with various concerned business sectors in order to conceive emerging services and to evolve immature technologies, through interaction and (open) cooperation with researchers and users.

Description of work performed

The action, designed to be developed in five years, is organized into three phases, with identified objectives and milestones. The first phase extended through 2011 and 2012, the second phase extends through 2013 and the third one will go from January 2014 to December 2015.

Phase 1 (2011 - 2012): Construction and basic infrastructure. Deployment of technologies: conditioning of the first spaces of the laboratory and deployment of the first technologies and experimental concepts. Deployment of the first provisional Demo Room, to perform experiments and demos in a lab environment designed to test and demonstrate technologies and service concepts in controlled conditions. This phase was completed in January 2013.

Phase 2 (2013): Deployment in the final space (160 m2) of the concepts of the Experience_Lab: installation of Experience Rooms, spaces designed to emulate some rooms and contexts in an advanced space. The space of the Experience_Lab is designed as a multifunctional space prepared to easily compose rooms and/or real contexts of a public or private space.

Currently, the space is organized into rooms with adaptive structures to configure different environments and integrates embedded infrastructure of sensing technologies, ubiquitous display/visualization and interaction technologies for intelligent objects. During the last quarter of 2013 the deployment of the actual services will be stabilized and evolved.

The basic objectives of this phase are to reproduce in the Experience_Lab, in quasi-real conditions, certain scenarios and experiences, based on existing and available or precompetitive technologies.

Phase 3 (2014-2015): Demonstrations and Experience_Lab evolution. During this phase, the activities will be oriented to users and industry players, including technology companies, and there will be numerous activities to identify valuable technologies and also actions of dissemination to groups and centers of UPM, and diffusion to the outside. This phase allow for the continuous evolution and adaptation of services to new opportunities and applications.

It is expected that the first external partners will join the ExpLab in 2014.

Most significant results

During 2013, apart from the achieved progress in the supply of infrastructure, several demonstrators have been deployed in the Experience_Lab. These demonstrators constitute the first stable deployment of the Laboratory. The demonstrators had developed in the previous biennium with resources coming from the UPM and its partners.

Among others, we mention the following examples (all of them are already in operation, in their second or third version):

- Demonstrator of indoor user locatization through wireless technologies (WiFi and ZigBee): the system is able to accurately determine the room or area in which the user is, and to provide him with contextual relevant services through an appropriate local device.
- Proximity detection demonstrator: the system is able to determine the closest device to the user and, as a consequence, present multimedia content or other information of interest in the appropriate device.
- Mobile augmented reality demonstrator, for indoor environments, with accurate localization based on ultrasound systems and RFID systems: through these two technologies and the ones embedded in the tablet device, the user can evaluate different augmented reality concepts and services in an indoor environment.
- Demonstrators of the use of personal mobile devices for interaction with the smart environment: using the sensors embedded in the smartphone (accelerometer, NFC, etc.) and infrastructure and networking technologies, the demonstrators let the visitor experience several concepts of interaction with the environment and its objects, by using gestures and movements.
- Demonstrator of Kinect gesture-based interaction: the demonstrator allows the user to perform several actions (including home automation) that are triggered through natural interaction gestures.
- Virtual window demonstrator: this demonstrator simulates a window, equipped to track (through optical sensors) its observer’s movements and attitudes, in order to provide a natural feeling of being looking through a real window.
- Demonstrator of a platform for sensor fusion and actuation: this demonstrator includes a centralized monitoring system, which allows the management of diverse sensing and

actuating systems that are ubiquitously located in the Experience_Lab environment.

These demonstrators have already been deployed in the Experience_Lab space; they are combined to compose services to shape "user experiences". This is to say that they are not presented as if they were isolated demos, but integrated in the areas of the Lab and in a natural visitor flow, intending to simulate real daily living spaces. Some of the "experiences" have already been prescreened or evaluated by real users, with the participation of lead users.

The Experience_Lab facilities have been visited, at this time of installation, by several corporate representatives and by individuals interested in the deployed technologies and services. Additionally, the Lab has also been visited by several groups of graduate students of different specialties.

However, the stage of diffusion, dissemination and technology transfer is planned to be addressed in the biennium 2014-2015, a period in which we expect the services to be matured and new innovative ideas appear, as a natural consequence of the cooperative interaction among several complementary agents.

Explanation of the use of human, material and economic resources

Stages 1 and 2 (2011-2013): these stages where funded in the CALL OF THE INTERNATIONAL CAMPUS OF EXCELLENCE 2010 by the Ministry of Education (now Education, Culture and Sports); these two phases are mainly conceived for infrastructure deployment, being the needed R & D performed with other resources.

The acquired resources are infrastructure, equipment and material used to build the Lab. In particular, to the date of this report, the resources are the following:
- Computers and processing equipment (servers, hubs, etc.) from various companies: BENOTAC, SMO, Misco, Taysa, etc.

- Sensors and advanced devices to implement services (smartphones, tablets, etc.), bought to several companies: Alava, Google, etc.

- Miscellaneous furniture enabling to create and décor the physical space and to host and install the ICT equipment, from several companies: ORGANYTEC STUDY, Ofibroker, LM, Mipuf, etc.

- Recording equipment (cameras), projection devices (3D) and multimedia presentation devices from various brands and companies: SATEC, SMO, Mediamarkt, etc.

- Wooden structures and other auxiliary structures to build the internal architecture of the Experience_Lab.

- Accessories and other tools to build the spaces.

The expenditures referred to in this section (Stage 1 and 2), are the strictly necessary for the deployment and operation of the demonstration sites and related activities.

Stage 3 (2014-2015): it will be mainly financed with resources from the UPM (from its groups and centers) and with the contribution of external business partners.

In particular, the development costs of technologies and services are assumed by the UPM Groups participating in the Lab, through its own or external funding, independently of the Experience_Lab budget. This initiative was not intended to directly fund any R & D activity, except, when applicable, the necessary marginal costs to bring R & D outcomes to demonstration phase in the Laboratory.

Significant deviations in the progress towards the objectives

There are not significant deviations to mention; there was a slight delay in the reception of the physical space with respect to the original planing, which altered the planned investment schedule. In any case, the development and deployment of the services that were to be deployed was aligned to the schedule during the months of April, May and June 2013. In July 2013, we can say that the progress towards the objectives is according to the initial planning.

Proposed Corrective Actions

They are not needed.

Table I. Description of actions to be executed within the project

Scope	Transfer of knowledge and technology resulting from academic research to business
Actions	Living Labs – Iluminación
Objectives	The main objective of the project is to improve the street lighting infrastructure at the Campus of Montegancedo, by installing a comprehensive energy efficient lighting solution based on LED technology. As a result of the project the Campus environment will be improved, becoming more attractive and safe. Money savings will be achieved by reducing energy consumption. An experimental area in open spaces, unique in Europe, will be obtained, in order to test prototypes developed at the university to be transferred to the industry.

Progress towards the objectives

The Campus of Montegancedo will be provided with a smart and efficient exterior lighting solution. Part of the existing infrastructure will be reused, installing new LED lights and a remote control system developed in CeDInt-UPM.

Areas of focus include road, pedestrian roads, parkings and exterior lighting of buildings. LED technology has been selected as lighting source for its high luminous efficiency, performance, low power consumption and low light pollution.

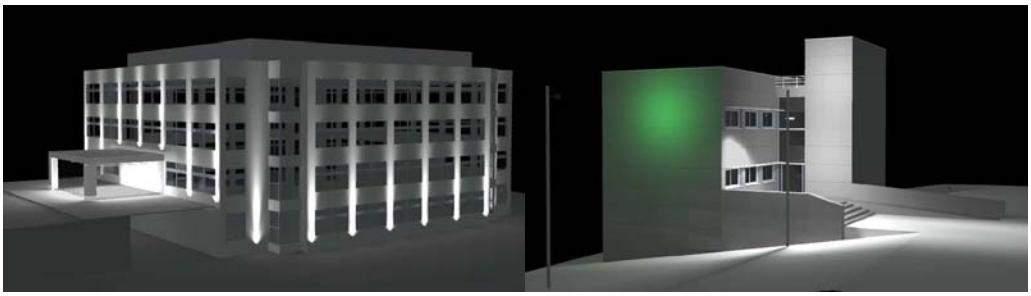
- **Pedestrian roads lighting:** replacement of old sodium vapor lamps by remotely dimmable LED lamps. To leverage existing infrastructure, columns in good condition are preserved, requiring only sanding, priming and painting to match the aesthetics and color of the new lamps.
- **Road lighting:** grooving and wiring, columns setback and replacement of old sodium vapor lamps by low consumption LED lamps.
- **Parking lighting:** lamps installation in parkings with no previous illumination (CBGP & CAIT).
- **Ornamental lighting of buildings:** architecture and building ornaments enhancement, getting luminance levels required in each area. Flood lighting, integral lighting and projection of corporate logos. The proposed solution includes lighting the buildings facades that are more visible from the M40 road (USOC-IDR, CBGP, CTB, CeDInt y Business Center-CAIT).
- **Remote control system:** the control solution proposed is totally innovative, since it allows different possibilities of regulation: DALI, five levels autonomous regulation and 1-10V control.

Description of work performed and role of participants

- **Analysis of existing infrastructure:** researchers at CeDInt-UPM with help from UPM core

services have analyzed and reviewed the status of the Campus lighting infrastructure. As a result of the study, deficiencies in the infrastructure have been detected (lack of wiring, cabinets in disrepair, unlit areas, etc.) as well as operational problems (electrical leads). A detailed inventory of the points of light, location and features has also been made.

- **Technology and lights selection:** in collaboration with Philips, the luminaries, lamps and headlamps have been selected in order to fit the needs of the project.
- **Design and simulation of lighting solution:** the characteristics of the lights (power, luminous efficiency, beam opening angle, protection, size and outdoor behavior) have been chosen to comply with Energy Efficiency Regulation for Outdoor Lighting. They also meet the requirements and sizing of the Campus. Philips, in collaboration with the university, has been responsible for modeling and simulation of different lighting solutions for its measurement and representation of the final result to be obtained.



- **Development of the remote control solution:** CeDInt-UPM has developed a wireless actuator network for Philips' Xitanium driver based on the standard IEEE.802.15.4. Each actuator integrates presence and lighting sensors for remote regulation of luminaries individually.
- **Installation:** prior to installation of the road lamps, it was necessary to sand, prime and paint the columns with the same color of the new lamps. The installation of lamps and actuators has been parallelized with the installation of spotlights and projectors on the building facades.

On the other hand, the grooving, wiring and installation of new light points in parkings and the setback of columns for street lighting has been initiated.

- **Experimentation pilot:** the resulting scenario is completely innovative, since it combines

the most efficient lighting technology with a very innovative control system, developed in the University with the collaboration of Philips. This is a unique setting in open areas with a great potential for experimentation for the University and companies, enabling the transfer of knowledge between them.

Most significant results

Lighting of areas with no previous illumination, improving campus security.

Reduction of outdoor lighting consumption, due to the installation of more efficient LED technology and the performance optimization of lighting installations.

Optimizing lighting control: regulation of consumption depending on outdoor lighting and presence detection.

Improving the visibility and attractiveness of the Campus.

Getting a testing and experimental setting in open spaces, unique in Europe, where to test prototypes developed at the university in order to transfer that knowledge to the industry.

Explanation of the use of human, material and economic resources

The allocation by the Spanish Ministry of Education (currently, Education, Culture & Sport), has been fully used for the supply and installation of an integral low consumption lighting solution.

Important deviations in the progress towards the goals

Not applicable.

Proposed Corrective Actions

Not applicable.

Table I. Description of project activities

Scope	Scientific improvement
Activity	Acquisition and deployment of R+D infrastructure to reinforce analytic capacities at CBGP
Objectives	To establish and optimize technologic platforms of analysis and services (genomics, microscopy, proteomics and metabolomics) at CBGP

Progress towards objectives

The acquisition of the proposed infrastructure has allowed the implementation or update of advanced technological platforms at CBGP for analysis of biological samples by means of last generation technologies. Specifically:

1) Implementation of a metabolomic analysis platform.
2) Implementation of a high resolution confocal microscopy analysis platform.
3) Improvement, update and optimization of existing platforms for genomic and proteomic analysis.

Description of work carried out and role of the participants

A technical and market study, and the corresponding public tenders, have been carried out for each of the platforms. As a result, the equipment listed below has been acquired. After delivery, the equipment has been implemented in order to offer the proposed analytic services.

Most significant results

Acquired infrastructure is in full operation. This has allowed the implementation of analytical services not only for internal use but also for use by the scientific community external to CBGP.

For complex infrastructure, such as those for metabolomics and confocal microscopy, implementation implied not only acquisition but also specialized training. Specifically:

- 1 *in situ* training course for users, taught by the Bruker company engineers.
- 1 specialized course for operators at the headquarters of the Bruker company in Germany, with attendance of two CBGP scientists (S. Pollmann y J. Kehr), heads of metabolomics and proteomics services, respectively.
- 1 *in situ* demonstration of confocal system TCS SP8 for users, taught by the Leica company engineers

Finally, within implementation, we must highlight that a Specialized Technician (Licenciado en Biología, Master en Quimica Agrícola y Nuevos Alimentos, UAM)was hired as high-level technical staff for the metabolomics platform. This has been carried out with CBGP funds.

Explantion of use of human, material and economic resources

CBGP has contributed three Assistant Professors from its staff, those responsible for metabolomics (S. Pollmann), proteomics (J. KehruntilSeptember de 2012, and A. Díaz-Perales since then), and microscopy (P. González-Melendi) to the implementation and use of the new infrastructure. In addition, CBGP contributes 1 postdoctoral researchers and 1 specialized technician for operation of this infrastructure. None of these resources is financed by CEI.

The following equipment has been acquired (investment from Ministerio de Ciencia e Innovación de la Convocatoria de subvenciones 2010 para iniciativas de I+D+i y Transferencia de Conocimiento through Programa ***INNOCAMPUS,***within the framework of Programa Campus de Excelencia Internacional):

A) Metabolomics platform

Consists of a GC / MS system, triple quadrupole (Scion TQ), with automatic robotized injector, and a LC system (UPLC, Ultimate 3000 y EasynLCII)) / MS /MS ESI-QTOF (microTOF-QII), all provided by the BRUKER company. Instrument control, data acquisition and processing are all be means of a control and data workstation with specific software, provided by the manufacturar. Cost: 430.000 € + VAT.

B) Confocal analysis platform

Last generation confocal microscopy system Leica TCS SP8. Cost:205.000 € + VAT.

C) Genomics platform

Acquired equipment reinforces and complements that already in place. Consists of:

High Resolution Melting system for identificartion of allelic variants, mod. Light Scanner from Idaho Technologies, furnished by Durviz, SL.

Cost: 22.950 € + VAT.
Quantitative PCR system for detection and quantitative amplification of nucleic acids. Consists of 2qPCR instruments Light Cycler 480 II from the Roche company.
Cost:58.850 + VAT.

D) Ancillary equipment for the metabolomics, genomics and proteomics platforms. Consists of:

Freeze-drying system consisting of 2 Telstar freeze-dryers with Labconco concetration systems, furnished by the VWR company. Cost: 38.650 € + VAT.
Scientific data server HP mod. Proliant DL380 G7, furnished by the CLEVISA company. Cost 10.983 € + VAT .
Accesories and complements for the platforms: Bio-Rad electrophoresis systems for proteomics (9.704 € + VAT), Micropipettes andBalances (Labnet company, cost 3.404 € + VAT).

Most important deviations in the progress towards objectives

Does not apply.

Proposal for correcting measures

Does not apply.

Table I. Description of the activities of the project

Area	Transfer of technological knowledge as a result of academic research to the business sector.
Activity	Generation and Maintenance of Patents, their internationalization.
Objectives	Protection and exploitation of scientific and technological knowledge generated together with the commercialization and internationalization of the technology generated that has been identified as an opportunity on the basis of R&D activity that has already been carried out.

Progress towards the objectives

Among the lines of activity at the ICE is the effective protection of the results of research, protecting them under industrial and intellectual property laws. This step represents a guarantee both to sustain the future ones and to put down solid bases for the potential commercialisation of the results obtained. This approach has gradually been catching on in the university community, which is becoming more and more aware of the importance of protecting the results of research.

Consequently, in recent years, the number of applications for patents outside of Spain has risen considerably, an evident proof that the potential of the procedures and technologies generated in the University and its possibilities for commercialisation outside of Spain.

Description of the work carried out and the role of the participants

The competitive advantages of some of the patents to which economic resources from the ICE Montegancedo have been used for the financing of certain procedures for its internationalization are detailed below. These windows highlight the potential seller of the technology and justify the investment carried out for its protection outside of Spain.

PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent: **EP11382327.2** *(Request for a priority patent at the European Patent Office)*	The invention is characterised by the use of stress patterns based on sigmoid transfer functions to allow the quantification of stress in a large number of situations. Therefore, it could cover the needs of enterprises interested in improving the security of their access systems in a potent manner. It could also be useful in smart building enterprises, biometrics and those in charge of improving road safety, through the insertion of these devices not only in family cars but also heavy vehicles and aeroplanes.
Title: **Method for the quantification of stress in a user**	
Family: EEUU: 13/661,838	
Centre: CEDINT	
Holder: *Universidad Politécnica de Madrid*	

PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent: **P200803750**	The simplicity of the invention makes it very favourable for a fast and efficient implementation, mainly in protocols for medical studies and after that in more complex applications. The study and neurological characterization that makes the invention feasible, will free the way perceptively to the understanding of the processes involved in the processing of pain, leading inevitably to a search for social wellness. The large medical device companies (see magnetic resonances, CAT scans, Magneto-encephalography etc.) are currently looking to be able to offer an integration of products related to a source of main revenues to add value to this face of competition.
Title: **System and procedure somatosensorial pneumatic stimulator of automatic synchronization**	
Family: PCT/ES2009/000558 EPO: EP09836104.1	
Centre: CTB	
Holder: *Universidad Politécnica de Madrid*	

PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent: **P200900310**	The invention allows the marking of polymeric layers with different motives, both on a macroscopic and microscopic scale, allowing their integration of information in the form of numbers, letters, bar codes or another motive that is required.
Title: **Procedure of marking, encryption, labelling and optical codification**	
Family: PCT: PCT/ES2010/070054 EPO: EP10738235.0 Germany: 602010006430.1 France: 2394816 Spain: E10738235 United Kingdom: 2394816	
Centre: CEDINT	
Holders: *Universidad Politécnica de Madrid and Consejo Superior de Investigaciones Científicas*	

PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent: **P201031626**	The genomic-clinical method could be used in oncology services in hospitals to be able to know what the possibility of survival is after the appearance of an adenocarcinoma of the lung. It is necessary to determine the levels of expression of 30 genes using 36 gene probes from the patient's tumour. The patients, in accordance with these levels, and their age, sex, and state of the tumour, can be divided into three groups with a risk of as a result of the disease: high, intermediate and low. Given
Title: **Test predictor for the overall survival in adenocarcinoma of the lung**	
Family: PCT: PCT/ES2011/070757	
Centre: CTB	
Holders: Universidad Politécnica de Madrid and CIEMAT	

	the aggression of the chemotherapy regimens used, the said treatment may be avoided for those patients, whose risk is low, improving the quality of life of the patient and saving the costs of the treatment for the hospital. This method has greater precision than the clinical methods currently used in hospitals.

PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent: **P201031941**	The capacity of having the information or not up to the time that it is required, offering the possibility of having it, however, already creates an interesting scenario that makes it possible to control the information while this is offered to second parties and while we can control it when we make use of it, now being the owners of it. To date the information can be had or not, or being encoded, having it in very little time, or even having it encoded without having the option of it (with the lack of the decryption code). It is possible that there may be scenarios in which the possession of information is necessary and be at the time until the conditions of the first party are complied with, on fixing the time and the resources in order to be able to make it available. In the same area of the rights of the author one could have a large quantity of information, but not be able, therefore, to openly distribute more that which the first party has given permission for since a dissemination of all of the content might be an extremely costly task in time and resources.
Title: **System for the slowing down of the rate of transfer of a device through a cryptographic method**	
Family: PCT: PCT/ES2011/070898	
Centre: CEDINT	
Holder: *Universidad Politécnica de Madrid*	

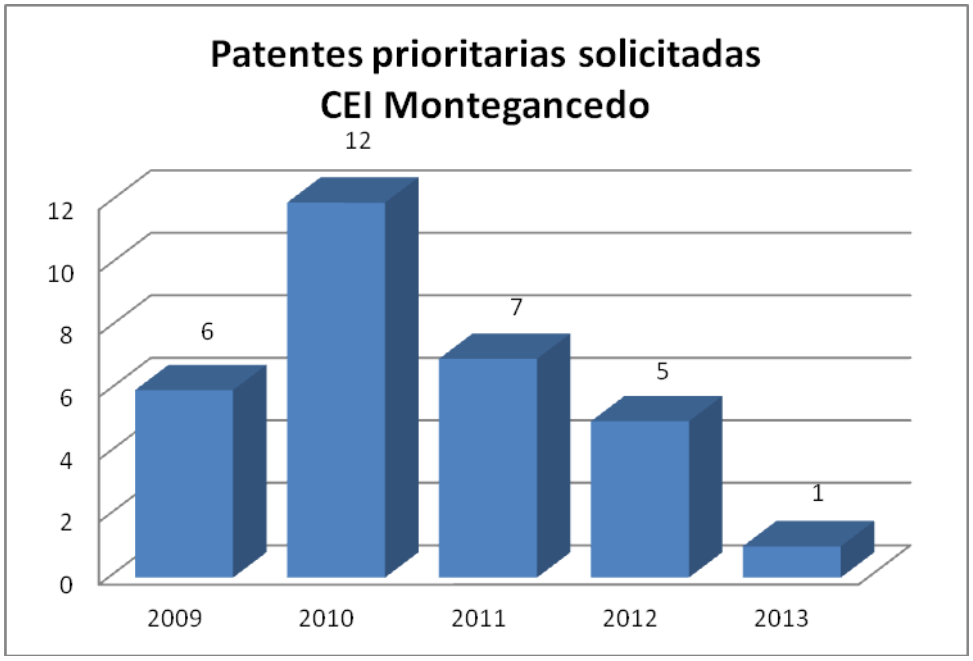
PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent: **P201131186**	The obtaining of raw ingredients would make a clear reduction in costs, as the production per hectare would increase. In the case of greater quality wood, without knots, the positive performance would also be large.
Title: **Procedure to increase or decrease the development of sileptic and/or proleptic ramifications in a woody plant**	
Family: PCT: PCT/ES2102/070471	
Centre: CBGP	
Holder: *Universidad Politécnica de Madrid*	

PATENT	**COMPETITIVE ADVANTAGES**
Nº of application for priority patent:	The device has its greater contribution and

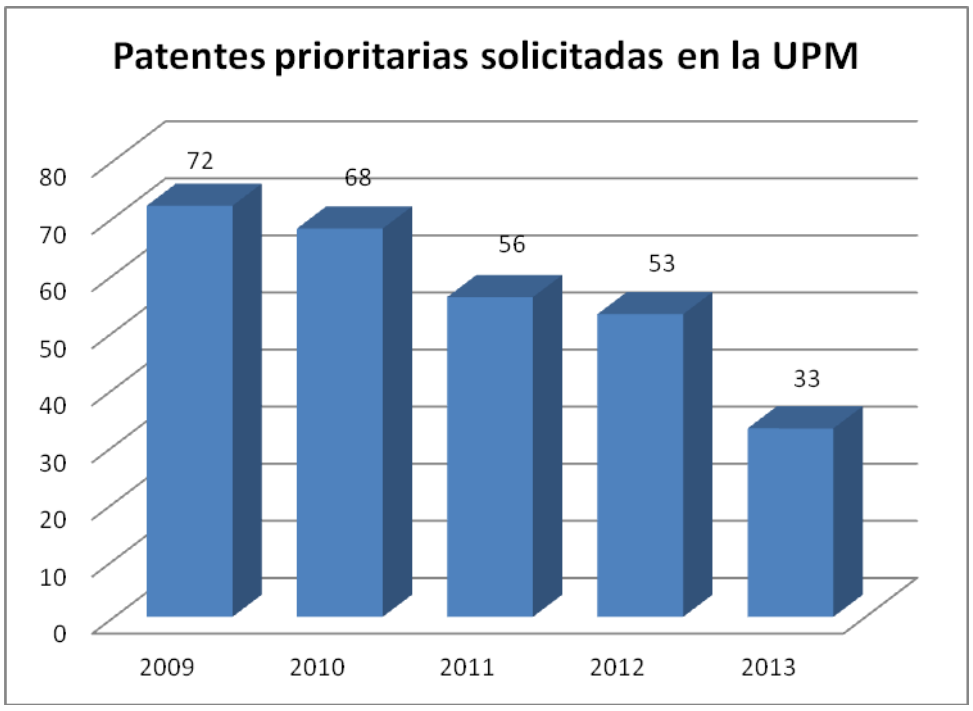
P201131226 Title: **Ocular device** Family: PCT: PCT/ES2012/070474 EEUU: 13/534,583 Centre: CTB Holderes: *Universidad Politécnica de Madrid, Universidad Autónoma de Madrid, CIBER-BBN and Fundación para la Investigación Biomédica del Hospital Universitario Ramón and Cajal*	advantage on existing products already existing in this, thanks to its design characteristics, functionality and biocompatibility supposes a normal quasi-postoperative, whenever it is not necessary to adopt any specific position. Furthermore, the probability of evolution to new intraocular functionalities is 90% due to the innovative technology that it implies. Consequently the social impact and the evolution inherent in the product gives a great aggregated value to the device and, in turn, differentiate it amply from its competitors.

Most significant results

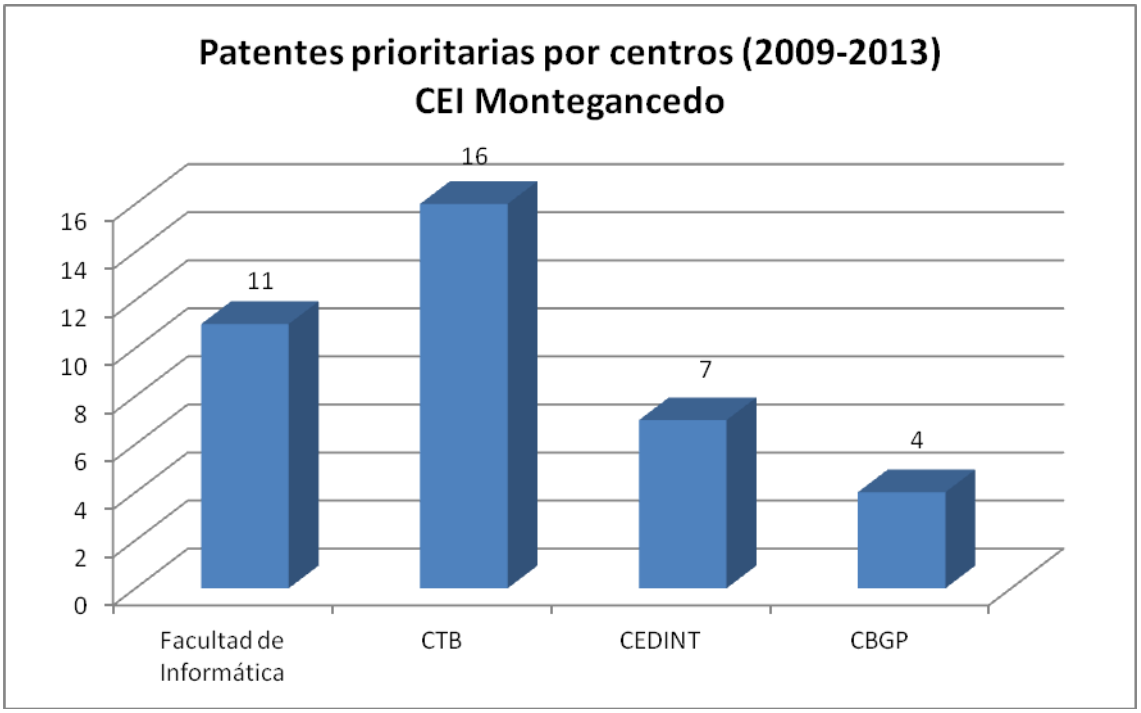
The internationalization of the patents is strictly linked to the prior protection in Spain. In the centres on the Montegancedo ICE, the number of priority applications requested between 2009 and 2013 is maintained in the line of evolution of the requests carried out at the UPM in this period.



2013: data on the 1st September



2013: data on the 1st September



2013: data on the 1st September

Two months after the priority applications, in accordance with the possibilities of commercialisation of the

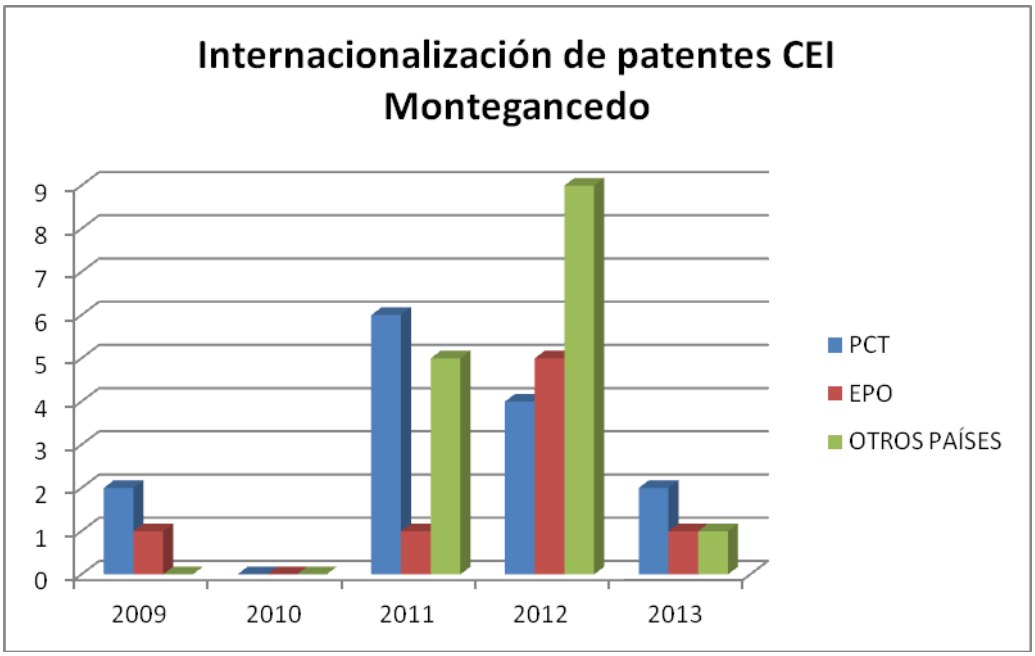
patent outside Spain and the available economic resources, it is decided whether a PCT application is carried out or enters directly into the national market of the country in which it is desired to make the patent effective. The most common procedure in the UPM is to make the PCT application, which gives us an additional 18 months to enter the national phase.

The internationalization of a patent demands high economic costs. The resources provided by the ICE Montegancedo to these ends have allowed both the patents outside Spain to be extended and maintain the already applied for ones.

Data on the internationalization of patents (Montegancedo ICE)

	PCT	EPO	Other countries
2009	2	1	0
2010	0	0	0
2011	6	1	5
2012	4	5	9
2013	2	1	1

2013: data on the 1st September



2013: data on the 1st September

Explanation of the use of human, material and economic resources

The protection of the results of research carries a significant investment with it, which is considerably increased if done outside of Spain.

The investment made from the Ministry of Science and Innovation from the 2010 Call for subventions for R&D&I and Transfer of Knowledge initiatives through the ***INNOCAMPUS*** Program**,** within the

framework of the International Campus of Excellence program has allowed international applications for patents to be carried out in the United States, through the European Patents Office and carried out PCT applications as well as assuming the maintenance costs of already internationalised patents and evaluation as regards internationalization.

Most significant deviations in the progress towards the objectives.

The results obtained to date comply with the objectives proposed in the project.

Proposal for corrective actions

Not appropriate

Table I. Description of the activities of the project

Area	Improvement in teaching/ scientific improvement/ Transfer/ Integral Social Campus
Activity	**International Program for the contracting of PhD Graduates (PICD)** Attraction and motivation of talent
Objectives	The attraction of research talent through the contraction of PhD Graduates coming from any country in areas of priority research activity of the Campus

Progress towards the objectives

One of the fundamental axes of the activity at the Montegancedo ICE that the *Universidad Politécnica de Madrid* (UPM), is to guarantee excellence in research within the framework of the structuring of R&D&I activity of the UPM training in research university studies, in compliance with the social commitment to the training and contracting of Human Resources in research activities,

For this reason, the attraction of research talent through the contracting of PhD Graduates coming from any country in areas of priority research activity of the Campus is a fundamental objective. Likewise, the UPM takes on the commitment that the conditions that are enjoyed by the contracted post doctorate students are, as much as possible, similar to those of the beneficiaries of the calls of the public administrations, and through it, avoid substantial differences that would later prejudice them.

It is an action that reinforces collaboration and integration of the campus and fosters internationalization

Description of the work carried out and the role of the participants

International call for the contracting of PhD Graduates:

The international PICD call allows the key axes of specialisation of the Campus to continue to be researched, that is R&D&I processes on the campus of TIC and their horizontal and vertical application. This is co-financed in part by the resources of the Montegancedo ICE, within the International Program for the Obtaining of Talent (PICD) of the UPM of 50%, and the other 50% of the financing coming from enterprises and foundations. The different PhD Graduates have the support of the respective permanent alliance in each centre who collaborate in the development of research projects.

Calls made and those planned 2011

The Rectoral Resolution of Regulators and Call Bases has been established for young PhD Graduates who begin their research university studies and who comply with the mobility rules required (Researchers with non-Spanish nationality who have carried out their PhD studies outside of Spain / Researchers of any nationality who has carried out their research in a country different from their nationality for at least18 months, before or after their PhD Thesis)

The call was resolved in December 2011.

Most significant results

The call made has been widely disseminated and has attracted aspirants of high quality. The places for

young PhD graduates were covered mainly by non-Spanish researchers.

The four contracted PhD graduates from the call were incorporated into different Centres on the Campus from March 2011: two in the CBGP, one in CEDINT and the other in the *Facultad de Informática.*

Explanation of the use of human, material and economic resources

This program is co-financed by the Aid for the Contracting of Young PhD Graduates program, within the International Program for the Attraction of Talent (PICD) financed by the Ministry of Education in the call for the International Campus Excellence, of the ***FORTALECIMIENTO*** Subprogram 2011 annual payment.

The contribution of human resources coming directly by the investment of the ICE is for 4 contracted Postdocs in competitive public offers 50% financed by the International Program for the Attraction of Talent (PICD) and the other 50% by research groups of the Montegancedo Campus.

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropriate

Table I. Description of actions to be executed within the project

Scope	Scientific improvement Transfer of knowledge and technology resulting from academic research to business sector
Actions	Pilot Plant of an Advanced Concentration Photovoltaic System
Objectives	• Renewable electricity supply for consumption on campus • Study and compare the performance of two technologies for high-efficiency solar cells with last generation concentration optics. • Contribute to the strengthening of the international leadership of the UPM in the development and study of concentration photovoltaic systems

Progress towards the objectives

A 25kW Photovoltaic Pilot Plant will be built at UPM Campus of Montegancedo. It will comprise two 60m2 arrays.

One of those arrays will be provided with Boeing Spectrolab's triple-junction C3MJ cells, whose GaInP-GaInAs-Ge technology has achieved a 41,6% maximum efficiency, and provides a 39,2% average efficiency in production.

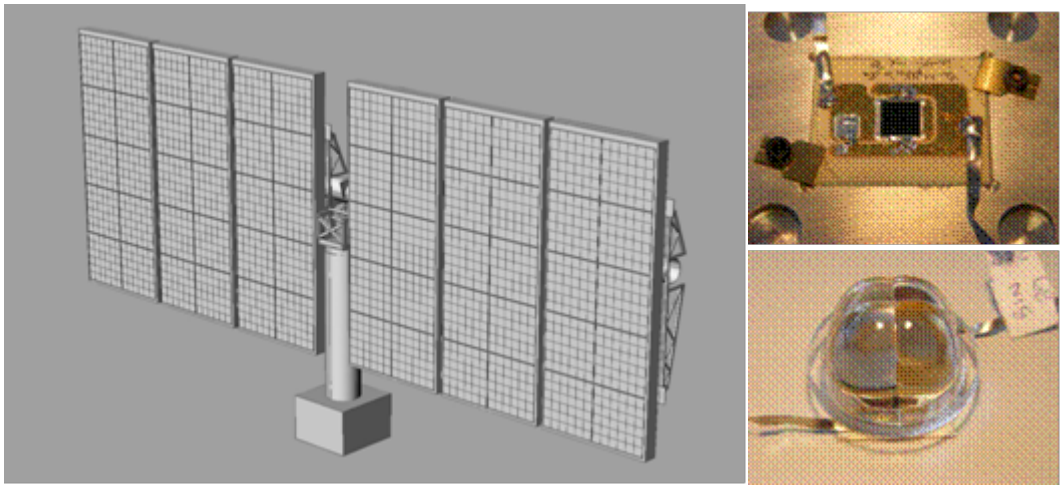
The other array will include Solar Junction SJMJ-3 cells, whose GaInP-GaAs-GaInNAsSb technology is the latest revolution, and currently holds the world record of 43,5% conversion efficiency, with 42% production average efficiencies.

Description of work performed and role of participants

The execution of the Concentration Systems Pilot Plant has been initiated, using last generation triple-junction solar cells, with advanced Köhler integration optics and with the collaboration of CeDInt-UPM.

The concentration optics to be used, called FK (Fresnel-Kohler), corresponds to the multi-channel Köhler freeform integration technology of the company LPI, which is the most advanced nowadays. It comprises primary Fresnel lenses with four sectors. This optics, the most advanced nowadays, consists on a primary Fresnel lens with four PMMA sectors, and sencondary lenses class B270 with four lobes. Both arrays will include the same optics, which will enable a better comparison between the two cell technologies.

Chroma Energy is the company in charge of the optics assembly, the cells receiver circuit, the heat sinks and the modules interconnection, to be mounted in the sun tracking systems also designed and manufactured by Chroma Energy.



Array, cell and optics of the CPV pilot plant

The installation of the trackers and the connection of the photovoltaic modules to the power network at CeDInt building, require foundation works and electrical conduit, currently in development.

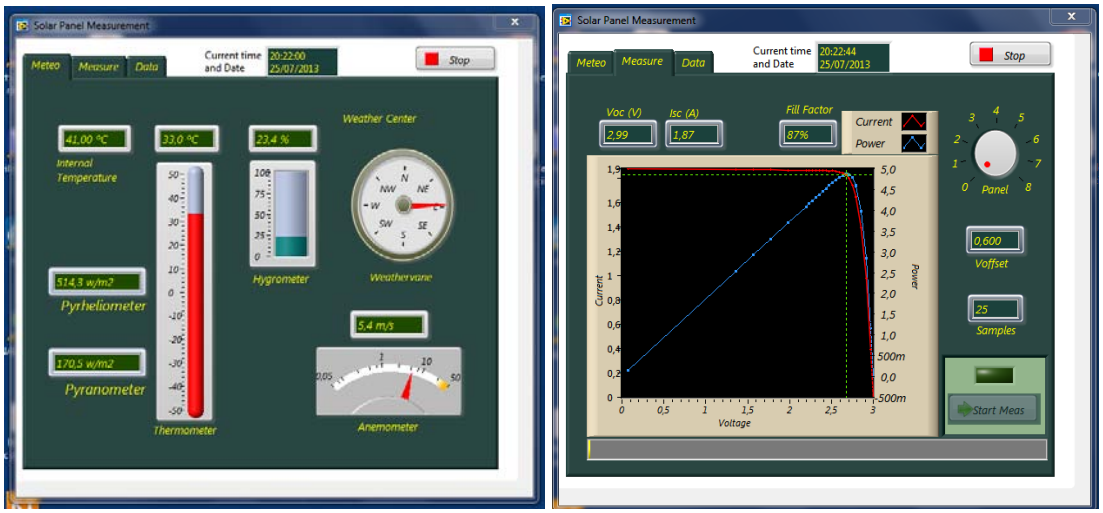
For the execution of these works it has been necessary to develop a topographical study of the area. Several administrative procedures have been arranged with Pozuelo de Alarcon's Council to obtain the permits (work and activity licence, building tax, endorse the construction project, environmental impact study, waste management, etc.).

In order to achieve a comprehensive analysis of the PV plant production data, a weather station has been installed to know the weather conditions during the operation of the plant. The weather station comprises a pyranometer, a pyrheliometer, an anemometer and wind vane and thermometer and hygrometer. These sensors will provide the following meteorological data: temperature, humidity, wind speed and direction, direct irradiance and global irradiance. This information will enable the calculation of the modules efficiency, which could be analyzed depending on meteorological parameters.

Weather station

A new automatic measuring system with remote control has been designed for the characterization of new concentrators. The measurement system is based on an electronic load which traces the IV curve of the module to be characterized. The load control is performed through a National Instruments CompactRIO. This system is also responsible for collecting meteorological data. Both, the IV curve and the

meteorological data are automatically saved. For their visualization a graphical application with multiple windows has been developed. In one of the windows, called Meteo, the weather data can be seen. Another window, the main application, called Measure, shows the graphical representation of the IV curve, and the power generated by the photovoltaic module. Also the Voc, Isc and Fill Factor values are shown. At the right side of the picture there is a wheel that controls the module measured at a given moment, given that the system can measure up to 8 different modules. Besides, the number of measurement samples can be modified, changing the value Samples.



Graphical application: weather data and IV curve

Most significant results

Following the installation of the plant CeDInt-UPM will analyze the results obtained in the monitoring process.

This installation will comprise two independent Siemens inverters for the connection to the electrical network at CeDInt-UPM building, allowing comparative analysis of both technologies.

Explanation of the use of human, material and economic resources

The allocation of **500.000 €,** to the ***CAMPUS OF INTERNATIONAL EXCELLENCE*** by the Spanish Ministry of Education (currently, Education, Culture & Sport).

Important deviations in the progress towards the goals

Foton HC (before, Guascor Fotón), the company contracted to elaborate the construction project, changed in 2012 the orientation of their business. This change immediately led Foton HC to completely paralyze engineering activities regarding concentration arrays with triple-junction cells. For this reason, it was necessary to find another company able to design and supply modules that included LPI optics.

The search of a new supplier has led to delays in the project implementation.

Proposed Corrective Actions

After the cessation of Foton HC activity, it was necessary to find a new company that produced and assembled PV modules. Finally, Chroma Energy Pvt. Ltd., located in Pune, India, was selected to provide the tracker and half of the receivers.

Thus, there has been a delay in the execution of the project, but the technical objectives are being achieved as planned.

Table I. Description of the activities of the project

Area	Scientific improvement/improvement in teaching/ Transfer of knowledge and technology as a result of academic research to the business sector
Activity	CeSViMa (Centre for Supercomputing and Visualization of Madrid). Updating the supercomputing and visualisation capacities.
Objectives	Improvement in the scientific production and competitiveness of the Campus and transfer of knowledge to productive sectors, including training.

Progress towards the objectives

The contribution of the CeSViMa has meant an increase in the scientific production of the different groups who have used its resources. In the same way, it has contributed to improving its capacity for attracting resources in competitive calls and contracts with companies.

CeSViMa participates in joint projects with enterprises and provides training resources both at undergraduate level and Masters' and PhD level. Also, at an international level within the framework of joint projects in collaboration with the *Forschungszentrum Jülich* - FZJ (Jülich Research Centre) in Germany or at a national level with the IMDEA network (mainly Software and Materials), the QUITEMAD network and enterprises such as IBM, Skybus or Repsol.

On the other hand, we have covered some of the objectives that we proposed along the same lines last year, such as adding specialised nodes for, for example, metagenome tools, services in the cloud and virtualisation, expansion of the filing system.

Description of the work carried out and the role of the participants

High performance computing has become a fundamental pillar of modern science and technology making it possible for both the creation of new knowledge and its efficient application for the benefit of society. Within this framework, the role of the CeSViMa is double. On the one hand working in the maintenance, modernization and the efficient use of computing systems, increasing the resources at the least possible cost and, on the other hand, acting as a catalyst for the use of Supercomputing techniques to improve the scientific and technological results. It is also directly involved joint research projects.

Through its membership of the RES (Spanish Supercomputing Network) and the network of Laboratories in the Autonomous Region of Madrid, CeSViMa also offers Supercomputing resources to researchers from other centres.

The large lines of work carried out during 2013 has consisted of the Magerit-2 with iDataPlex (Intel) nodes, special nodes and the amplification of the disk system, as well as the offer of new services based on Cloud technologies. The participation in emblematic projects and the expansion of research activities at the centre.

Magerit-2 in the CeSViMa

Magerit-iDataPlex in the CeSViMa

Magerit-iDataPlex in the CeSViMa

Most significant results

- Amplification of the Magerit 2 with nearly 800 Intel cores and 3,7 TB of RAM.
- The amplification includes 4 special nodes with a large amount of memory and. The objective is to use them for special applications (e.g.: metagenome) and as a development system for coprocessors.
- Renovation of the disk system, adding 400 TB more under the control of GPFS.
- The aforementioned activities are the result of an agreement with IBM, in such a way that the cost has been zero. The accelerator cards have been obtained from research projects.
- Implementation of a storage service in the cloud which takes advantage of the existing infrastructure. This allows more than 500 users to be served with 100 GB of storage space. The service also includes virtual cloud servers, in such a way that a virtual server which is under its control can be assigned to a centre or group.
- New academic virtualisation and cloud services: with the objective of optimising resources and reducing the costs of information has been brought about through the consolidation of servers. This has been done in a joint project with several enterprises. The short-term objective is the virtualisation of services in the *Facultad de Informática*, and later extending them to the rest of the centres in the Campus and the UPM.
- Participation in emblematic projects such as thel FET Flagship Human Brain Project, where the centre leads work packets in visualisation in exascala and neuroinformatics
- Beginning the change of the entire cooling infrastructure to systems based on Free Cooling. Through this we expect to reduce the electricity bill, which was already reduced in 2012 to a third of what was consumed in 2010 by an additional 40%.
- Participation in several projects with research staff that spend part of their time in the CeSViMa and part of their time at another centre.
- The envisaged actions are actions to improve the performance of the centre and the continuation of lines that we want to expand. We have envisaged the following for the rest of this year and next year (some of the activities are already underway):
- Improving the communications with the exterior by means of the connection with the RedIris Nova network.
- Consolidation of the systems management staff.
- Staff for service to enterprises: Direct support to HPC projects and application of competitiveness.
- Extending the research part of the centre.
- Increase cloud computing and virtualisation services (academic and industrial)
- Visualisation services.
- Improving energy efficiency.

Explanation of the use of human, material and economic resources

The Supercomputing and Visualization Centre that forms part, as the Madrid node, of the Spanish Supercomputing Network (RES). This node is made up of IBM nodes, with modular "blade-type" architecture with a UNIX operating system. The Magerit-2 is made up of 3,920 Power7 cores and close to1,000 Intel nodes, including the special nodes with high capacity memory and coprocessors. The total memory exceeds 11 TB.

CeSViMa, including the new Intel nodes, produces close to 45 million hours of CPU a year. The equivalent to some 14 of a CPU from a tabletop PC per day of work. This permits a service to be provided to around 100 work groups a ear.

The human resources included in the putting into operation, installation of additional SO, SW, user management and the optimization of systems, including the reduction in energy consumption and support to projects has been paid for by the UPM with its own projects, agreements with CeSviMa and with the call for the International Campus of Excellence, of the FORTALECIMIENTO 2010 – 2011 Subprogram.

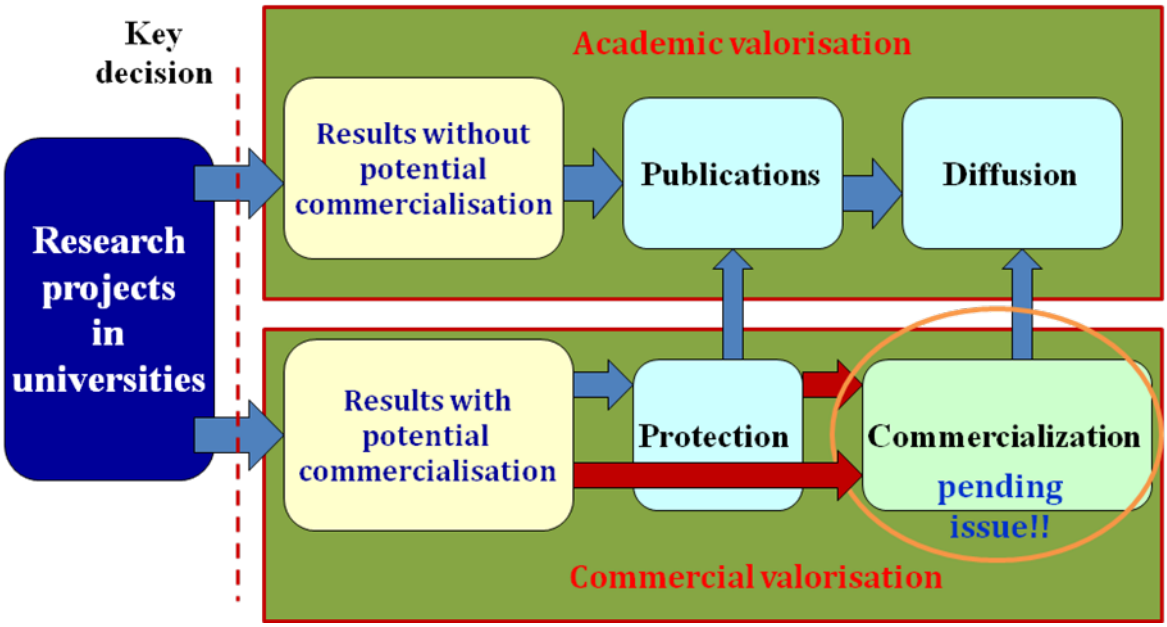
Table I. Description of the activities of the project

Area	Scientific improvement/improvement in teaching / Transfer of knowledge and technology as a result of academic research for the business sector
Activity	Creation of the 'Support Centre for Technology Innovation' (CAIT)
Objectives	The fundamental objective is to promote the exploitation of the results proper to the R&D activity as well as serving as a stimulus for the innovation process in the business ecosystem close to the UPM.

Progress towards the objectives

The applied research activity carried out by research groups at the UPM is in many cases carried out in collaboration with the business sector be it national, international or through direct contracts with the enterprises.

The results obtained from these projects are usually in the form of "laboratory prototypes" which, in some cases, are later developed into industrialisable products and transferred to the industrial sector (especially when they are developed at their request). Nevertheless, in many other cases, these prototypes are not developed after the termination of the research projects which have generated them since there is no specific support for it, as neither the public administrations nor the universities have the means or instruments for it. The current situation is set out in the diagram below in which it is wished to reflect the commercial valorisation of the results which is still a subject pending in the public system:



Although in the last decade the results derived from protection have improved substantially (at the moment the UPM has a portfolio of more than 300 active patents. In 2012 the OEPM awarded 50 new patents), the revenues derived from their licenses are still low (in 2013 it is expected that the UPM will receive around €400,000 in royalties; 14% of licensed patents). We must recognise that many of these patents have a curricular purpose and there is no special exploitation purpose.

Creation of the Support Centre for Technology Innovation (CAIT) *The proposal made to the Ministry is known as CEDET (Centre for Technological Demonstration), the current name is CAIT but the objectives are the same as those expressed in the initial proposal.*

The main mission of the CAIT is "to complement the activities of the current Business Centre and allow its expansion, configuring informal, polyvalent and multifunctional areas for the promotion of innovation destined to the finding and exchange of ideas, to the installation of living laboratories that develop the concepts of user-driven open innovation, the putting into operation of technological demonstrators, together with the location of units of the UPM itself oriented to the commercialisation of the results of research and the creation of enterprises.

This function is complemented with the location of spaces for already constituted enterprises that develop concepts arising from experiences with the UPM although they cannot be considered directly as "spin-off" or "start up" enterprises. With this, the aim is for the CAIT to consolidate the already created objectives in the whole of the University reinforcing the entrepreneurial and innovative spirit of the UPM, the exploitation of the results of technological research and the valuing of the R&D results in the private sector.

The development of the CAIT has been consolidated with the construction and occupation of a new building attached to the current Business Centre at Montegancedo. although the Business Centre has been oriented to the location of a business incubator (in a conventional model linked to the Science and Technology Park of the UPM), the CAIT will concentrate its activity on activities for the commercialisation of the results of research, and the development of products, supported by the existence of technological demonstrators or living laboratories which allow a rapid feedback from the users to be obtained.

In short, it is about the putting into operation of the creation of an **"open technological ecosystem**" promoted from a public technological university. Emphasis is made on this name to the "technological" character of the ecosystems.

Description of the work carried out and the role of the participants

The ICE Montegancedo is a specific nucleus of activity in which the aforementioned open innovation ecosystem concept could be developed quicker and with better perspectives for success: coming together in the same seat at the Science and Technology Park of the UPM (having, among other elements, a business incubator) with the existence of research or technology centres, or joint or individual laboratories, or those created jointly with different entities, and with a close relationship with schools, faculties and R&D centres or research institutions, located at other campuses of the UPM.

With the development of the "**technological ecosystem of open innovation**" of the UPM the aim is to create a process of positive feedback to cover the following specific objectives:

1. **Attract new innovative enterprises** who are in a favourable environment to establish strategic alliances with the UPM and that combine their own activity with the carrying out of joint R&D activities with the UPM and other entities of the ecosystem[1]. Some of these entities may not come from the EU but from other places (for example the USA) insofar as they favour interaction with the UPM and the commercialisation of their results.

2. **Accelerate the development of technology** by means of activities that facilitate the integration of technologies, its maturation of processes and commercialized services, its active interaction with the users throughout the lifecycle of the products and their development in the international market.

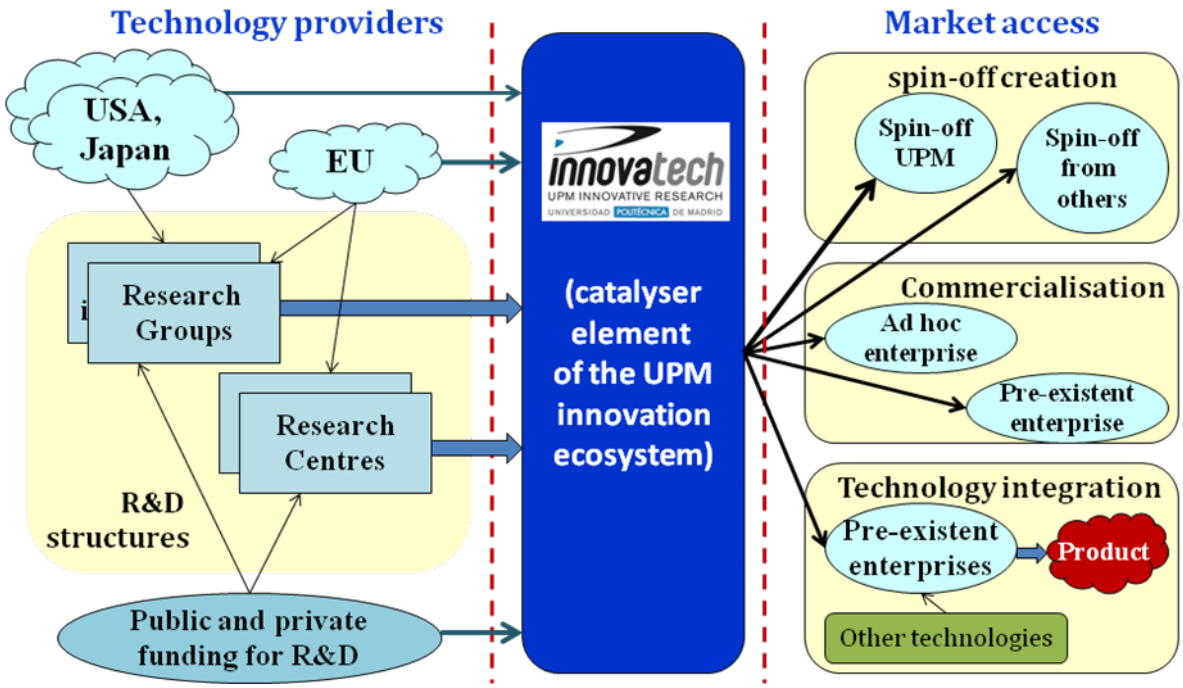
3. **Develop the spin-offs** generated by the UPM or by other entities allied to them at the ICE Montegancedo **more rapidly** (for example, from the entities with whom research centres or mixed technologies are created) accelerating the growth and internationalization process by means of agreements with investors and access to other technologies available in the ecosystem.

4. Put a series of **service platforms** at the disposition of allied entities which make their location at the Campus more attractive and collaboration between them for the integration of technologies and closeness to the market.

5. Support the search for **external recourses** financed for R&D activities, for the process of the commercialisation of technologies, and for the growth of spin-offs thus making foreign technological investment in Spain more attractive.

6. To get to know the **needs and tendencies of the market** better with the aim of acting with greater priority in those technological areas in which business investment is currently concentrated and with it influence the activities of the UPM and that of the entities allied to it in the innovative technological ecosystem.

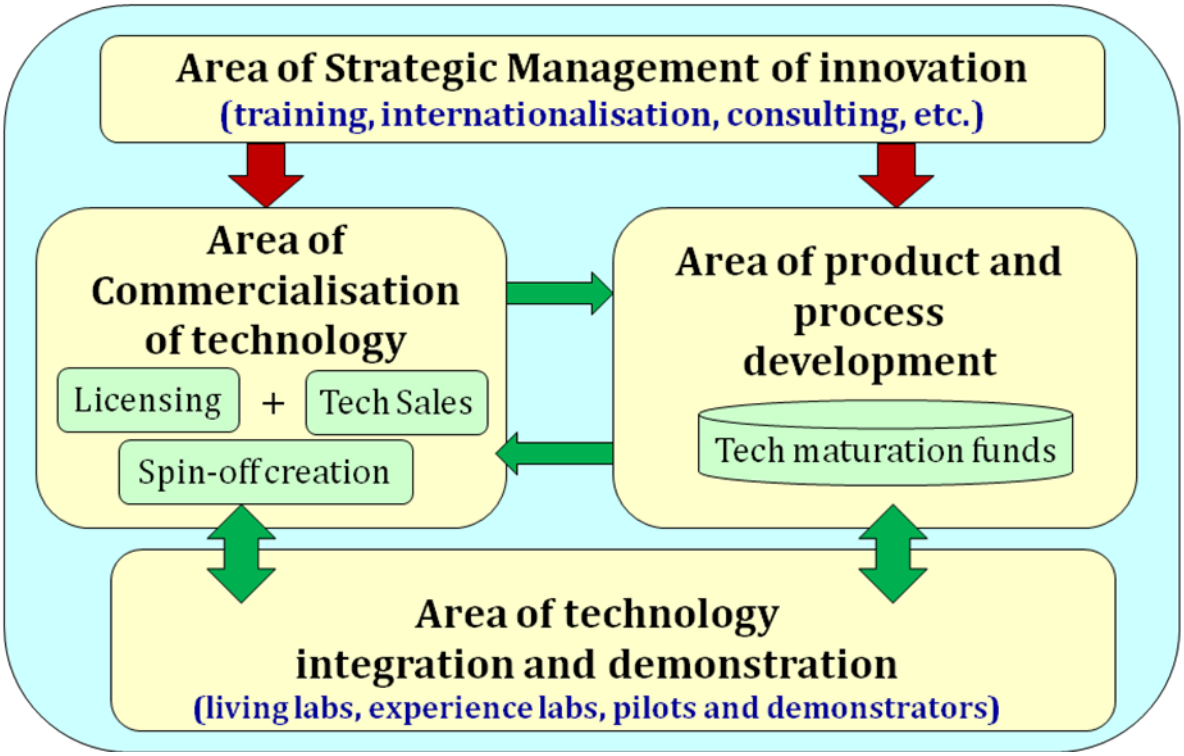
The figure below schematically describes the characteristics of the technological ecosystem open to that which has been made reference to.



As the figure indicates, the fundamental objective is to transfer the promising results generated from the R&D activity towards the market using three complementary models: 1) creation of new technology-based enterprises, 2) Direct commercialization of technology via patent licences or knowledge 3) integration of the technological solutions of the UPM in other products or services by means of agreements with

constituted technology enterprises.

With the objective of covering the aforementioned objectives, the CAIT has been based on the following organisational structure:



The three fundamental areas indicated, commercialization, product development and technological demonstration are complemented and fed back between them with the object of facilitating the proposed objective.

In other files in this report the description of the different living laboratories and technological demonstrators located in the CAIT or coordinated from the ICE Montegancedo have been incorporated:

- The 3D TV technological demonstrator
- Laboratory for experimenting “future spaces”
- Living lab of the bank of the future
- Concentration photovoltaic solar energy demonstrator
- Intelligent illumination demonstrator

Most significant results

- Construction of the Creation of the ‘Support Centre for Technology Innovation’ (CAIT) with different units and living laboratories as reflected in the figure.

Figure: External view and the cafeteria terrace on the top floor.

As well as the previously described areas proper to the CAIT, two units that complement the activities envisaged in the ICE Montegancedo have been located in the building constructed in its initial proposal.

- **Research centre and Higher Heritage Studies (CIEPS)** (mixed centre constituted jointly with the *Universidad Complutense de Madrid*), including the laboratory for 3D manufacturing (Fablab) at the already installed *Escuela de Arquitectura* of the UPM. The aim of this activity is to accelerate the use of TIC (Communications and Information Technologies) in the Architecture sector and expressly in the recovery and management of artistic historical heritage. This activity is carried out in collaboration with the ICE Moncloa.

- **Mini-ágora**. Common space for interaction with a restaurant has come into service in 2013 and which will likewise allow a meeting point for activities of a business nature and user attention which will become progressively into operation. This activity is complemented with the creation of the so-called "Club innovatech" whose objective is to serve as a forum for meeting with the activity programs, conferences, round tables, etc. in the context of the exploitation of results. In this context, the 1st Innovatech International Seminar is to be held in November this year.

The future development of the CAIT is fostered decisively with the effective putting into operation of the KIC node of ICT Labs of the European Institute of Technology and Innovation during this and successive years. The following figure describes the envisaged interaction schematically:

Explanation of the use of human, material and economic resources

The development of the CAIT has initially benefited from the financing obtained from the 2009 Call for Public Subventions for the implementation of the International Campus of Excellence Program in the Spanish university system within the R&D&I and Transfer of knowledge through the ***SUBPROGRAMA B***, oriented to Technological Innovation of the Ministry of Science and Innovation (currently the Ministry of Competitiveness and Innovation). The financing of **€1,098,437.95** allowed the corresponding call for the drawing up of the project and adjudication of the work and specifically, the first four certifications, corresponding to the months of June to October 2010, to the company Dragados who won the public call that was made for the construction of the building.

The remaining costs are financed from the ***CALL FOR THE INTERNATIONAL CAMPUS OF EXCELLENCE 2009/2010*** by the Ministry of Education (currently known as Education, Culture and Sport), for **€4,700,000 for** the expansion and equipping of infrastructure.

The resources obtained from the call for the International Campus of Excellence referring to the Support Centre for Technology Innovation has allowed the construction of a building attached to the current actual Business centre (connected by a footbridge) with the objective of having just one reception.

With the process of bidding for a public contract made in 2010 adjudicating the work of the company Dragados S.A. commencing construction in September 2011.

Subsequently, in 2012, it was considered advisable to carry out an extension of the construction underway to include a space for the location of the CIESP with the envisaged economic resources, initially, for the research centre in the construction that is expected to take place on the Montegancedo ICE and activities also envisaged for the Moncloa ICE after the agreement between the two universities.

The construction has been developed with no outstanding problems and with the formal handing over of the building taking place in April 2013. The Pozuelo de Alarcón council has already awarded the administrative licence for the activity.

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropriate

Table I. Description of the activities of the project

Area	Scientific Improvement and Transfer of Knowledge. Strategic decisions as regards the internationalization process of the Campus
Activity	Creation of a joint research Centre in Bio-energy with the Universidad de Campinas (Brazil)
Objectives	The carrying out of these activities is in line with the strategy of the ICE to promote the transfer of knowledge, the attraction of talent and the internationalization of its activity and that of its researchers. These activities will allow information at the vanguard to be accessed, which will be to the clear benefit of the Spanish system of science and technology, fostering its lines of work and collaborations with other European Centres as well as those from other regions of the world

Progress towards the objectives

Work is underway on the creation of joint research **Centre in Bio-energy with the Universidad de Campinas (Brazil)**

a. This activity, initiated in 2012, has financing from the 2011 call of the Subprogram of Strengthening the support to the CEI of the MECD.

b. The centre, located on the UNICAMP Campus in Brazil has the economic support of Repsol for the financing of two lines of initial projects:

   i. Microbiome of cane sugar with the participation of the CBGP

   ii. Multi-phasic simulation of the transport of fluids with the participation of the CESVIMA, ETSI Aeronautics

A third project pending formalisation is currently being prepared.

Description of the work carried out and the role of the participants

Several visits have been made to Madrid and to Campinas, through which the teams and joint lines of research have been identified. The UNICAMP and UPM delegations, accompanied by those researchers more related to the initial lines of interest, have travelled to know and present possible proposals for activity. Likewise, representatives from REPSOL have participated in both visits in order to define their

interests.

As a consequence of the visits, two first projects have been identified for the UMP, UNICAMP and REPSOL.

The installation of a joint main office has started and two provisional laboratories have been fitted out in buildings at the UNICAMP facilities. The works of the definitive main office will be finalised at the end of 2013.

A first collaboration project has commenced through the signing of a 'bridging' agreement between Repsol, the UPM and UNICAMP to begin the taking of samples and measurements

An agreement has been reached which will involve Repsol, Repsol-Sinopec, UPM and UNICAMP and the two aforementioned first two research projects are already underway.

Most significant results

Identification of the first two research projects

Creation of two work teams

Drawing up of the work protocols between the three institutions

Agreements as regards areas related to results and intellectual and industrial property

Identification of the administrative details related to the signing of agreements, transfers, location of the researchers in the UNICAMP facilities, billing, etc

Identification of the spaces for the provisional main office of the centre while the construction of the building destined for the main office is being finished

Drawing up of an agreement between UNICAMP, UPM and REPSOL

Drawing up of the proposal for the first purchase of material for the centre

Mobility of researchers between the UPM and Campinas

Explanation of the use of human, material and economic resources

The financing of this activity is at the cost of the Subprogram of Strengthening the Support to the CEI of the MECD. Travel costs have been accrued for the representatives of the Universidad de Campinas to Madrid and those of the Universidad Politécnica de Madrid to Campinas for the identification of the lines of

cooperation. As regards the investment in equipment and furniture for the putting into operation of the joint Centre we still have to resolve the problem of property that supposes the acquisition of equipment by the UPM to be installed in the joint Centre at Campinas. A consultation with MECD has been made which still has not been resolved.
Most significant deviations in the progress towards the objectives. The delays in the acquisition of equipment.
Proposal for corrective actions That aforementioned will make it necessary for the MECD to request an extension to this activity.

Table I. Description of the activities of the project

Area	Transformation of the campus for the development of an integrated social model Interaction between the Campus and its territorial environment
Activity	Dissemination from the CEI to the territories Dissemination activities of the science produced at the ICE Science week at Montegancedo
Objectives	Disseminate the areas of preferential research of the Campus (Information and Communications Technology (TIC) as well as its teaching and research centres and innovation to its most immediate environment, makes the social impact of the technologies that are developed in them clear.

Progress towards the objectives

With the range of activities envisaged to be carried out during the Science Week, the wider public belonging to an environment beyond the strictly academic and which includes school children will come to the Campus as well as seeing the science and technology that is generated there and which has TICs as a solid backbone.

Furthermore, the institutional training of this type of activity as regards the scientific dissemination and divulgation in the Campus will contribute to the development and improvement of the culture of the dissemination of the results of its staff to society.

All of this will be to the advantage of increasing the visibility of the International Campus of Excellence Montegancedo and it scientific-technological activity to its environment (the closest municipalities and the Madrid Regional Government) and to the exterior.

Description of the work carried out and the role of the participants

The activities of the Campus during the 2013 Science week of the Regional Government of Madrid (from 4 to 17 November) will constitute a main hub for the dissemination activity of the ICE I2Tech to the environment to secure its knowledge reaches the citizens.

The offer includes more than 25 dissemination activities (between workshops and guided tours) of ICE centres:

- *Facultad de Informática (known since 18/07/2013 as the"Escuela Técnica Superior de Ingenieros Informáticos")*

Visits to its research laboratories and to the Computing History Museum (with the inauguration of its extension).

- *Centro de Supercomputación and Visualización (CesViMa)*

Visit to the Magerit Supercomputer.

- *Centro de Domótica Integral (CeDInt)*

Visit to its laboratories (including a demonstration in the CAVE, its virtual reality cave).

- *Centro de Biotecnología and Genómica de Plantas UPM-INIA (CBGP)*

Visit to its laboratories as well as the different biotechnology, biology and genomic workshops.

- *Centro de Tecnología Biomédica (CTB)*

Visit to its laboratories and conferences (cognitive neuroscience and computation, biological networks, etc.)

- *Centro de Investigación Aeroespacial (CITA):*

  Spanish User Support and Operations Centre (EUSOC)

  Visit to its facilities and laboratories (including its operations hall)

  Instituto Universitario de Microgravedad "Ignacio da Riva" (IDR)

  Visit to its facilities (including its aerodynamic wind tunnels)

- *Support Centre for Technology Innovation (CAIT)*

  Living Lab TV 3D

  Visit and demonstrations (filming, visualization, postproduction and a real system for 3D capture)

  Experience Lab de los Espacios del Futuro

  Visit and demonstrations (recreation of spaces that are transformed thanks to technology)

The overall offer of activities is coordinated in the UPM by the unit for Scientific Culture, which is the interlocutor with the Office for Scientific Information of the Madrid Regional Government, who, in turn is the regional coordinator of the event, thanks to which the visibility of these activities of the Campus will increase enormously as well as its impact.

The activities will be attended to by the research and support staff of the centres themselves. These activities will have an interactive framework nature for seeking the active participation of the visiting public. The dissemination will be oriented in the majority of cases towards secondary education centres, but will also look for the participation of the general public.

As specified in the proposal, the financed activity contemplates an extension to the Computing History Museum (www.fi.upm.es/Museumfi), located in the *Facultad de Informática* of the UPM, with the new name: *Escuela Técnica Superior de Ingenieros Informáticos*. The inauguration of this extension will coincide with the Science Week where there will be guided tours.

General view of the current Computing History Museum

This extension includes not only an extension of the physical space destined for the Museum but also an increase in the pieces on show. The new collection put on show (collections already belonging to the Museum) will include different computing systems. Since the space that Museum currently occupies is unable to house an increase of these characteristics, the *Facultad de Informática* has decided to relocate the Museum in a new area of the building which is why the activity that is being developed contemplates both an adapting of the new space and a transfer of the old Museum. At the same time both the extension of the 'Museumgráfico' project and the 'Museumlógico' plan is being developed in which the divulgation of the TICs to the Campus environment is a priority objective.

Finally, as part of the activity to bring the ICE to the environment and facilitate the knowledge that he public has about its centres, some information panels will be installed (coinciding with the dates of the Science Week) on the door of each of the buildings in the Campus, like those in the image below. As well as a location plan and a brief description of the activities of the corresponding centre, it will include QR codes that will redirect to the Web pages so that all of those interested can amplify the information.

Design of the Information Panels at the Montegancedo ICE

Most significant results

With these actions it will bring the Campus to its closest environment, to the Regional Government of Madrid as well as the potentially the public outside of its immediate environment. The emphasis that will be made in the dissemination de of its capacities in the area of TIC will contribute to making the ICE Montegancedo known as a reference in the Information and Communications Technology sector.

In accordance with previous experience of the UPM in similar activities, the aim is for hundreds of people who by being there will participate in the activities in the Science Week and others with the activities which will form permanent activities beyond this event, that is, the Computing History Museum permanently open to the interested public, and the exterior information panels which will facilitate access of the population to information relative to the Campus.

Explanation of the use of human, material and economic resources

The economic resources used to carry out this activity come from the Subprogram for the strengthening of the International Campus of Excellence program, CEI 2011 call. The heading implemented refers to costs for the putting into operation, construction or adapting the facilities or buildings and acquisition of equipment.

Extension of the Computing History Museum:

This activity will include costs relative to the refurbishment and adapting of the new space for the Museum. The total amount ascends to €14.000 + VAT.

Information panels with the QR codes of the centres:

This activity will include costs relative to the production and installation of seven stands of 60x50cm, 60x85cm frontal and 125cm high in dimensions (in accordance with the image presented) at a cost of €5,537 + VAT

The cost of the planned divulgation activities for the Science Week (visits and workshops) have not been charged to this section.

Most significant deviations in the progress towards the objectives.

NA

Proposal for corrective actions

NA

Table I. Description of Project Actions

Scope	UPM technology and knowledge transfer to business sectors
Action	UPM *innovatech* Technology Commercialization Programme development
Objectives	The main goals are to boost the exploitation of research results and also to stimulate the innovative process in the business ecosystem near the UPM, within the scope of the Centre of Support for Technological Innovation (CAIT).

Progress to objectives:

UPM *innovatech* Technology Commercialization Programme aims to actively improve the exploitation of R & D results generated at the university. To do this, we have chosen a model for marketing that has to rely on the cooperation of different actors in the following process (Figure 1):

- **Motivation**: promoting technology transfer concepts and creation of IP as a basis for action strategies in technology commercialization projects.
- Technology **identification**: IP generated by the academics and R&D structures.
- Technology **scouts** identification: dialogue with UPM R&D structures for the screening of projects with market potential.
- **Planning** for exploitation and commercialisation of results with the support of university advisors.
- **Contacts** to industrial parties: negotiation of licensing contracts, royalty agreements and clauses.
- Support for **negotiation** of licensing contracts.

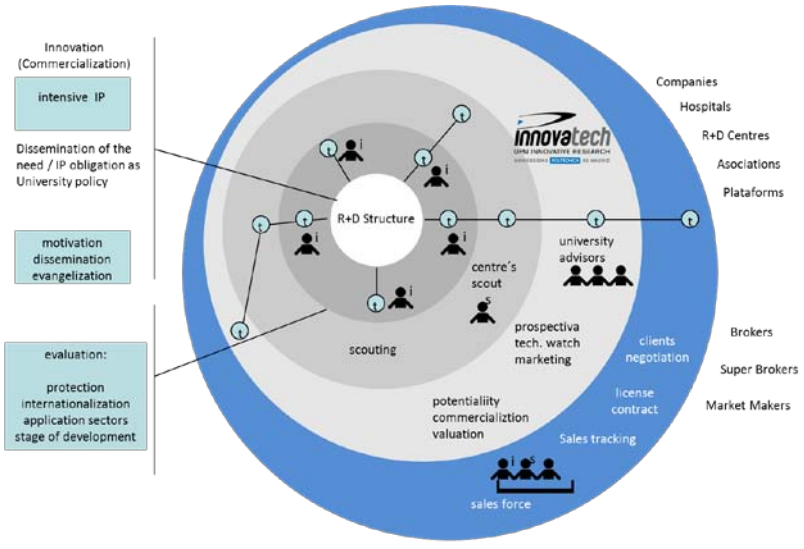
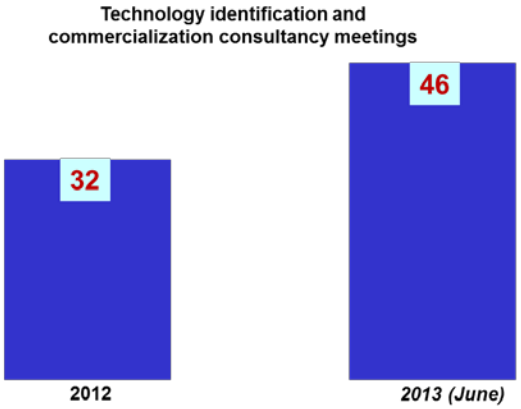


Figure 1. UPM technology commercialization strategy.

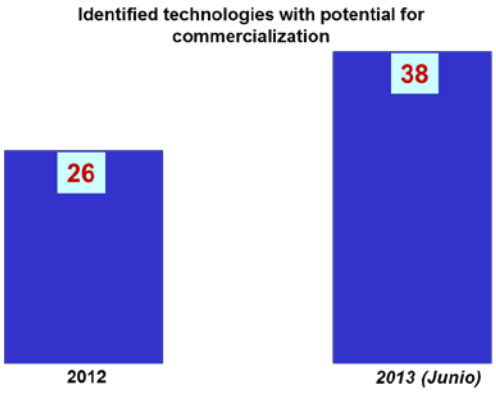
The implementation of this model and the set of actions involved in have been fully integrated into the strategy of the Centre of Support for Technological Innovation (CAIT).

Description of accomplished work and role of participants

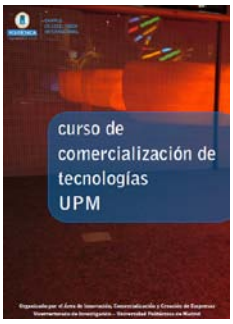
- **<u>Technology identification, motivation and counselling</u>**:
  - Planning meetings with researchers who have developed a technology solution is constant throughout the year, for both starting assistance with technology transfer consultancy and getting in contact with early stage technologies in order to asses their market potential from the very beginning. In 2012, 32 meetings were held in this regard and in the period from January to June 2013, 46 meetings.



  - As a result, including custom technology screening activity and the above meetings, in 2012 26 UPM technology solutions with market potential were identified, and in the period from January to June 2013, 38 new technologies.



- A training programme focused on technologies commercialization has been scheduled, exclusively aimed at researchers in charge of the development of a UPM technology solution. This course, in collaboration with experts teachers and professionals, provides theoretical and practical concepts in subjects such as marketing and productization, industrial property, communication or negotiation. In 2012, the first edition was attended by 25 researchers. It is scheduled to hold the second edition of this course in October at CAIT.



- **<u>Technology valorisation</u>:**

  - In the context of the university-industry chair Clarke, Modet & C º, which is focused on industrial property and technology intelligence, 10 UPM patents have been valorised as a part of a commercialization project.

  - In the context of collaboration with agro-biotech technology company Plant Response Biotech SL, an analysis of valuation of UPM patents portfolio in the field of agro-bio has been performed, highlighting those with the greatest potential for commercialization.

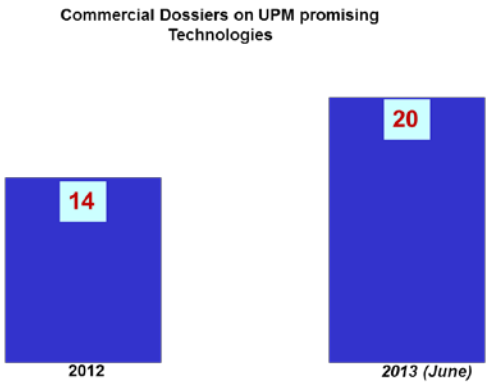
  - As recent examples of coordination and development of technology watch and prospective studies, we have coordinated the realization of a technology report ("HTML5 and compatibility in User Agents") at the request of the company Global Line SL and in collaboration with UPM ETS Telecommunications Engineering researchers. The report was spread at the Mobile World Congress MWC, Barcelona 2012, the most important annual event for the mobile communications industry worldwide. On the other hand, at the request of the company Cotelsa SA a UPM technological offer proposal-report in the field of biometrics has been developed.

- **<u>Marketing</u>:**

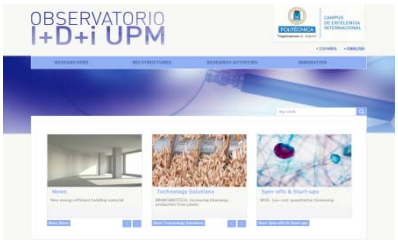
  - Own UPM innovative technology brand: UPM-Innovatech brand has been developed and registered, which distinguishes those innovative technologies developed by the university with market potential and promote them to potential business partners or customers.

  - Development and promotion of commercial dossiers based on UPM technology solutions previously

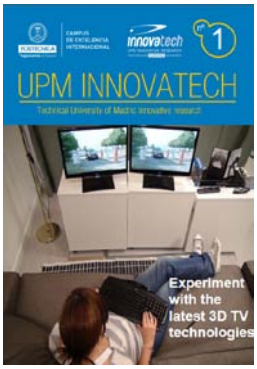
identified, used for marketing goals (both Spanish and English versions). In 2012, 14 dossiers were developed and in the period from January to June 2013, 20 new dossiers. As a result of that, draft versions of complete commercial catalogs by bussiness sectors have also been developed.

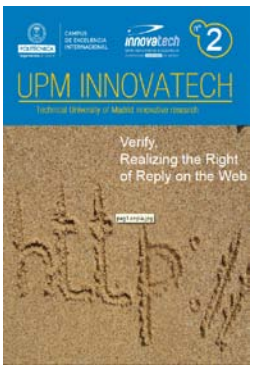


- Design, management and promotion of UPM on-line technology marketplace, based on information about innovative technologies; both Spanish and English versions are available.



- Development and promotion of a regular newsletter (bimonthly, approximately) including UPM technology innovation and CAIT latest news, in print and digital formats, and both Spanish and English versions.

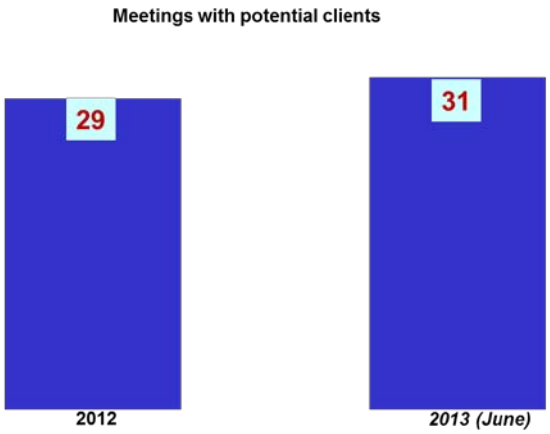




- Presence at technological fairs and networking events (Genera 2013 related to energy sector, and foreseen SIMO 2013 related to ICT).

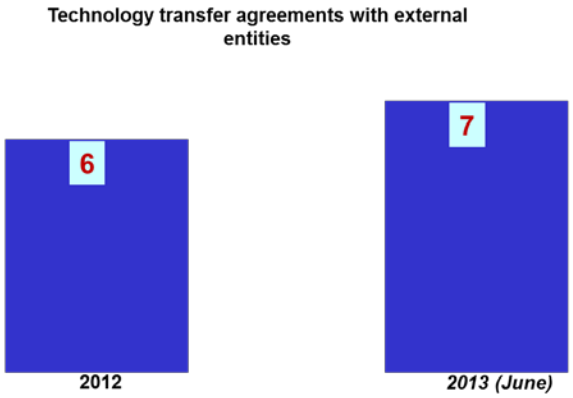
- **Sales:**

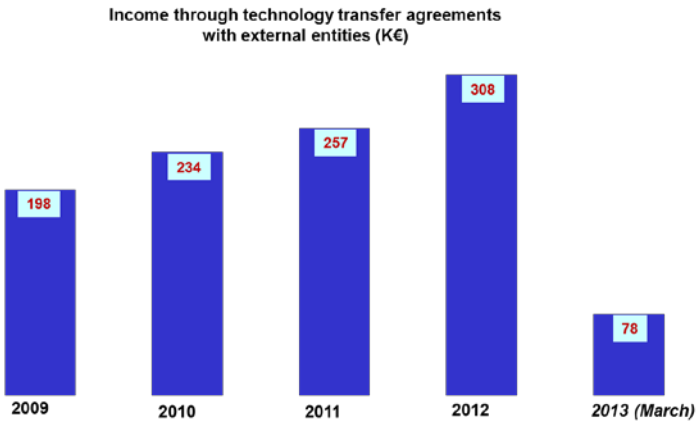
  - The program team has held 29 bilateral meetings with industrial companies in the field of innovation technology during 2012 and 31 ones in the period from January to June 2013, all of them within an active promotion plan and as a starting point for potential sales process.



  - CAIT-UPM team is in process or has already signed agreements with external entities, which collaborate as technological brokers in order to reinforce technology sales internationally: Plant Response Biotech (collaboration in the agro-biotechnology sector), AJ Calero (ICT and bio industries), Clarke, Modet & C º (industrial property commercialization in the ICT sector).

  - In terms of technology transfer agreements with external entities, in 2012 CAIT-UPM has signed six new license agreements for the commercial exploitation of technologies (5 with spin-offs of the UPM and 1 external company). From January to June 2013, it has been signed seven new licensing deals (2 with spin-off of the UPM, and 5 with external companies). The evolution of revenues from technology licensing contracts is shown in the figures. This data are related to the license of technologies protected by patent, software register or know-how.





- **Actúa_COM, open innovation project:** the first call of Innovación Abierta Open Middleware "actúa_COM" was launched in collaboration between Campus de Montegancedo Center for Open Middleware (COM) and CAIT-UPM. Among its objectives, it highlights the identification of successful business ideas from UPM university community. These ideas will be supported during the development of the business models, trying to reduce the time from project to market validation. This initiative is made possible thanks to the agreement signed among the UPM, Banco Santander, Isban and Produban.

Explanation of the use of human resources, material and economic

Please, see "Creación del Centro de Apoyo a la Innovación Tecnológica (CAIT)" description. Additionally, in the period 2012-2013, the program has been supported for human, physical and economic external private partners to launch activities included within the strategy described above, such as the support of Clarke, Modet & C º (through the university-industry chair Clarke, Modet & C º which main objective is technology valuation, IP advisory, and training in technology transfer field) or the collaboration with

Santander Bank, Isban and Produban for the launch of the first call for open innovation in the open of middleware field technology.
Important deviations preventing achievement of objectives Not applicable
Proposal of correcting actions Not applicable

Table I. Description of Project activities

Scope	Transfering of knowledge and technology academic research results to the business sector through the establishment of technology-based companies
Performance	UPM Entrepreneurship Program
Objectives	Advice on generating high potential business projects with university origin. Specialized training processes in business management. Support in the development of new technology-based companies. Providing added value services to companies already established.

Progress towards objectives:

The UPM interact with their immediate environment through CAIT as a focal point for the innovative activity of the institution, through the transfer of knowledge generated either through the creation of new companies and the commercialization of these technologies.

UPM 's interest to favor rooting with its innovation ecosystem has been reflected through the Campus of International Excellence of Montegancedo. From the market point of view, it represents an added value for both established companies and start-ups, devoting human and material resources to foster the running of high growth potential new technology-based businesses.

The strengths resulting from the creation of a favorable environment for innovation, which transform and transfer all the knowledge, research, and technology ideas generated in the university in traded goods and services with high added value in the market, are clear.

Under these assumptions, the Entrepreneurship Program is in charge of realizing this important role in the current economic scenario. The Program is integrated within the UPM Innovation, Commercialization and Entrepreneurship Area. Until January 2013, this Area depended on the Vice President for Research of the University, being located physically in the Rectorate building on the campus of University City. From January 2013, all the team is relocated in the CAIT building at Montegancedo Campus, continuing since then the development of the functions and tasks that are peculiar from this new location .

To meet the challenge of encouraging an entrepreneurial culture within the university community and promote UPM knowledge transfer, the Program provides services that include, among others:

- Monitoring and ongoing advice from the initial stage until the constitution of the company.
- Analysis of the viability of the project.
- Guidance on writing the business plan.
- Training activities aimed at the team's needs.
- Visibility in the business environment, both to potential customers and investors.
- Activities aimed at promoting networking.
- Support in finding funding sources.
- Professional services that meet the needs of startups.
- Business Plan Competition actúaupm (ten editions till nowadays).

Moreover, note that linking activities Entrepreneurship Program in the field of International Excellence Campus Montegancedo fall well with the generation of a greater number of tools to support internationalization, understood both in terms of conception from the start of business models in a global environment (favoring to do networking, visibility to potential partners, customers and / or investors, among others) and increase and acceleration of growth and entry into new markets of the companies already established.

Description of work and role of participants

Despite Entrepreneurship Program has come to integrate into the new structure of activities of the Center for Support of Technological Innovation (CAIT), its activities were already being developed within the UPM , thus counting with a background and previous experience. Therefore, in the last nine years:

- There have been submitted 2.212 business ideas from researchers, professors, PhD, master and degree students linked to UPM schools and research centers.
- It has supported the launching of 138 companies till nowadays.
- It have been captured by the UPM spin- offs and start - ups over 28 million euros in funding from public and private sources.
- It has brought together 13 sponsors and partners around the Entrepreneurship Program to provide both direct and indirect economic resources to promote the generation of new business ideas.
- Thanks to all that has been said before, UPM has become the number one university in terms of spin- off for three consecutive years (2010-2012) according to the ranking published annually by the Transfer of Research Results Office of Spanish universities (RedOTRI universities).

<u>More relevant results</u>:

1. **Results for the first half of 2013 :**

For the first half of 2013 (date on which all tasks have been undertaking having as hub Montegancedo Campus) , the aggregate activities undertaken and results achieved in the UPM Entrepreneurship Program are those shown below:

- Total number of ideas received in the framework of the X Business Creation Competition (currently in force): **405**. In terms of people, this figure is translated into a total of 1,026 people involved and interested in the field of entrepreneurship. These numbers remain the turnout compared to previous editions in which already reached a record of inscriptions. All groups (teachers, researchers, undergraduate and graduate studens, administration and services) have recorded ideas in this edition in which, moreover, almost all UPM schools and research centers have been represented.

- Celebration of three training courses simultaneously with more than 90 teams of entrepreneurs with a business idea.

- Among the many outreach activities to promote entrepreneurship spirit, should be highlighted:

- Workshops on entrepreneurship topics (business ideas in universities, business models, marketing, etc.): **23**, involving a total of 1,180 attendees.
- Training actions understood as sessions lasting 2 or more hours on entrepreneurship: **9**, what has come to represent more than 250 attendees.

- About 130 teams are getting personalized and individualized advice regarding the feasibility analysis of their business project. Of these, a significant percentage is conducting a business plan that reflects its approach to business. 2013October 1st, is the deadline to submit as part of the X Business Creation Competition actúaupm, such documentation and be eligible for the prizes to the best business plans for this edition.

- For the third consecutive year there are being celebrated **Expert - Lab** and **Business- Lab** initiatives. It is about programs for MBA alumni, former entrepreneurs, investors and entrepreneurs that through individual consultation, contact innovative entrepreneurial projects that currently are exploring the viability of their business. The ultimate goal is to bring greater business insight to these new projects, as well as an opportunity for these profiles of becoming part of a high-potential entrepreneurial ecosystem. These meetings have been carried out in the facilities of CAIT thanks to the meeting rooms available. Currently, more than 35 projects are receiving added value services that include these initiatives.

- Note the holding of the second edition of InternetTech Forum, a meeting place for new entrepreneurs and companies, investors and experienced professionals to know new trends and leading companies in the areas of Internet, mobile and technology. This event is integrated into the framework of the activities promoted by the UPM - FDI Innovation and Technology Chair , located in the campus of Montegancedo .

- It also took place the II actúaupm New Technology Business Investment Forum in collaboration with InvestBAN, Private Investors Network (activity covered within the specific cooperation agreement that UPM has with this entity). This forum is articulated as a space in which business projects launched in the environment of the University have the opportunity to present their initiatives to a large number of investors specialized in technology projects. While the first edition (in November 2012) the 8 projects presented were characterized by UPM companies with some travel on the market , in this second edition the approach was geared towards companies with activity related to ITC sector. In sum , in these two editions , a total of 16 companies have presented their businesses to potential investors through this forum.

- It has managed to raise about 1 million euros primarily of private funding sources by companies with origins in the UPM.

- In terms of communication, the number of media impacts related companies both UPM and the Program itself is located next to the 100, including both internal university media and external to it.

- Total number of new companies to date: **10** (5 spin- offs and 5 start - ups)

- As for the work of internationalization, there are examples of business projects, supported from the Entrepreneurship Program since the beginning of the business idea, which are currently in negotiation or agreements now closed for the development of its activities with a supranational

perspective. Also, there are now several cases of companies that, due to its technological profile, its high growth potential and its business model of international scope, have received investment from outside our borders.

- While in the process of development, it has to be mentioned the upcoming opening of the pre-incubator of CAIT. This space is designed as an area of gestation of ideas until they become viable business market. In addition to infrastructure support for collaborative work teams of entrepreneurs (with access to jobs), it promotes and facilitates the provision of certain services by the Entrepreneurship Program (including counseling and assistance in setting up projects), as well as promotes other activities such as training seminars or active networking , among others.

However, given that the UPM Entrepreneurship Program has a longer track, we only include the results achieved throughout the year 2012, in order to have a closer view of what represents a year of activity in this initiative and thereby completing all activities involved in actúaupm Business Plan Competition.

2. 2012 Results:

In 2012 the UPM Entrepreneurship Program experienced a significant increase in terms of participation: a total of 474 teams submitted a business idea forward in analyzing its feasibility, representing more than 1,200 people. This figure came to demonstrate that the Program arises great interest and participation of all those held in the University throughout the year. Also there was a notable increase in terms of business plans completed and submitted, reaching a figure very close to 60 plans.

The Entrepreneurship Program has shown in the past five years high capacity of diffusion of Entrepreneurship, as evidenced by the fact that over 11,000 people have attended some of the different activities (training, conferences, workshops, seminars, etc.).

In particular, the following are the 2012 facts and figures:

- New companies : **17**
- Ideas submitted to the ninth edition of actúaupm Business Plan Competition: **474**
- Teams advised: 91
- Business projects advices by experts in Business -Lab and Expert -Lab initiatives: **40**
- Training seminars: **9** (involving about 300 participants)
- Communication:
    - Impacts on press and internet : **150**
    - Press Releases: **4**
- Specific training activities in the areas of business management:
    - Conferences: **29** (which represents approximately 2,200 attendees).
    - Training: **12** (490 attendees).
- Teams presented to investment forums since 2009: **39**. In aggregate terms, the investment figure captured by UPM companies stood at over **€28 million**.

Note that in general that work on diffusion of entrepreneurship among the academic community, multiple sessions were organized in UPM schools, research centers and institutes and also the Program participated in other training activities in collaboration with various organizations such as the Entrepreneurs Roundtable held in the framework of the summer UPM courses at La Granja (Aranjuez), a technical Session on

technology transfer at the University of Valladolid, or Gamification workshops , human resource management and financing within the IX edition of the Entrepreneur of the Week Community of Madrid, among others.

It also participated in various university job fairs (Induforum in ETSI Industriales, Satelec in ETSI Telecommunications and 3U Forum) and several conferences of innovation and commercialization of results through targeting university companies and research groups, as the Conference "opportunities to undertake in a global world", conducted by the president of Microsoft International , Jean- Philippe Courtois.

3. Aggregated results for the 2008-2012period:

Finally, we present the results achieved by the Program at the aggregate level during the 2008-2012 period. As you can see, these figures emphasize that the activity in supporting the establishment of spin- offs (companies that are based on scientific and technological knowledge of the University) and start- ups (rest of new technology companies born in the university environment) continues in a growth and consolidation phase in the UPM environment .

	2008	2009	2010	2011	2012	TOTAL
Teams advised and tutorized	126	170	175	198	131	800
Dissemination activities	52	79	128	138	148	545
Attendants	1.820	2.334	2.221	2.521	2.575	11.471
Training seminars	3	4	3	3	9	22
Training activities attendants	53	61	65	150	294	623
Media impacts	135	118	106	150	150	659
Promotional material	11.223	11.434	12.805	6.480	8.980	50.922
Business Ideas Competition	163	266	257	415	474	1.575
Business Plan	29	38	38	50	58	213
Teams in investment forums	--	10	8	10	11	39
New companies	12	15	15	17	17	76

Explanation of Human, material and economic Resources

The Entrepreneurship Program has a stable structure of both financial and human resources and infrastructure for the development of its activities.
In the economic sphere, it has the support of the Technical University of Madrid through the resources available at the Center for Technology Innovation Support (CAIT) of the Monteganceda Campus of International Excellence. Additionally , from an institutional level , the Ministry of Economy and Competitiveness acts as sponsor in the framework of INNCIDE 2011 (OTR-2011 - 0236).

It also has the support of private partners, which not only make direct financial contributions but also non-

cash or in kind support in the frame of strategic relationships maintained with the institution (specialized training, counseling on matters of interest, participation in conferences and events, among others). Thus in 2013 the sponsorship program has entities such as Accenture, a global management consulting, technology services and outsourcing; Creania Labs, a business accelerator that focuses on the design, technology, research and development of business projects; eGauss, a diversified company active in the technology sector, specializing in the field of Internet, mobile and technology; InvestBAN, Network of Investors and Business Angels, with interest in projects and / or companies with innovative technological character and high growth potential; ROUSAUD COSTAS DURAN SLP, multidisciplinary law firm with extensive experience in knowledge transfer processes and the development of technology-based companies, Revista Emprendedores, the most widely read Economy magazine of Spain, with practical information for freelances, entrepreneurs and professionals; IEN business school specialized in offering UPM graduates training in the area of business administration; and Savior Venture Capital, an investment company that collaborates with entrepreneurs providing business insight to their business model.

In terms of staff dedicated to the Program, it should be noted that one of the factors that characterize and enrich this team is its multidisciplinary nature and the high interconnection when undertaking tasks. This stable team consists of three full-time staff at the head of which stands the Program Director Innovation and Entrepreneurship which performs the function of coordinating the activities to be developed.

In terms of infrastructure, the Entrepreneurship Program is physically located in CAIT, in the environment of the Montegancedo UPM Campus of International Excellence, in the town of Pozuelo de Alarcón (Madrid). In this center it has been developed the activities of the program since January 201. This building has everything needed to keep on working , both in administrative terms (jobs with modern and functional furniture, computer components, wireless Internet and fixed telephony, miscellaneous office supplies, etc.) as well as informal spaces, multipurpose and multifunctional where work meetings can be held, training or videoconferencing (it has meeting rooms of different sizes, hall and its own cafeteria).

Important deviations in the progress towards the goals

lIt has been postponed the conditioning of a space on the -2nd floor of the building for the location of a pre-incubator as multifunctional environment in which business ideas are able to boost the development of its business plan.

Proposed Corrective Actions

Not applicable

Table I. Description of the activities of the project

Area	Improvement in teaching Scientific improvement Improvements directed to the adaptation and implantation at EEES, including the corresponding adaptation of the buildings Transfer of technological knowledge as a result of academic research to the business sector.
Activity	Installation of a Concurrent Design Facility (CDF)
Objectives	The objectives of the activity consist of the acquisition and putting into operation of a CDF, consistent in an integrated environment of design for multidisciplinary applications, based on the methodology of concurrent engineering. Its main characteristics are: concurrent engineering through teamwork, integration of tools, project data and the simultaneous participation of all of the domains of the mission, including planning, AIV, operations, costs, risk analysis, CAD and simulation.

Description of the work carried out and the role of the participants

The activity has been carried out in accordance with the objectives envisaged in the initial planning, although with a certain delay due to the complexity of the facility, which has required the visiting of similar facilities and collaboration with the European Space Agency (ESA).

Description of the work carried out and the role of the participants

During 2011 preparatory actions have been carried out for the design of the facility and in 2012 its acquisition has gone ahead. The activities carried out within this period have been:

- Visit to ESTEC, one of the main offices European Space Agency (ESA), in June 2011 to get information from the CDF of the ESA.
- In July 2011 an agreement was signed with the ESA for the use of software developed by the ESA for educational purposes in the UPM. In September 2011, a CD-ROM was received from the ESA with a licence and the instructions for the software.
- Between September and October 2011 meetings were held with different suppliers of computer and audiovisual equipment, with whom they discussed possible technical solutions. After evaluating the different options, it was decided which was the most suitable for the UPM and the list of technical principles was drawn up and the contacting proceedings initiated.
- The announcement of the bidding was published in the BOE in March 2012 and the adjudication was signed in June. The handing over of the facility took place in November 2012.

Once the installation of the *hardware* and *software* of the CD is finished, the activities carried out during the period between December 2012 – July 2013 were as follows:

- Study and analysis of the "Student Concurrent Design Tool" *software* provided by the ESA. After carrying out a series of evaluation tests the following conclusions were reached:

- As it is written in Excel its lack of stability when changing the version was an elevated risk.
- The capacity to connect several applications was limited.
- Excel offers little robustness with the intensive and continuous use of the tool.

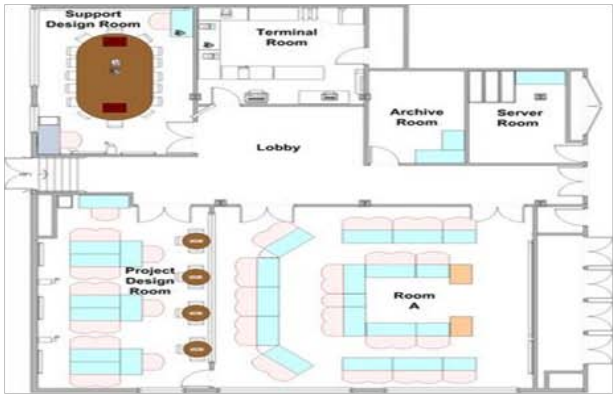
For this reason it was decided to develop an application in Python which was capable of resolving the aforementioned limitations, whilst thinking about the possibilities of extending it in the future.

- Development of its own "Concurrent Design Platform" connexion application, with the following characteristics:
  - Written in mainly free software without charge.
  - Use of data bases, en instead of spreadsheets for storing values.
  - Its own interface which can be personalised.
  - Multiplatform and almost total connectivity with third-party programs.

- Perfection of the application of the design modules.

  With the objective of having a means of testing the aforementioned application, a concurrent design system has been developed for a satellite, specifically for a Low Earth Orbit (LEO) observation satellite. The aforementioned modules have been developed in multiple languages - programs (Microsoft VBA, Matlab and Python) with the aim of testing the connectivity and robustness of the applications.

  The design has been limited in the first phase of the subsystems of orbit, energy, structure, thermal control, and in the second phase, the launch, propulsion, attitude control, communications and onboard computer, and mission. Several sessions have taken place with the CDF in which the experts from different subsystems have implemented its code, and have collaborated in the perfection of a first version of the "Concurrent Design Platform" series and the design modules. This has permitted, on the other hand, to contributing to the training of the experts of each of the subsystems as regards the knowledge of the working and the interaction with the remaining subsystems.



CDF of the UPM

Most significant results

Alonso, G.; Pérez-Grande, I.; Fernández, G.; Torralbo, I.; Martínez, A, Integration of the Concurrent Design Facility in the Research and Educational Activities at IDR/UPM.

5th International Workshop on Systems & Concurrent Engineering for Space Applications. SECESA 2012 17-19 October 2012, Lisbon, Portugal

Explanation of the use of human, material and economic resources

The material resources have been used to assemble the installation, configured in such a way that permits the working in the concurrent mode of the engineering teams from different technical disciplines, under the direction or a systems engineer or director. For this reason a series of computer equipment is necessary, as is an audiovisual environment that allows the communication and sharing the work of each of the members of the team. The different computer teams are connected together and to the audiovisual environment which allows the systems engineer to control the information that is shown both on each of the general screens and the stations of all of the members of the team. The connexion between the computer teams also allows the shard use of the computer applications.

The contracting of a technician at a cost of €35,000 has been necessary to define the initial configuration of the equipment, program it and put the systems into operation.

The financing has been **€200,000** from the ***call for the International Campus of Excellence 2010*** of the Ministry of Education (now Education, Culture and Sport)

Most significant deviations in the progress towards the objectives.

Not appropriate

Proposal for corrective actions

Not appropria