

CAMPUS MONTEGANCEDO:

The ICE oriented towards international technological Innovation

I2_Tech

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TECHNICAL REPORT

International Campus of Excellence Program
2010 call
Presentation to the international committee

Madrid, 16th September 2010



CEI-CAMPUS MONTEGANCEDO
Universidad Politécnica de Madrid

ACRONYMS

ANECA: National Quality and Accreditation Evaluation Agency **AAPP:** Public Administration
APTE: Spanish Scientific and Technological Parks Association
CA: Autonomous Community
CAIT: Support Centre for Technological Innovation
CBGP: Biotechnology and Plant Genome Centre
CCAA: Autonomous Communities (Regional Government)
CDTI: Industrial and Technological Development Centre
CEDINT: Integral Home Automation Centre
CEI: International Campus of Excellence
CEVISMA: Supercomputing and Visualization Centre of Madrid
CIET: Innovation Technical Education and Research Centre
CITA: Aerospace Technology Research Centre
CRUE: Rectors conference of Spanish Universities
CSIC: Informatics and Information Security Research Centre
CTB: Biomedicine Technology Centre
DEFE: Spanish Delegation of the European Foundation for Information Society and electronic Government
EHEA: European High Education Area
EEES: European High Education Area
EOI: Industrial Organisation School
f3I: Future of Internet
FP: Vocational Training
GATE: Tele-education Group
GIE: innovative Education Teams
R&D: Research and Development
R&D&I: Research, Development and Innovation
ICE: Sciences Education Institutes
ICEX: Spanish Institute of International Trade
ICT: Information and Communication Technology
IDR: Ignacio de la Riva University Research Institute
EIT: European Institute of Technology
IMDEA Software: Madrid Institute of Advanced Software Studies
ISFOC: Concentrated Photovoltaic Systems Institute
ISOM: Optoelectronics and Micro technology Systems Institute
KIC: Knowledge and Innovation Communities
LC: Science and Technology Law
LES: Sustainable Economy Act
MEC: Ministry of Education
MICINN: Ministry of Science and Innovation
O.M: Ministerial Order
OEPM: Spanish Patent and Trademark Office (SPTO)
OTRI: Research Results Transfer Office
OTT: Technology Transfer Office
PAS: Services and Administration Personnel
PBL: Project Base Learning
PDI: Research and teaching personnel
PIF: Research Personnel on Training
RD: Royal Decree
HR: Human Resources
SIGC: Internal Quality Services
ULAB: European Laboratory for modelling the Technical Research University of Tomorrow
UPM: Technical University of Madrid
USOC-E: Spanish Users Support and Operations Centre

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INTERNATIONAL CAMPUS OF EXCELLENCE PROGRAMME INTERNACIONAL
Orden EDU/1069/2010

1. GENERAL PROPOSAL

1.1 INTRODUCTION

The International Campus of Excellence Programme led by the Ministry of Education (MEC) and supported by the Ministry of Science and Innovation (MICINN) seeks to improve the quality of our universities. It aims to lead to excellence the foremost campuses for the benefit of society as a whole through the **aggregation, specialization, differentiation and the internationalization of the Spanish university system**.

The purpose of the call for 2010 is to strengthen some relevant points regarding the proposal of 2009. These are the **strategic aggregations as a way to achieve excellence and international relevance, the incentivisation and talent attraction policies undertaken by universities** and the **Graduate School**, where young people selected from all Spanish campuses will be educated, attracting students from other areas or countries. Finally the participation of the university system in a new model of **sustainable economy is envisaged**.

During 2009 the Campus Montegancedo was recognized as a Promising CEI 2009 in the MEC call. Prior to that, it achieved the status of "Excellence in ICT and technology transfer" during the first phase supported by MICINN. For the 2010 call, **the UPM seeks the CEI 2010 certification with the aim of obtaining the seal of excellence**.

The Campus Montegancedo, due to its focus as **Campus orientated towards technological innovation**, will launch measures to accelerate the innovation process as a differentiating factor in all Spanish universities. This desire is meant to point out the institutional commitment with specific actions to support the innovation strategy jointly with the graduate teaching and applied research.

The Campus Montegancedo project strives to achieve a **"user driven open innovation"** model, with an institutional vision, sustained over time and shared by the entities added. In this model the user interacts with researchers to obtain early feedback on the development process itself in technological equipped spaces.

The UPM is aware that Campus Montegancedo has enormous growth potential that should allow its development in the period 2010-2015, despite the efforts made in recent years. This development will focus on three priorities: **1. Increase internationalization, 2. Enhance the postgraduate training** and **3. Strengthen R&D&i. Campus transformation** will act as a transversal priority with a focus to further improve the natural environment, accessibility, security, sports and residential facilities. Figure 1 shows schematically the relations between these axes which are mutually complementary.

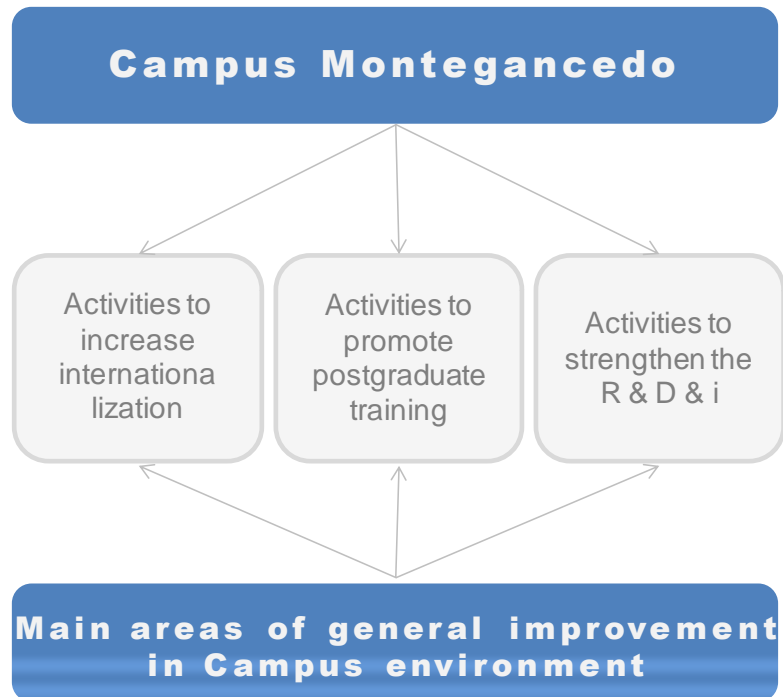


Fig. 1. Areas to expand in Campus Montegancedo

This document aims to specify the actions to be taken, either those already identified or their expansion, for the 2010-2015 period outlined in the Strategic Plan presented in the proposed reclassification document during MEC 2010.(particularly those for the 2010.2012 period will be emphasized)

For that purpose, it wishes to strengthen and build on the internationally recognized excellence present already in the Campus with further support and assistance in specific aspects.

The following are resources for investments obtained so far in 2010 and the ones that will be applied. These are:

CALL	STATE	AMOUNT	OBJECT	MINISTRY	
CEI	2010	Awarded 1st Phase	Grant 0.39M €	Talent attraction, residence project, EHEA adaptation	Education
		Awarded 2nd Phase	Loan 2M€	Complete construction of Support Center for Technological Innovation (CAIT), jointly with resources from 2009 call (€ 4M loan)	Education
Incentives to Science and Technological Parks		Applied	Loan 1,8M€	For furniture and equipment to enable CTB installation whose construction was financed from the last year call	MICINN
		Applied	Loan 0,4M€	For measurement equipment systems in the boundary layer wind tunnel and satellite integration room UPMSAT	MICINN
INNOCAMPUS	2010	Applied	2,5M€	Supercomputer	MICINN
		Applied	0,8M€	Food and Health (CBGP)	
		Applied	0,5M€	Photovoltaic Concentrator	
		Applied	0,06M€	Patent Support	
		Applied	0,2M€	Modular construction	
R.D university residence		To apply	315 €/ m ²	Montegancedo residence	Housing

Table 1. Distribution of aid and grants applied and granted in 2010 Montegancedo CEI

In summary, Figure 2 shows an overview of the funding applied and granted in 2009 and 2010 to carry out the Strategic Plan of Conversion to International Campus of Excellence Montegancedo.

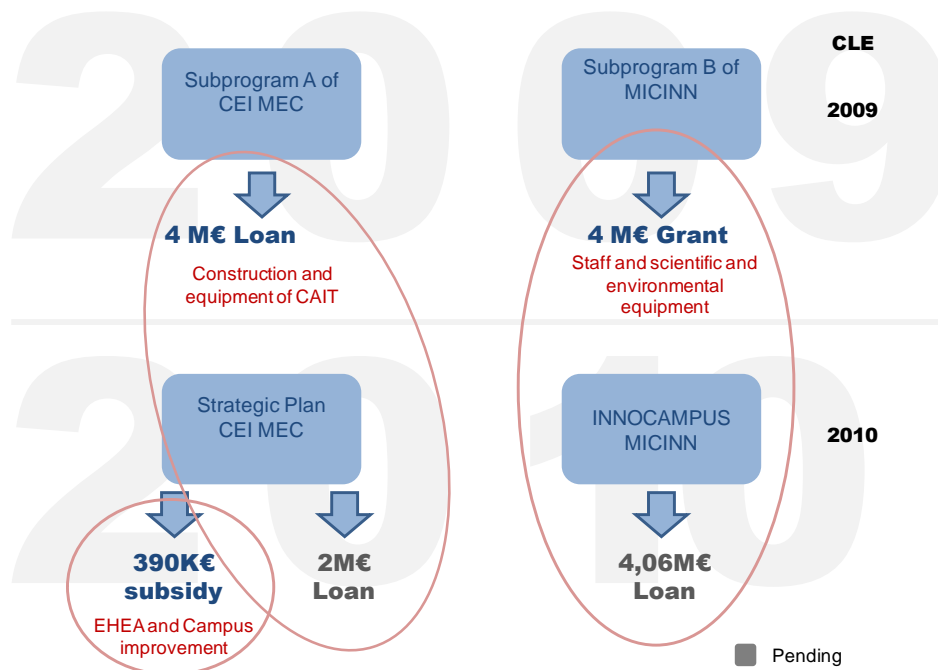


Fig. 2. Applications overview

During 2009 and 2010, the UPM made a collective effort to realize the strategic plan through the development of agreements with already signed **aggregations** (2009 and new ones), the **specialization** of Campus Montegancedo in some attractive areas, **the focus on** an open innovation approach as a differentiator and **internationalization**.

However, since the first call in 2009, the economic crisis has had an immediate impact in the proposed new campus, slowing down some or delaying the planned actions. In any case, it should be noted that over 16M€ investment commitments made in 2010 in the Campus reflect its institutional priority and importance.

The Montegancedo proposal is a campus that specializes in vertical and horizontal ICT application, with a distinctly international dimension and where the innovation process is accelerated and strengthened to achieve the highest performance. Three reasons reorient the Campus of Excellence:

- o The new economic reality
- o The development of aggregations
- o Emerging Opportunities

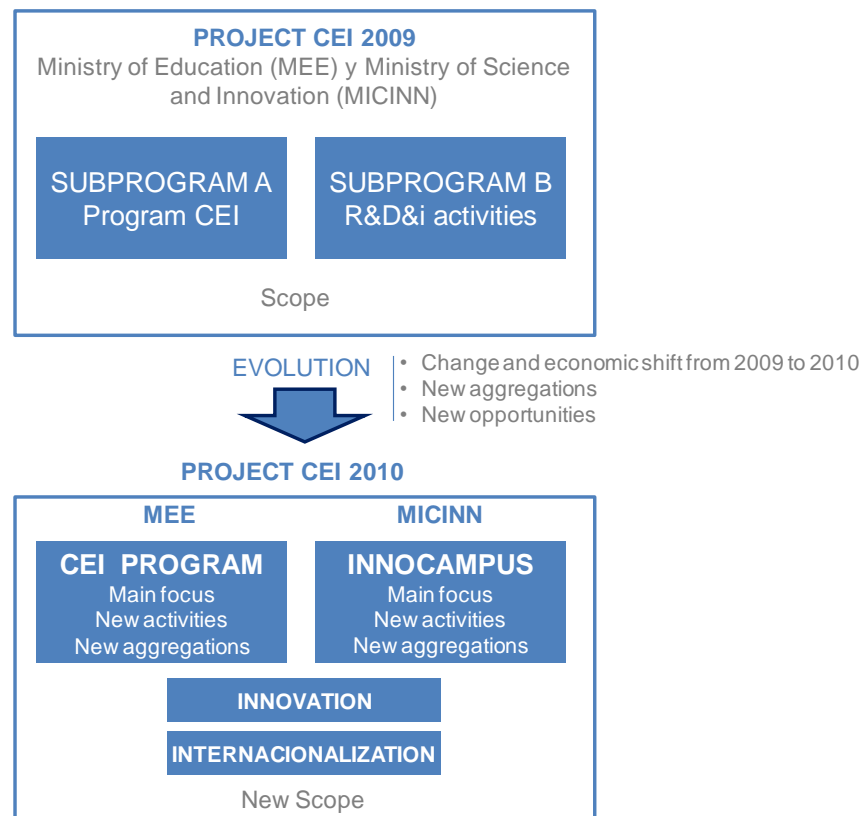


Fig. 3. Evolution and orientation change in CEI proposal

1.2 VISION AND MISSION

Vision

The Campus vision is to become the International Campus of Excellence known to be the foremost Spanish university and an international reference on sustainable and international technological innovation. The CEI will provide support to technological innovation through its integrated use of Information and Communication Technologies (ICT).

Campus Montegancedo project strives to achieve a “**user driven open innovation**” model. This is an institutional vision, sustained over time and shared by the entities added. Montegancedo will become an attractive campus to encourage sustainable technological innovation with a clear emphasis on vertical and horizontal ICT applications. Also, as a distinctive and leading singularity, agreements and partnerships with the national and international productive sector with particular emphasis on private aggregations will be strengthened.

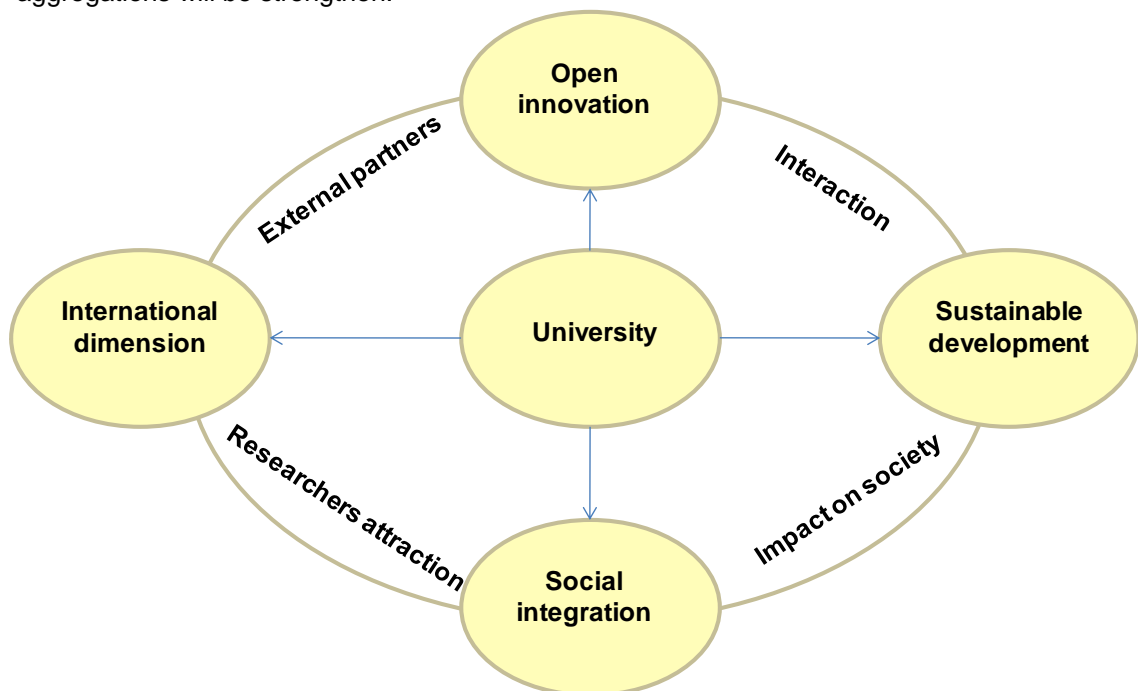


Fig. 4. Campus as an innovation catalyst

Mission

ICE Montegancedo’s mission is to create a Campus of both national and international prestige, which will contribute to the social and economic benefit of the area where it is located.

Montegancedo is committed to a comprehensive innovation model. There is a balance between education, innovation and research activities. The three vertex of the triangle are complementary and mutually reinforcing. The investigation has a key position in the knowledge generation. The transition to knowledge exploitation, successfully completed in some points of the innovation process, is a key element that addresses one of the recognized weaknesses in the national system in which UPM is specially prepared. The support initiatives focus on experimental and open collaboration with the end user; achieve results and performances in new services, products and processes. The linkage of research centers, education and the productive sector allows applied research becomes a reality.

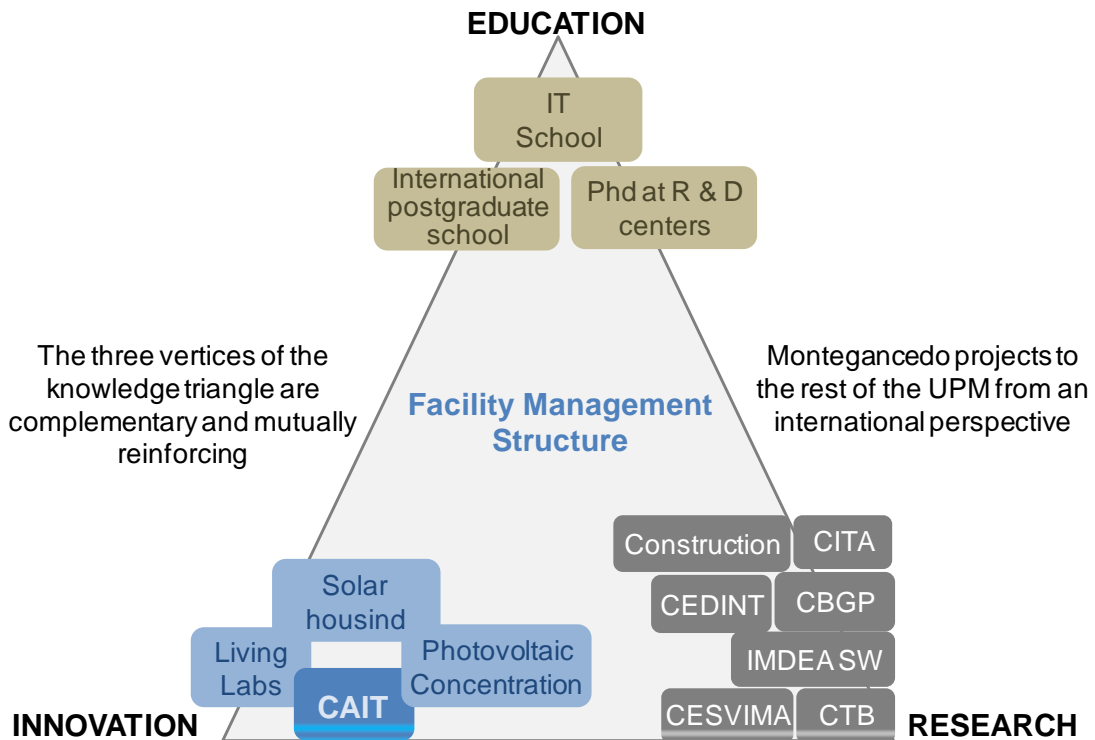


Fig. 5. Model integral innovation

Without going into detail of all the actions carried out in the first year of life of the Campus Montegancedo under CEI 2009 program, new priorities under this edition have been established. The growth potential and the maneuver flexibility must continue to develop in the next period 2010-2015. To do this, and considering the economic shift caused by the crisis, the development of aggregations and the identification of new opportunities in this first year, Campus Montegancedo set its priorities in the following subjects:

- Activities to strengthen R & D&i
- Activities to promote postgraduate training
- Activities to increase internationalization

The following scheme explains the relation vision-mission supported by five key strategies and a very favorable environment in the campus (see fig.6).

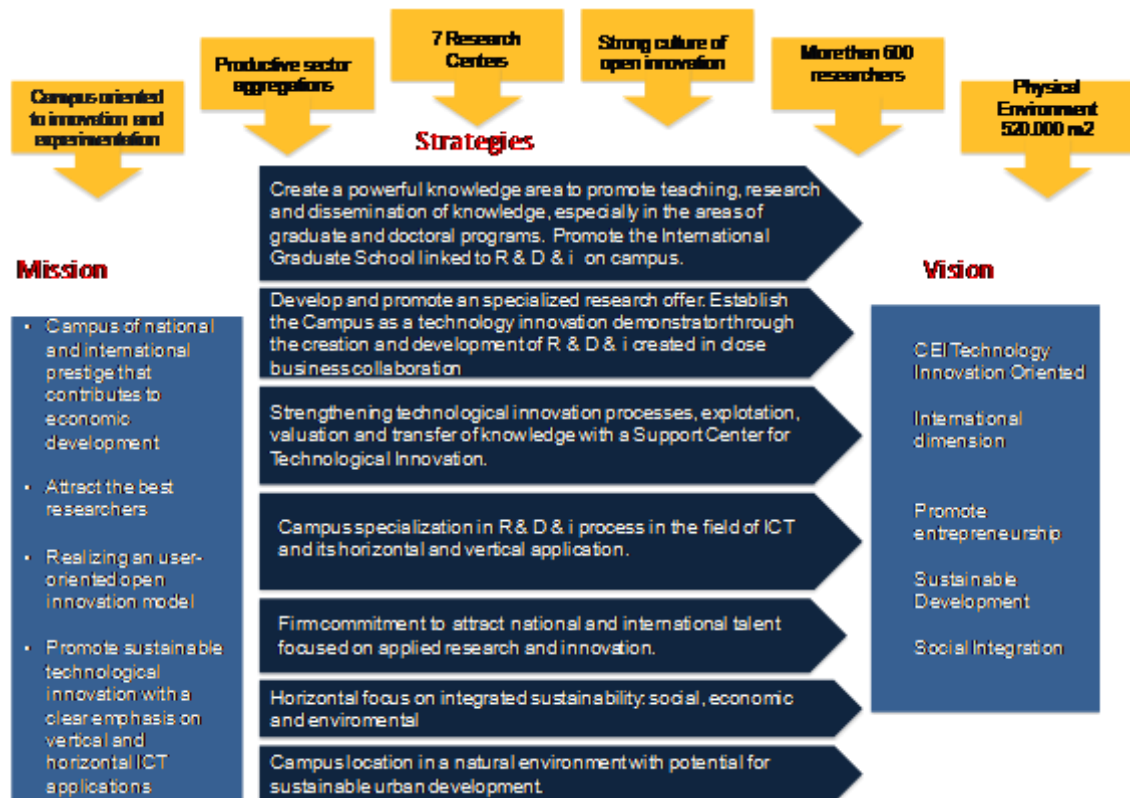


Fig. 6. Relation vision-mission

1.3 CAMPUS MODEL AND SWOT

THE CAMPUS ENVIRONMENT

Over the past 4 years the Campus has developed as part of the UPM's Science and Technology Park, located on a 480,000m² (will be extended to 520,000m²) campus within the district of Pozuelo de Alarcón, to the northwest of Madrid, directly connected by the M-40 highway. The site has enormous potential for future development. It is located in a privileged natural environment composed of oak trees and shrubs. The area is an extension of, and contains the same type of vegetation as the "Monte del Pardo" and the upper basin of the Manzanares river ecosystem.

The Campus is characterized by a porous architecture, integrated into the surrounding future area. It will include a series of buildings characterized by a constant search for efficiency and flexibility. Within the Campus one can find, teaching facilities, research centers, companies and a hall of residence for student and professors, all of which are supported by value added services (sports facilities, restaurants, shops, etc.)

Please see the following website for further maps and pictures
http://www.upm.es/CEI_Montegancedo/propuesta/2010/educacion/planos

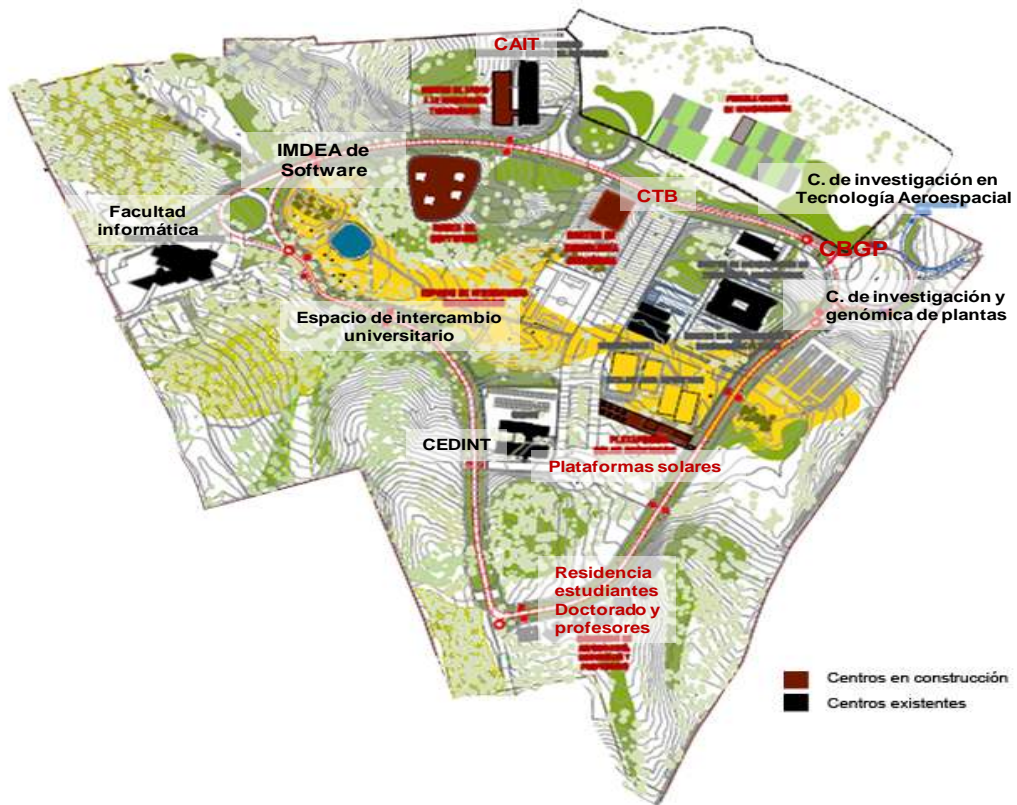


Fig. 7. Campus Montegancedo Map

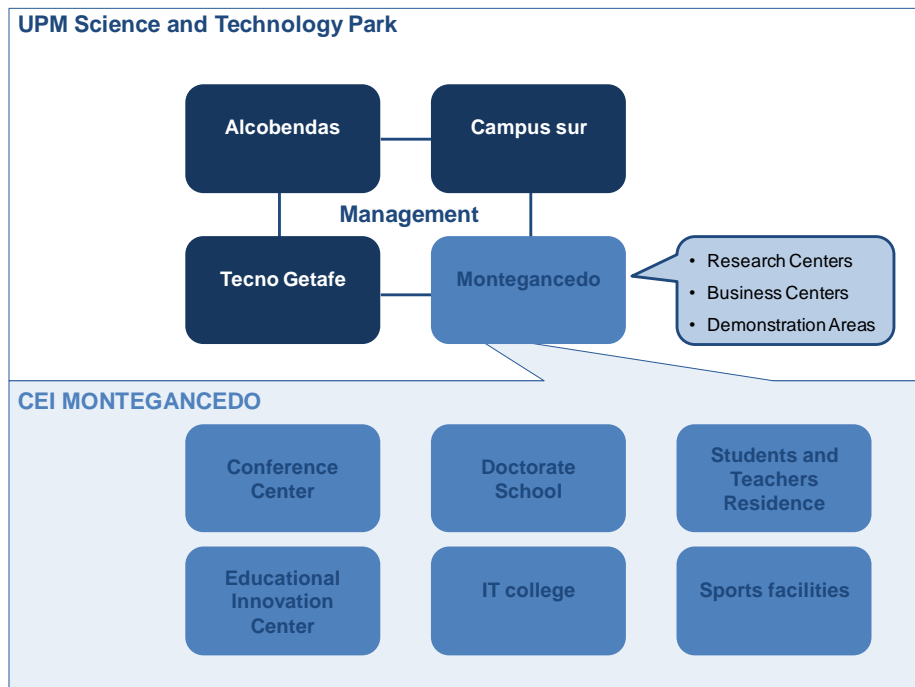


Fig. 8. Relation between Campus & Park

Differentiating factors of Montegancedo International Campus 2010

Improving international competitiveness of Spanish universities is one of the main objectives of the creation of the International Campus of Excellence. This objective is also supported by governments and authorities.

Achieving this improved competitiveness depends on many factors but one essential element is underlining the strengths of each university and as possible of each of their campuses aspects and campuses. It is obvious that no university can possibly achieve this competitiveness in all scientific and technological areas. Some of these areas are particularly relevant within a university for several reasons. The university should therefore focus on those and concentrate its efforts looking for a differentiating factor relative to other universities. Both universities and government should encourage, strengthen and fund these quality differentiators that identify each university intrinsically

In the case of the Polytechnic University of Madrid, UPM, this international competitiveness has some common elements and a close relationship with business and technical bodies of the public administration. Among them, we can highlight the support to technological innovation and a demonstrated capacity for stable and long term collaboration with other private sector entities in training activities or R&D.

The Montegancedo campus, subject of this proposal, although it shares common elements of the UPM listed above, has differentiating factors that converts its development in a unique opportunity to have an international highly competitive Campus. Moreover, the Campus will become a catalyst for overall improvement of the UPM.

The simultaneous combination of nine factors presented below helps the transformation of Montegancedo in a unique campus.

1. Campus strong specialization in R&D processes in Information and Communication Technologies (ICT) and its horizontal and vertical application.

Montegancedo does not only host a set of institutions, faculties and research groups thematically related to scientific developments. ICTs in Montegancedo have become the engine for development of scientific and technological capabilities in application areas such as space, aerodynamics, biomedical technology, intelligent modular construction and bioinformatics applied to plant genomics.

2. R&D Creation and development in close collaboration with business stakeholders.

The UPM has achieved stable cooperation with the business sector in Montegancedo offering new opportunities to implement innovative schemes. It goes beyond traditional ways such as providing spaces for an incubator supporting business creation or developing outsourced R&D projects or in consortium with companies. It is not just focused on creating a university chair with the business sector. All these actions are also implemented in other campuses as well and they have been developed with significant intensity in Montegancedo. However, what has proven to be more unusual in Montegancedo is to find models for the creation of joint laboratories with business stakeholders within Montegancedo's R & D centres. It is even more unusual to offer spaces for R&D companies linked to long term strategic cooperation agreements (as in the CEDINT or CTB). Finally, the implementation of open user driven innovation models like living labs "(as in the CAIT) constitutes a distinctive element of Montegancedo.

3. Strengthening technological innovation processes, exploitation, valuation and knowledge transfer with a Support Centre of Technological Innovation.

The Support Centre of **Technological Innovation** (CAIT) is an evolution of traditional business centres based primarily on business incubators and technology-based common services. The CAIT intends to become a focal point for implementing a user driven open innovation model through living labs, demonstrators and simulations, international research and technology marketing agreements.

4. Strong aggregation with the productive sector by encouraging strategic alliances at the forefront of technological innovation and collaboration agreements.

Montegancedo Campus aims to focus on the objective of having aggregations with an emphasis on private entities. These private companies will assume with the UPM a commitment to invest and support technological development. This scheme, unlike the one linked to aggregation with public entities, aims to facilitate the generation and transfer of knowledge in an international context since many of these aggregations are developed with multinational companies. Thus, strategic alliances allow UPM to strength its international strategy in close coexistence with the Spanish business sector interests in several countries.

5. Intensive promotion of entrepreneurship as an incentive effect of science and technology production and marketing.

Although the general culture of the UPM is very active generating ideas and creating companies, it is expected that Montegancedo Campus develops a new strategy in the promotion of new businesses. This strategy does not assume that the creation of new companies are responsibility of a specialized unit located in the campus. On the contrary, this process is part of a common mentality shared by the university community of Montegancedo. The importance of the aggregations with the private sector as part of the development of the Campus should stimulate and act as a catalyst for grade students, masters and PHD to make it part of their education.

6. Boosting the International Graduate School linked to R & D centres located in the campus.

The recent amendment to UPM statutes in 2010 has modified the role of the R&D centres and research institutes in relation to postgraduate and PhD. Specifically, it will allow to teach in these centres official programs of Master and PhD degrees (with the exception of Masters of engineering and architecture with professional attributions).

As a result, R&D centres at the Montegancedo Campus will be able to develop their programmes and apply its advanced facilities in postgraduate training.

The UPM is developing the International Graduate School (including master's programs and their own degrees, as indicated by the Ministry of Education) whose structure and content in various locations will be approved after the forthcoming publication of the RD (Royal Decree) that the Ministry of Education will launch . The inclusion of master's, PhD and degrees programmes imply the achievement of different criteria. It is also foreseen that some programmes of the centres located in Montegancedo and the Faculty of informatics will be host at the Graduate school in Montegancedo.

7. Strong commitment attracting national and international talent focused on applied research and innovation.

The effort made in physical infrastructure and scientific equipment would be useless if it is not followed by a talent attraction programme that would allow hiring researchers. Therefore, in the last five years, the UPM has launched an ambitious programme to increase their research staff in training (from about 200 in 2005 to 500 in 2010) and recruitment of doctors.

In the case of young and senior doctors, the UPM has launched their own programmes of Juan de la Cierva UPM, I3 and Isaac Peral and the programme COFUND. These programmes have allowed hiring more than 100 researchers in the given period. This process has been accompanied by an institutional commitment to stabilization of the Ramón y Cajal MICINN report.

The campus has been especially favoured with these policies. About 40% of the doctors employed in these programmes by the UPM since 2005 have been hired in R&D centres in Montegancedo. This is one of the main reasons that have provoked the implementation of new R&D centres in Montegancedo.

8. Institutional Agenda on integrated sustainability: Economic, social and environmental.

Economic sustainability refers to the reuse of facilities, the energy efficiency measures, or the expansion of campus facilities with a low debt ratio. For Montegancedo, UPM investments have been raised with the requirement to ensure a strong ability to generate revenue outside classical funding sources.

On the issue of social sustainability, UPM wants to increase its international dimension, equality programmes, accessibility and the student and researcher residence. In other words, the campus of Montegancedo will be a place of teaching, working and researching. Its social engagement will be achieved through collaborative efforts with developing countries, open days and access facilities to the people of the Council, etc.

Environmental sustainability implies the implementation of CO₂ reduction measures, energy efficiency, energy generation including the use of photovoltaic, adaptation to the environment, etc.

UPM will commit on gradually improve these aspects in the period 2010-2012, as long as economic resources allow us to do so.

9. Campus location in a natural environment with potential for sustainable urban development.

The development of a university campus in a partially protected natural area becomes an interesting value for the UPM. This should be emphasised by the location of new R&D centres in the area, in a privileged location and with sport services indoor and outdoor. This requirement is a constant in the development of the Campus, in which UPM is supported by experts from the School of Architecture that ensures respect for the principles of sustainability.

The UPM is aware that achieving this development will need a continuing effort. This will definitely increase the Campus attractiveness.

All these distinguishing items are important and explain a development model already mentioned in 2009 Strategic Plan. However, what gives Montegancedo its unique selling point is the simultaneous coexistence of all of them in line with a very strong institutional commitment.

The distinguishing character allows Montegancedo to become a test ground for policy actions that the UPM University wants to develop together with other institutions. The actors involved must be convinced of the useful character of the strategic model to the university system.

CAMPUS MODEL

The campus Montegancedo model in regards to the generation and use of scientific and technological knowledge is based on two closely linked perspectives of performance: the perspective of research and development (R & D) and innovation perspective, including the exploitation of research results.

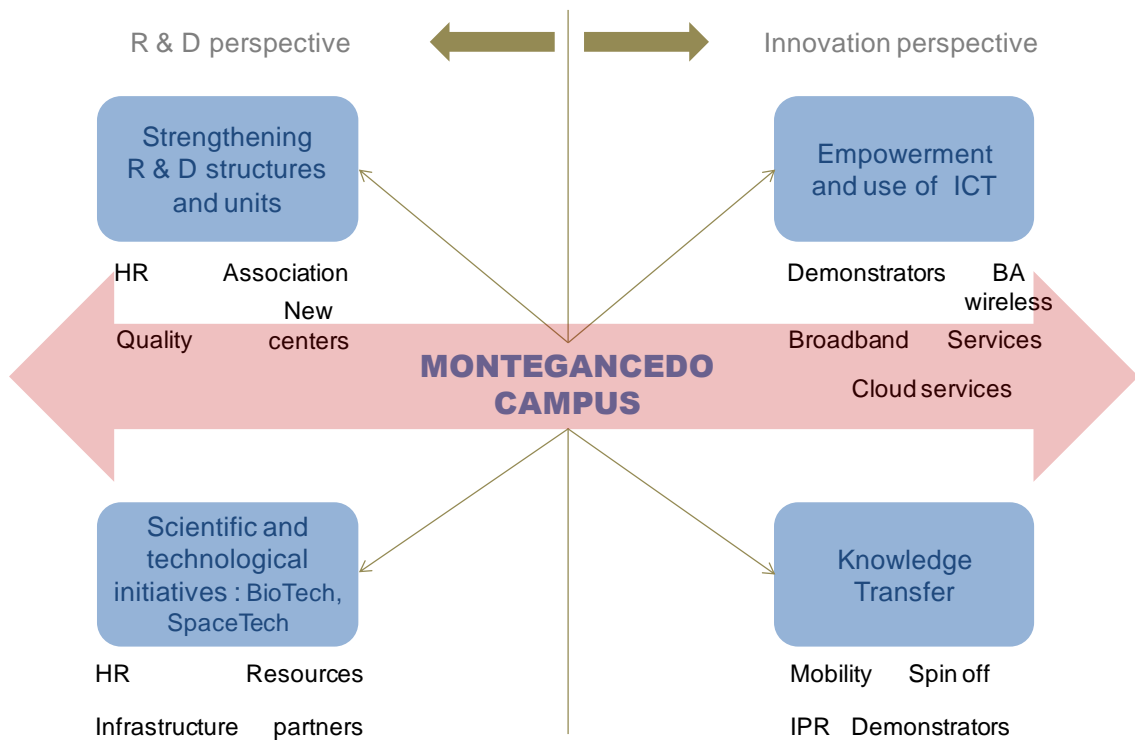


Fig. 9. Areas of performance in R&D, innovation and transfer

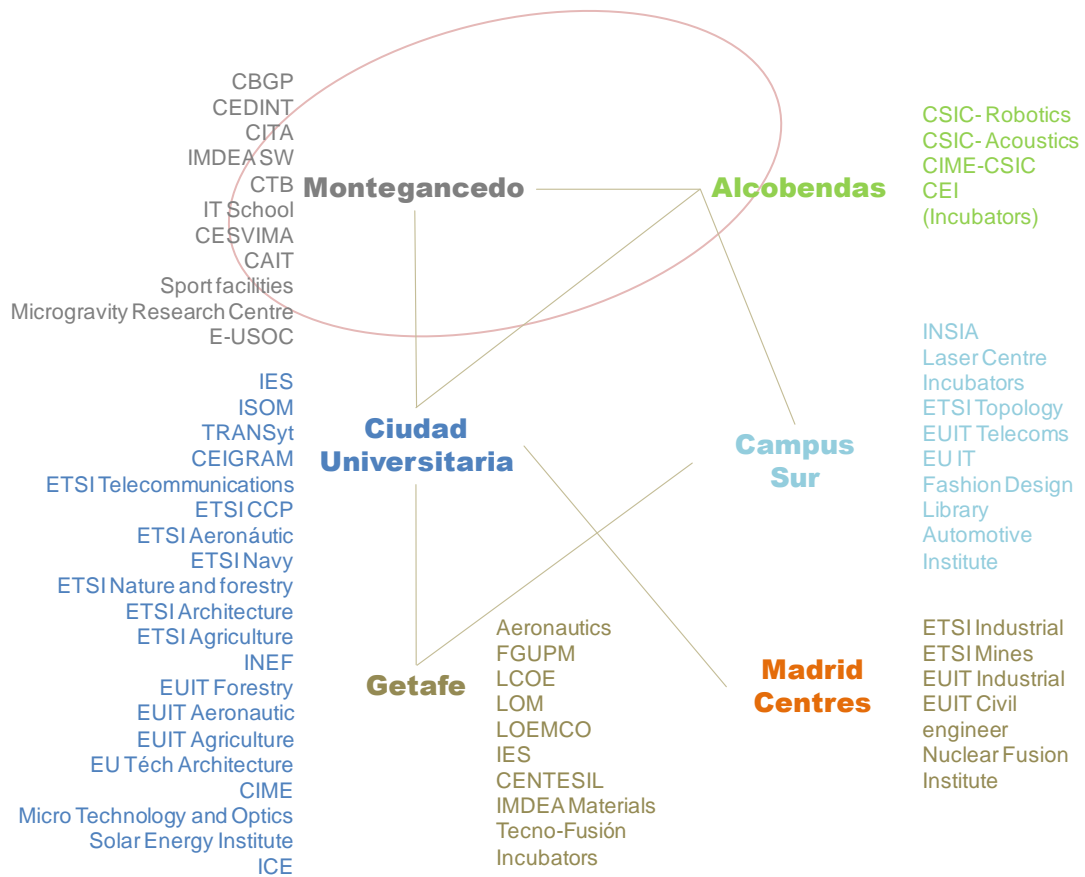


Fig. 10. Montegancedo in relation to the rest of UPM

The Montegancedo campus projects itself to the rest of the UPM from an international perspective. Depending on the line of research the various UPM campuses create areas for collaboration, synergy and maximum complementarily with Campus Montegancedo.

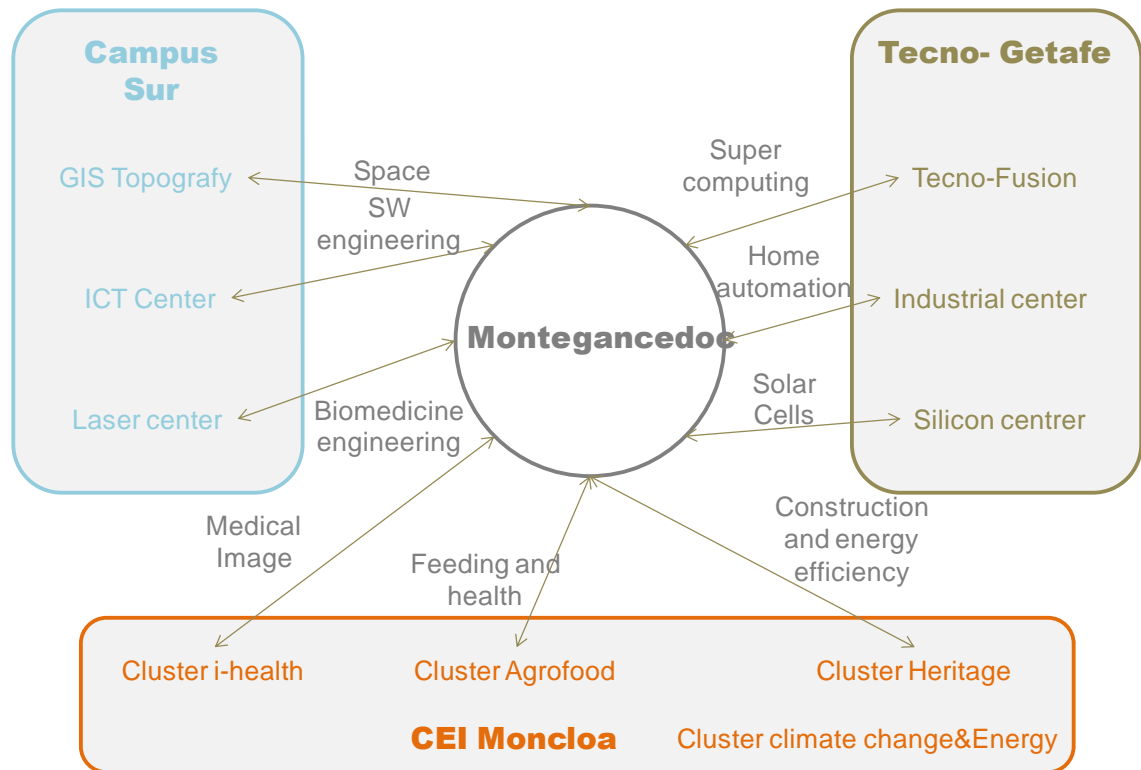


Fig. 11. Montegancedo's influence in UPM's R&D

Campus Montegancedo should act as a catalyst, improving the R&D&i for UPM. In this sense, UPM wants to establish as many links as possible with other UPM campuses. Especially important are the relations with the Moncloa International Campus of Excellence near University Complutense of Madrid as shown in Figure 11.

Specifically relations exist with:

1. The i-health cluster
 - 1.a. The Medical Imaging Platform (requested to INNOCAMPUS 2010) has a direct and complementary relation to UPM actions undertaken in the CTB in Montegancedo. The installation of the MEG has received UCM's support through resources of CEI Moncloa 2009.
 - 1.b. The "living lab" of Health, located in ETSI Telecommunications of UPM, is planned to start in October 2010 allowing synergies with the ones located in CAIT's Montegancedo
2. The agrofood
 - 2.a. The new line of Food and Health requested for CBGP INNOCAMPUS in 2010 call will support other activities in Moncloa Campus Agrifood Corridor
3. The climate change
 - 3.a. Energy efficiency
 - 3.b. Photovoltaic concentration panels demonstrator
4. The heritage cluster
 - 4.a. Cultural Landscape and architecture integrated into the environment

SWOT

Strengths

- Specialization in R&D&I processes in the field of ICT and its horizontal and vertical application.
- ICT as a catalyst for scientific capacity in several application areas (space, aeronautics, biomedical technology, sustainable construction, biotechnology and genetics of plants.)
- Being under construction has a much larger potential than other more established campus.
- Strong position in the field of ICT in and their implementation areas
- Postgraduate activities linked to the R & D & I Campus
- Stable and intense cooperation with industry, development of joint laboratories.
- Intensive promotion of entrepreneurship.
- Strong academic orientation of graduate school for their involvement with the R&D&I.
- Strong commitment to attracting national and international talent focused on applied research and innovation.
- Alignment with integrated sustainability.

Weaknesses

- Campus still not very developed and under construction.
- Poor coordination between R & D centers, facilities and research groups located in the Campus.
- Poor experience in implementation of user driven open innovation like living labs.
- Separate the business center of its current site and turn it into a Support Center for Technological Innovation.
- Reduced experience on the R&D&I centers of Campus Montegancedo to develop programs and postgraduate training.
- Poor integration into the Campus Montegancedo environment . Need to strengthen links with the municipality.

Opportunities

- Because of its distinctive character, the opportunity to have an international leadership and dimension.
- Patents and research results not exploited or insufficiently recovered.
- Interdisciplinary nature of the Campus activities which enables support activities that underpin and recover scientific activities.
- Making the campus a leader living lab where users can participate in the innovation model.
- Market leadership and services most likely to succeed.
- Get a campus, with support from architecture school that ensures respect for sustainability, usability, innovation in construction and efficient architecture.

Threats

- Despite some efforts the R & D centers remain independent with reduced integration with the university.
- Too much emphasis on teaching technology at the expense of management strategy.
- The relation with the private sector is still diffuse.
- Difficulty of governance by having different actors with different objectives.
- The state and the public funds cuts compromise the expected results and potential urban development of the campus.

EXPECTED RESULTS

The main results of this project are:

1. Campus International Leadership in ICT and its vertical and horizontal applications
 - 1.a. Increased participation in international R & D projects
 - 1.b. Strengthening international networks with other universities
2. Creation of an International Graduate School linked to R & D Centres of the Campus
 - 2.a. Selection of school's doctoral and master programs
 - 2.b. Incorporate the medical imaging program with MIT
3. Strengthen the R & D centres infrastructure on campus.
 - 3.a. Creation of new research centres with a business collaboration strategy
 - 3.b. Creation of joint labs with the business sector
4. Development of technological demonstrators and living labs for promoting knowledge transfer and technology
 - 4.a. Entrepreneurship pilots for teachers and students
5. Expand aggregations through agreements and partnerships with other national and international entities, both public and private
6. Attract the best researchers, teachers and students
7. Achieve integrated sustainability: economic, social and environmental.

Campus Montegancedo governance

Montegancedo Campus is being developed since 2005, with a dual focus: technology park headquarters and UPM Campus of Excellence focused on technological innovation. Montegancedo has a strategic dependence on the Research Vicerectorate and partial aspects with other units of the Rectorate.



Fig. 12. Scheme governance Campus Montegancedo

1.4 AGGREGATIONS SUMMARY AND OBJECTIVES

During last year's 2009 CEI call, Montegancedo stood out due to the high number of agreements signed with public and private entities. Noteworthy were the 22 aggregations agreements signed with private entities¹ who believed in a new model and way of working. This model surpasses the traditional scope of mere business relations or straight R&D collaboration by entering the field of technological innovation through stable partnerships. All aggregations regarded the UPM as a "**strategic partner for technological innovation.**" Even aggregations with public entities² main objective was the focus on applied research as a way to feed the innovation process.

During this period the UPM Campus Montegancedo has made a big effort to develop new agreements with public and private entities and create a model for Campus Montegancedo based on the following **objectives**:

- Strong involvement of others entities in long-term strategic alliances with UPM.
- Joint participation in long-term R&D&I projects
- Creation and development of R&D&I centres created in close collaboration with the business sector
- Effort in internationalization Activity
- New models of exploitation of research results

The following additional specific agreements started during 2010:

¹ Aggregations were signed with the following private entities: DEIMOS, GE, GMV, INDRA, ATOS, IBM, ZEISS, ROCHE, T-SYSTEMS, TELEFÓNICA I+D, ELEKTA, FRAUNHOFER, BICG, SANTANDER, FENIM, VODAFONE, ISFOC, LPI, ZETA SEEDS, ACCENTURE, CLARKE&MODET, AETIC.

² Aggregations with public entities were: EOI, IMDEA SOFTWARE, INIA, IEO, FUNDACIÓN ONCE

Private Institutions:

- o **Banco Santander:** Aggregation expanded through the creation of the Living Lab: Bank of the Future Living Lab; and executive education.
- o **BICG / Fraunhofer Institute IAO:** Aggregation expanded through the creation of a joint strategy for the launch of two Living Labs: One in the retail sector (presumably with the el Corte Inglés as a tractor company) and the other one in the catering business (currently in definition stage).
- o **Clarke and Modet:** Sponsoring of a university industry chair in Montegancedo Campus orientated towards intellectual and industrial property, technology surveillance and patents scrutiny in technological areas of common interest.
- o **T-Systems:** Agreement for the joint exploitation of the virtual reality cave with third parties and development of processing data software.
- o **Zeiss:** Development of software for the automation of neural imaging capture through cross-beam microscopy systems of dual-beam.
- o **IBM:** Extend the agreement on the supercomputer Magerit and future agreement on the development of Cloud Computing. A university-industry chair with IBM Rational, has also been signed
- o **Elekta:** MEG installation and subsequent exploitation
- o **INDRA:** Agreement for simulation activities in the area of biomedical engineering

Public Institutions:

- o **INIA:** participation at the Center for Plant Genomics and Biotechnology (CBGP): installation of new laboratories. .
- o **CSIC:** Instituto Cajal incorporation in the Blue Brain project (temporary facility at the CTB).).
- o **Universidad Complutense de Madrid** in the joint laboratory of Cognitive Neurosciences (CTB for the MEG).
- o **Universidad Rey Juan Carlos** de Madrid in the joint laboratory of Neuroimaging (CTB): Capabilities of Alzheimer's image processing.

Also, the following new additions not considered in 2009 have strengthened the Campus Montegancedo during 2010:

- o **Hospital Ramón y Cajal.** Agreement for the establishment of a Experimental Neurology and computational Lab
- o **MIT:** Teaching and research agreement on medical imaging jointly with the Foundation Madrid+D as part of the Visium+Project
- o **European Foundation for the Information Society:** Support the development and implementation of Internet television devices (IPTV)
- o **ULAB** Agreement (ParisTech, TUM, Politecnico Torino, Oxford, UPM)

LOGOS 2009



NEW AGGREGATIONS 2010 OR AMPLIFIED AGREEMENTS



ADDED AGGREGATIONS 2010					
AGGREGATION	TEACHING IMPROVEMENT AND EHEA ADAPTATION	SCIENTIFIC IMPROVEMENT	KNOWLEDGE TRANSFER	ENVIRONMENT	INTERNATIONALIZATION
Banco Santander	GRADUATE SCHOOL	Blue Brain	CAIT-Living Labs		GRADUATE SCHOOL
BICG			CAIT-Living Labs	RESIDENCE	
Fraunhofer			CAIT-Living Labs	RESIDENCE	International Cooperation
T-Systems		CEDINT		5 SIDED 3D CAVE	International Difusion
IMDEA SOFTWARE		Imdea Sw		IMDEA CONSTRUCTION	
ELEKTA		CTB		CTB CONSTRUCTION	International Cooperation
Clarke, Modet y Compañía, S.L	GRADUATE SCHOOL				
IBM	GRADUATE SCHOOL	CESVIMA			International Cooperation
ZEISS		CBGP	CBGP		international Cooperation
Centro de Formación Padre Piquer				VOCATIONAL SCHOOLS	
INDRA		CTB	CBGP		International Cooperation
ULAB (Paris Tech, Politécnico di Torino, Oxford University, TU of			CAIT		International Difusion
IN NEGOTIATION					
ATOS			CTB		International Cooperation
ISFOC		Architecture Center		PV DEMONSTRATOR	
BOEING		Architecture Center		PV DEMONSTRATOR	International Cooperation
HOSPITAL Ramón y Cajal		CTB			
MIT	GRADUATE SCHOOL				
Fundación Europea SI		IP-TV			International Cooperation
					International Difusion

Table 2. Added aggregations 2010

1.5 INITIAL ACHIEVEMENTS AND NEW INITIATIVES

The project presented in the 2009 call is **not going to be changed substantially, although the focus on specific actions** leads the initial project from **Promise to Excellence**. Its flexible and dynamic character focused on knowledge transfer and innovation, supported by the development of a new International Graduate School linked to R & D centers are its hallmarks.



Fig. 13. Campus image Call 2009

The Campus is committed to promoting the development of **sustainable technology innovation focused on ICT**. In the future more than 1,000 researchers will investigate on campus within the following lines of research: ICT on computing, plant genomics, automation, virtual reality, energy efficiency and bioclimatic architecture. Currently, aside from the IT School, the Campus houses Centers in Aerospace Technology (CITA) (including the USOC-E and the Institute of Microgravity Ignacio de la Riva), Biotechnology and Plant Genomics (CBGP) Supercomputing and Visualization (CESVIMA) Home Automation (CEDINT) and the Biomedical Technology Building (CTB) and IMDEA Software, both in temporary spaces on campus.

The nine previously introduced differentiations started in 2009 and consolidated themselves in the current 2010 project. The project CEI Montegancedo 2009 outlined the following points:

- o **Campus specialization** in R & D & i processes of ICT and its applications, converting it in a national and international leader.
- o **Strong aggregation with the productive sector** by encouraging the development of strategic partnerships at the forefront of technological innovation.
- o **Promotion of entrepreneurship** as incentive effect for production and scientific and technological commercialization.

This 2010 Campus project not only emphasizes those strengths but expands them covering the following aspects that deserve the **seal of Excellence**:

- o The consolidation of technological innovation, exploitation, valuation and transfer of knowledge processes through the creation of Support Center for Technological Innovation (CAIT).
- o Firm commitment to open innovation through Living Labs, simulators and technology demonstrators.
- o Support the International Graduate School closely linked to the campus centers.
- o Strong commitment in attracting national and international talent
- o Horizontal focus on issues of sustainable efficiency. The reuse of existing structures takes priority against over urban redevelopment.

UPM maintains the strategic objective to combine new R & D centers, with highly centers with high innovative teaching centers. As well the UPM Campus Montegancedo emphasizes those activities linked to the exploitation of research results whether through the CAIT, the Living Labs and technology demonstrators.

The Campus bases its strength in its broad scope of action, allowing greater freedom of configuration of services and infrastructure. It permits a total adaptation, to teaching, research and transfer activities.

On this **proposal**, the UPM wants to make known the **achievements and activities** that have been done on campus, taking into account the recommendations identified by the International Committee in 2009.

Recommendations of the International Commission CEI 2009 Call	Montegancedo Proposal 2009	Montegancedo Proposal 2010
Increase the involvement of local and regional administrations in the aggregation policies		
The universities have overly focused on areas related to BIO-HEALTH-Life Sciences.		
Contribute to the objectives of the sustainable economy law		
Level of aggregation is not deep enough		
Low aggregation of productive sectors: increase focus on actions related to innovation and transfer of knowledge and technology.		
Limited initiatives to improve the internationalization of university staff. Little attention to talent recruitment tools.		
Coordinate degrees with other universities and concentrate efforts (Masters)		
The level of attention to urban and architectural development and sustainable environmental quality in the 2015 horizon is clearly inadequate.		
Attention to emerging issues related to students and researchers residence: aim: increase internationalization		

Table 3. Level of compliance with the Call 2009 recommendations

Montegancedo Campus has established in the last two years the perspective of the knowledge triangle in which the "research", the "higher education" and "innovation" (addressed jointly in what are commonly called "politics of knowledge ") are developed and complement each other in order to achieve greater competitiveness of society as a whole.

Initial achievements and new initiatives:

- o **Creation and consolidation of R & D & i centers** located on campus that in a short time have become national and international leaders. Specifically, the fast development of the **Center for Plant Genomics and Biotechnology (CBGP)** together with INIA, **Biomedical Technology Center (CTB)**, the Center for Integrated Building Technology (CEDINT) and the Center for Aerospace Technology Research (CITA). All share an **emphasis on the development and advanced use of ICT.**
- o **Development of R & D & i structures associated with ICT** including the IT School, IMDEA Software, the Centre for Spanish users of the International Space Station (E-USOC) and the Centre for Supercomputing and Visualization in Madrid (CESVIMA).
- o **Launch of a new range of masters and doctoral studies with an enormous capacity to attract national and international talent.** The statutory amendment will allow the R & D & I centers and university research institutes propose and take ownership of research oriented masters and doctoral programs.
- o **A strong increase of researchers located in the Campus Montegancedo in the last four years.** This will continue in the coming years through the support of the recruitment policies and the prioritization of Montegancedo activities.

The table below shows the achievements, short-term activities and priorities postponed for 2010:

Area	Current activities	Past, present and future campus activities			Medium term implementation
		Activities CEI 2009	Activities undertaken 2009-Sept. 2010	Priorities CEI 2010	
Teaching and adaptation to EHEA	IT Faculty	International Graduate School CIET(Centre for Research and Innovation in Technological Teaching)	Teaching adaptation to the EHEA.	New graduate school Adaptation to EHEA: teaching methods and creation of interactive classrooms and collaborative work	Graduate school construction Construction of the Centre of Educational Innovation and Development Cooperation CITA
R&D centres	CITA Research Center in Aeronautics Technology (USOC-E and Research Institute Ignacio de la Riva) CBGP (Center of Biotechnology and Plant Genomics) CeDint (Integral domotic center) CESVIMA (Supercomputador Magerit)	IMDEA Software (Madrid Institute of Advanced Software Studies) CTB (Biomedical Technology Centre) CIX (within CESVIMA: Complex Systems Research Center) CCTC (Information security Research center) ICTIO Bioclimatic Architecture Center 3D Center Application Center GMES-Galileo	IMDEA Software construction CTB construction CeDint: installation of the 5-sided Cave 3D (installation of the	CTB: Biomedical Equipment (completing MEG, Microscopy, Medical Imaging) CesViMa: Supercomputing equipment Research Center of sustainability in architecture 3D TV activity (Living Lab) Applications center GMES -Galileo	Construction CCTC (IT security) Demonstrators GMES-Galileo

Past, present and future campus activities					
Area	Current activities	Activities CEI 2009	Activities undertaken 2009-Sept. 2010	Priorities CEI 2010	Medium term implementation
Knowledge transfer	Business center	CEDET (Centro de Emprendimiento, Demostración y Evaluación tecnológica)	Basic and implementation project of the Centre for Technology Innovation Support (CAIT) ULAB agreement	CAIT: Support Center for Technological Innovation (equipment and construction).	Location technology platforms and the Community of Madrid clusters
	Technology demonstration area (solar homes)	Solar gardens with ISFOC	Installing solar homes (construction of a joint platform) Support for business creation and technological innovation.	Promoting entrepreneurship. Launch of Living Labs: solar, home automation, banking, office. Construction of photovoltaic demonstrators (CeDint)	
Integrated Campus	Sport areas	Sports Zone Expansion Students and teachers residence International Welcome Center Conference center Security improvement	Improved security and access (video surveillance and access barriers)	Teachers and students residence Develop the collaboration frame with national universities (UCM, ReyJuan Carlos I, etc)	Agora construction Conference center construction Communications improvement
	Transport Service	Communications improvement Energy efficiency improvements Environmental Improvements Transports Improvements Community services improvement Campus Environment Regeneration Intercampus Transport Service with electric bikes	Electrical services improvement	Sustainable Design: eco-urbanism	Implementation UNE 17 001 Creating gender and equality observatory Urban renewal

Table 4. Present and future activities. Road to excellence.

Despite this adverse reality caused by an uncertain economic situation, UPM has managed to carry out the following actions:



3D image

IMDEA Construction

- The construction of the new building began in May 2010 with completion planned for early 2012
- **Growth:**
 - 100 researchers by 2012
 - 200 researchers and 2015



Installation of the Virtual Reality Cave in CEDint

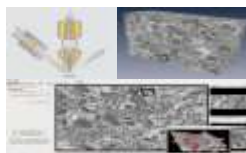
- First five side cave in Southern Europe
- UPM-T-Systems exploitation agreement
- Development Applications:
 - In biomedical technology area
 - In home automation area
 - In architecture area

R&D&I activities in Biotech area



- Construction of the Biomedical Technology Center (BTC)
 - Under construction
 - 7.000 m²
 - 10 M€ budget
 - 200 researchers by 2012
- CTB interim facility at the Center for Plant Genomics (CBGP)
 - Enabling 800 m²
 - 70 people already installed in 2010
 - Scientific equipment installation

R&D&I activities in Biotech area II



- Blue-Brain project participation
 - Strategic agreement with the CSIC (Instituto Cajal)
 - National coordination of other entities (universities and OPIs)
 - International coordination with the EPFL (Switzerland)
- Zeiss Cross Beam acquisition

R&D&I activities in Space-Tech area II



- IDR Enhancement
 - Start-up of wind tunnel boundary layer
- USOC-E Enhancement
 - New ISS experiments allocation
 - Engineering models room installation
- Analysis and possible establishment of a navigation services and earth observation demonstration center

R&D&I activities in energy efficiency area



- Creation of a processes research and bioclimatic architecture center
 - Jointly with companies in construction industry
- Installation of prototype houses built for the Solar Decathlon (U.S.)
 - Prototype 2005
 - Prototype 2007
 - Prototype 2009

2. EVALUATION ASPECTS OF THE PROPOSAL

2.1 TEACHING IMPROVEMENTS AND EHEA ADAPTATION MEASURES

Starting Point

With these tables, we recapitulate all the activities listed in the Strategic Plan CEI Campus Montegancedo 2009, in the areas of teaching improvement and the measures of adaptation to the EHEA. They show the evolution from last year, highlighting the completed, ongoing and to be initiated actions.

The need to maintain an attractive and efficient university offer adapted to the EHEA, from the point of view of education, requires addressing jointly the information indicated: adapted curriculum, physical spaces, new teaching methods and continuous assessment systems.

The campus takes up this challenge as a priority and essential to his concept of Excellence.

	STRATEGIC PLAN CAMPUS OF EXCELENCE_FUNDING AND BOND AIDS					
	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others
TEACHING IMPROVEMENT						
Increase Masters in English related to CEI research centres.	Completed	X				
Master in Software Engineering ERASMUS MUNDUS and advanced computing, Computer Engineering, Software and Systems and Artificial Intelligence.	Completed	x				
Masters in biomedical engineering along with a doctorate and Biotechnology and Genetic Resources	Completed	x				x
Computer Engineering Degree, Computer Science and mathematics at EEES	Completed	x				
Strengthen training through the creation of the International PhD School	In progress	x	x	x		
Implement the UPM educational model.	In progress	x				
Project based learning support (CDF)	In progress		X	X		
Biomedical Engineering Degree	Pending	x				
Biotechnology Engineering Degree	Pending	x				
Doctorate School Construction	Pending	x				
Create the Centre for Research and Technological Teaching Innovation(CIET).	Pending	X				
Enhance Educational Innovation Groups.	Pending	X				
Implement trainingship and final projects, business master's and doctoral degrees and abroad.	Pending	X				x

Table 5. Teaching Improvements

	STRATEGIC PLAN CAMPUS OF EXCELENCE_FUNDING AND BOND AIDS					
	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others
IMPROVEMENTS FOR THE ADAPTATION AND IMPLEMENTATION OF THE EUROPEAN HIGHER EDUCATION AREA						
Adapt teaching and methodology improvement to the EEES	Completed	x	x			
Creation of interactive classrooms and collaborative work	In progress	x	x	x		
Set network services to improve teaching	In progress	x	x	x		
Promote company, university and research integration, in graduate programs.	In progress	x		x		
MIT agreement	In progress					x
Strengthen access to information: Library Improvement	Pending	x	x			
Develop a strategy for attracting international students and exchange in predefined periods.	Pending	x				
Specific attention to non-Spanish students.	Pending	x		x		
Promote professional integration of students through a COIE office (Vocational Guidance Centre).	Cancelled	x				

Table 6. EHEA Adaptation Measures

Strategy

Within the educational improvement, Montegancedo strategy is still to fully integrate teaching, research and business. The general strategic lines are based on:

- o Fostering postgraduate and doctoral training
- o Strengthen the emphasis on entrepreneurship and innovation
- o Develop national and international collaboration

Within the process of adaptation to the EHEA, Campus Montegancedo maintains its strategy fully aligned with the overall requirements of the EHEA.

Thus, the campus wants to develop the strategy in a national and international context simultaneously in the following areas:

- o **Teaching**, emphasis on graduate training in both master and doctoral levels. The importance of universities in the international context will be determined on the graduate level. For this, the UPM will propose the creation of a new International Graduate School
- o **Research**, seeking a better and more interdisciplinary approach in addressing the complexity opening the campus to other PDIs from areas of knowledge of the UPM doesn't have. The host of research groups from other institutions to complement their own capabilities is also a way of understanding the accession of the UPM to open innovation model
- o **Knowledge environments**, offer advanced services to the entrepreneurship. Contributes to the creation of new business networks in the university community and its environments.
- o **Structural**, creation of new structures and governance models that promote the principles outlined. The proposal will introduce new structural instruments that make the Campus a pilot in the whole UPM

As part of the EHEA adaptation strategy, the UPM is renewing their innovative teaching methodology models both from an educational content point of view (degrees, masters and PBL methods) as well as from physical spaces for learning point of view (creation of interactive classroom teaching and collaborative work).

PERSONNEL	POPULATION	TOTAL	SCHOOLS/ CENTRES
Students	Degree	2600	IT
	Graduate	400	IT, CTB, CBGP, CeDinT
Teachers		300	IT
Researchers	Currently	150	CBGP
	Expected 2012	200	
	Currently	100	IT
	Expected 2012	150	
	Currently	100	CTB
	Expected 2012	150	
	Currently	50	IMDEA
	Expected 2012	100	
	Currently	60	CeDinT
	Expected 2012	100	
	Currently	40	CITA
	Expected 2012	50	
	Currently	0	Modular construction
	Expected 2012	50	
R&D&I for business	Currently	150	100 Spin offs, 50 LPI
	Expected 2012	300	

Table 7. Campus Montegancedo

Degree activities

In the process of EHEA adaptation, the IT School of Informatics has launched new degrees: Computer Engineering and Computer Science and Mathematics, keeping its Computer Engineer degree until 2014.

In this context, the UPM is also preparing two new degrees which are scheduled for delivery during 2011-2012. Each of these new degrees appears linked to a research center: Biomedical Engineering (associated with CTB) and biotechnology (associated with CBGP). Both new grades will have three semesters common to facilitate the mobility of students from one degree to another.

Graduate and Doctorate activities

As we have said previously, Montegancedo Campus focuses primarily on postgraduate activities closely linked to the R&D&I centres located in the Campus.

The graduate and doctorate programs planned for the IT School during 2010-11 are the following:

MASTER	STUDENTS	DOCTORATE	POSTGRADUATE PROGRAM	STUDENTS	FACULTY/CENTRE
IT engineering	45		Master in Biomedical Engineering	39	CTB
Artificial intelligence	64	Yes, 21 students	Master of Biotechnology Agroforestry	44	CBGP
Software and Systems	26	Yes, 19 students	Master of Plant Genetic Resources	18	CBGP
Advanced IT for Science and Engineering	21	Yes, 16 students	Master in Advanced Forestry Research	38	CBGP
Software engineering	44		Master in Technology and Communication Systems	62	CEDINT
			Master in Aerospace Engineering	77	CITA

Table 8. Graduate and doctorate programs

In these graduate activities, the UPM has strengthened the participation of foreign students. Within the graduate studies at the IT School, we have reached a number of 119 foreign students, 54 UPM ex-alumni and 92 coming from other Spanish universities. The postgraduate studies more closely associated with the R&D&I centres have a smaller share of foreign students (23), compared to students from and outside the UPM (56 students total).

The 10 major nationalities who attend Masters of the UPM are: Venezuela, Mexico, Colombia, Chile, Italy, Ecuador, United Kingdom, Cuba, Iran and India.

The aim is to promote postgraduate training internationally, specializing Montegancedo in the areas of its research centres.

Action Plan

Teaching improvements and EHEA adaptation actions are the following:

- Promote postgraduate training internationally specializing Montegancedo Campus areas related to their R&D&I centres.
- Teach own and official programs in English and graduate programs in the IT School
- Taught specialized postgraduate programs in the R&D&I centres after the university statutory amendment (CBGP, CEDINT, CTB, IDR).
- Establish a branch of the UPM International Graduate School, assigning some of the programs currently being undertaken if they comply with agreed conditions. The determination of the relevant criteria are being defined for its submission to the governing bodies of the UPM:

- o Creation and development of new spaces and learning methodologies

Activities and Development

1. New spaces and learning methodologies

The training model proposed by the UPM in its degrees offer, provides a significant reduction in teaching through lectures offset by an increased training through methods of Project Based Learning (PBL), cooperative work and practical lab training. It is also supported strongly by ICT and the secondary education network (especially the b-Learning). In this context we address several numbers of significant changes not only in programs and learning methods, but also in educational physical spaces.

1.a. Create 2 interactive teaching and collaborative work classrooms.

The aim is to solve structural problems of the classroom equipment that prevent the deployment and testing of technology solutions for new teaching methodologies. There is a proposal to create interactive classrooms with capacity to generate independent spaces with a high degree of flexibility. This interactive classroom complements a traditional classroom with audiovisual equipment enabling remote interactivity and collaborative work.

1.b. Creation of collaborative and individual workspaces adapted to EHEA outside the classrooms

EHEA adaptation demands changes in the meeting rooms, individual workplaces and meeting areas as shown (Fig.14)

Meeting Room

Competences:	Teamwork becomes extremely relevant in the Computer engineering field, as that is the normal way of working
Teaching methods:	Teamwork with students Learning from each other
Workspaces:	Libraries need to expand with workspace enabling teamwork.

The proposal is to adapt the workspace with a meeting room with furniture that allows interaction within groups and enables connecting portable computers

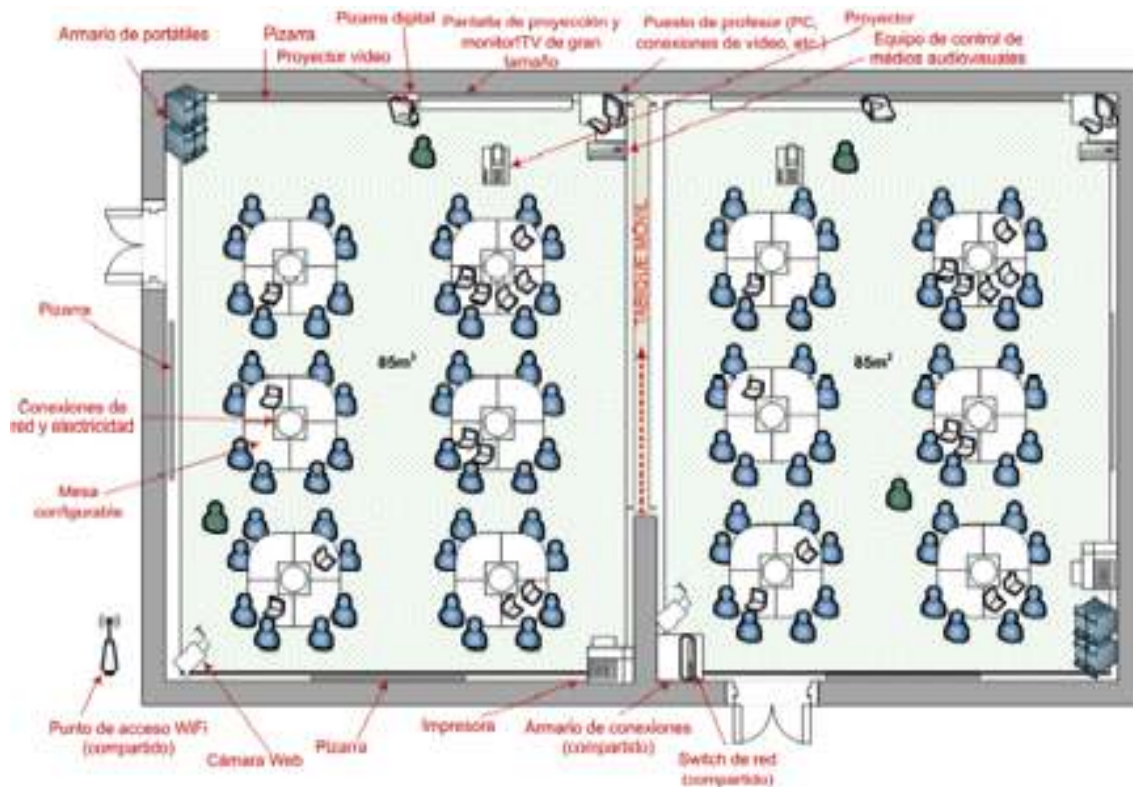


Fig. 14. Example of modular class room

Furniture and equipment

Blackboards on the walls, furniture allowing working around a common table and the possibility of using one or more computers in the group to find the necessary information at any time or recording decisions made.

Meeting Areas

Competences: To promote research teamwork and problem solving, it is proposed to enable meeting areas in common spaces like corridors of the blocks V and VI to enable work between classes. Very useful for graduate students.

Teaching methods: Work between classes

Workspaces: Workspaces in corridors allowing working between

Classes:

Furniture and equipment: Areas equipped to work with a computer.



Fig. 15. Learning and meeting areas

Individual work areas	
Competencies	For graduate students, this level of education is characterized by a less presence in the classroom than in the grade level, with a greater burden of student work both individually and in groups.
Teaching methods	The location of this spaces for graduate students promote interaction between them, so that the various postgraduate branches of the School are mutually enriched, especially in research.
Work spaces	Need of workspaces where graduate students can meet to work in groups or individually, with the adequate infrastructure. Work space with individual workplaces to provide the student an after class work place with box office for university material and laptop conexions.
Furniture and equipment	Equipped areas (board, computer)

Table 9. Individual workspace description

Attached is the proposed space reform project for collaborative work areas in the IT School.

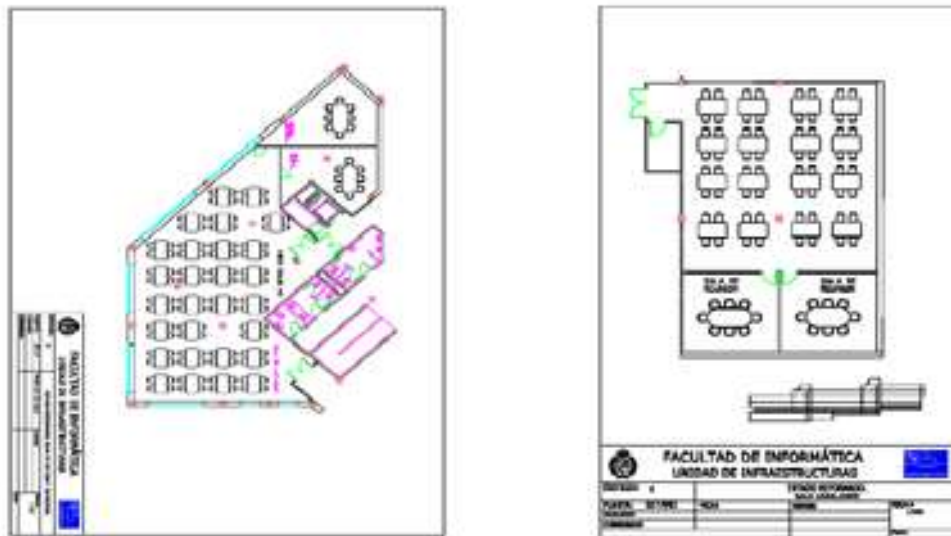


Fig. 16. Collaborative room reform

In relation to CEI Montegancedo, the UPM plans the reform of 6 more cooperative work classrooms at the IT School and further 15 classrooms of various sizes in the Graduate Schools

The current Campus Library will be improved: 25% more reading seats, 20% more shelf space. Group study rooms will be added and computer equipment will become available to users, etc.



Fig. 17. Classroom example before and after the reform

1.c. New ways of learning

Another relevant example of innovative teaching methods is the installation in the CAIT of a platform for the design of complex systems, based on concurrent engineering. Concurrent Engineering (Concurrent Engineering, CE) is defined as "a systematic approach to integrated product development that emphasizes the response to customer expectations. It is based on the values of co-operation, trust and sharing in such a way that decision-making is made by consensus, involving all perspectives in parallel since the beginning of the life cycle of a product. "

The plan is to have a "Concurrent Design Facility (CDF) similar to the one used in the European Space Agency (ESA) for the analysis and validation of requirements on platforms and space missions (see fig. 19).



Fig. 19. ESA Concurrent Design Facility use (ESTEC, Holland)

The CDF is a set of rooms designed and equipped with all relevant hardware and software tools to create a multidisciplinary design environment, providing effective communication, exchange of data engineering tools and databases to the components of a team working concurrently. The existing CDF at ESTEC (ESA) consists of three connected rooms interconnected with video conferencing facilities.

The UPM want to use this infrastructure to support collaboration with industry and provide a basis for training initiatives such as "project-based learning (project-based learning). Its use although initially linked to the space sector under the agreement with ESA, can be extended to other areas after the development of appropriate software.

2. UPM International Graduate School in Montegancedo

2.a. Justification

The interaction between the process of research and higher education in the European Union takes a decisive political impetus when in 2003 it added a line of action to the Bologna process entitled: "European Higher Education Area and European Research Area - two Pillars of the knowledge-based society "to highlight the symbiotic role of doctoral programs and scientific and technical research in universities.

The underlying objective was to increase the importance of the doctorate which, in turn, will produce an increase in research and its quality. It

incorporated doctoral students as researchers in training allowing set measures of social support and recognition.

In this context, the basic principles for the development of approved doctoral programs in Salzburg in 2005, as part of a seminar on the Bologna process, underscore the need to link research and training in universities, assuming that the central component of a Ph.D. is the acquisition of knowledge through research. After that, the aim is to highlight the following aspects:

Need for integration of institutional policies and research doctoral programs.

Support diversity enabling joint doctorates with aggregated entities or as a result of the process of internationalization of the campus.

Recognize the activity of the doctors as the first term doctoral research in association with a set of rights and obligations.

Obtain critical mass of students.

Promote innovative structures such as Graduate schools

Increase sponsored student mobility enrolled for short stays in other institutions, if possible in other countries.

Secure funding through the development of quality doctoral programs and fruitful, enabling the increase of the percentage of students who have scholarship

The European Union's mandate is to increase the quality of doctoral programs and highlight the key role of higher education institutions strengthening research through the creation of innovative structures, designed for mobility, internationalization and integration of master and doctoral programs. This will create critical mass in research encouraging research funding.

Different administrations (AAPP) at national and EU level, have urged universities to create new structures, oriented to the training of researchers helping to overcome the current limitations of departmental structures in use in most of the universities. A quality improvement is expected and a broader participation of new actors like the international businesses.

These new structures, called doctoral schools, graduate schools or research schools, will enable a shared vision, which will facilitate the transformation of doctors into researchers of excellence, providing a stimulating environment that promotes research cooperation between disciplines with a clear management structure where young researchers are working with senior researchers with the benefit of accelerating their learning process and their research performance.

The concept of Graduate School desired in Spain based upon the draft royal decree distributed by the Ministry of Education, includes the possibility of incorporating official master's degrees and master's and specialist degrees from the universities themselves. It is also possible to conceive this school between two or more universities. This model assumes the establishment at a university of an unrelated new structure with the presence of other doctoral or graduate programs (similar to the current case between departments, schools and colleges regulated by the statutes).

In addition, the graduate school will provide training in teaching skills, providing advice on calls, funding and projects, ensuring monitoring and quality assurance all in an environment that enhances the opportunities for mobility and international and inter-institutional collaboration.

The UPM wants to create an International Graduate School, bringing together a subset of existing or future programs that meet a set of requirements. These conditions include the teaching of the program in English, the existence of a minimum percentage of students from other countries, the need for a percentage of their teachers educated abroad, that a significant percentage of its students are scholarship and research trainees, or others that may be established by the Governing Council.

The international Graduate School will be distributed among different branches. One of them will be Montegancedo. Following the initial approach of optimizing resources systematically and prioritizing those areas where the Campus Montegancedo stands out uniquely, within the field of teaching improvements, priority is given to postgraduate and doctorate initiatives linked to the R&D&I centers present in the Campus.

2.b. Doctorate program transformation

The UPM, as a result of changes associated with the Bologna process, has been working on the transformation of their doctoral programs. The main objective was to link doctoral education with a research career emphasizing the role of participants in doctoral programs as researchers in training.

The transformation process has firstly achieved the integration of doctoral programs unnecessarily trying not to break their doctoral studies. As a result of this first transformation, the UPM has moved from one hundred PhD programs to the current situation in which thirty are offered. In this process, internationalization and mobility are essential elements along with interdisciplinary and integration of subjects.

As a result of the reform process, the UPM has identified the priority areas of research and development, being this focus what has allowed the design of the 50 master's degree programs currently offered. Despite the geographical dispersion of the UPM, it has been promoted that doctoral and research lines are strategically linked

The new regulations also have been affected by the reform process. It is important to note that they include the productivity of Ph.D. doctoral programs as a key indicator to measure the quality harnessing in this way the scientific production before and during the process of preparing a doctoral thesis. This is allowing, in certain priority areas, productivity increase expressed in articles in refereed journals.

Following the strong influence marked by Europe, the educational model has been reformed with more emphasis on master's and doctorate. UPM has made an effort in the internationalization and consolidation of master's degrees closely linked to the R&D&I centers. The UPM opts for the moment, for a single graduate school that will integrate both doctoral programs and university masters of their own.

In 2010 the UPM adopted new operating statutes, which highlights significant progress in the integration of research and doctorate. In particular, there is a step towards this integration with the recognition that doctoral programs may depend both on Colleges and Schools and Research Centers and Research Institutes.

This is particularly relevant in the Campus Montegancedo, allowing research centers such as those currently in operation in the Campus Montegancedo (CEDINT, CTB, CBGP, ...), to lead its associated research and doctoral programs. In fact, this year part of the teaching and other activities associated with research related to these programs has already moved to these centers and has shown a marked increase in demand for programs in these research centers.

The UPM will opt for a single Graduate School with 4 Areas

- ICT Area
- Architecture and Civil Engineering
- Agrofood area
- Industrial Area

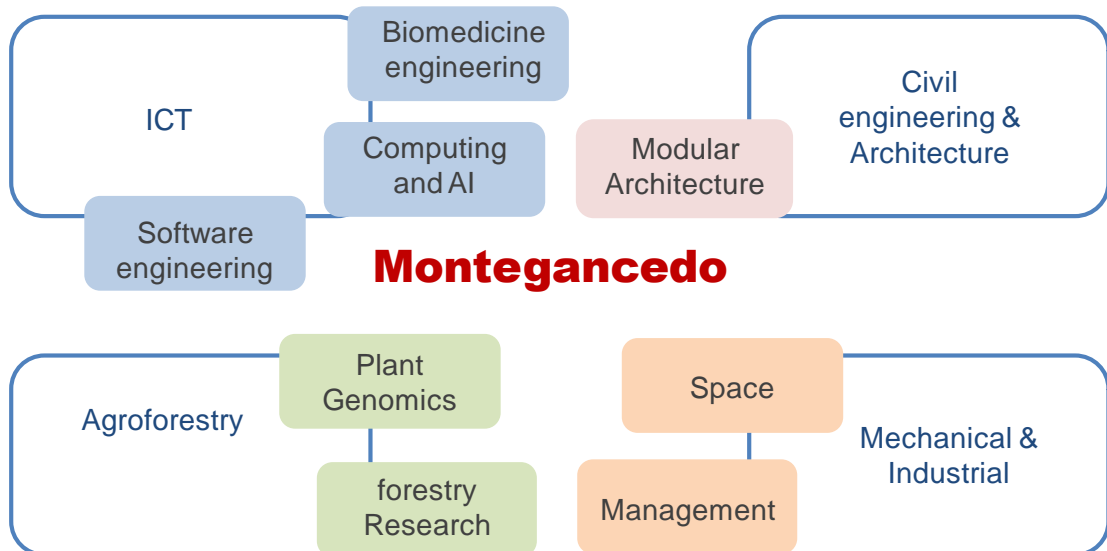


Fig. 20. Doctorate areas of different themes

The accelerated implementation of an ICT focused branch of the International Graduate School is one of the main objectives of Montegancedo campus development. The particularity of the School lies in the implementation of innovative teaching methods, its virtual character and an original master's offer closely related to R & D centers present in the Campus. Multidisciplinary, globalization and educational quality are their main objectives. Likewise it will have an inter-university character with strong ties to Moncloa Campus (UCM-UPM).

As part of the quality assurance process and to provide these studies the same mechanisms of quality assurance, over the last year we have incorporated own graduate students in the computer systems of the UPM, enjoying the level of the control mechanisms that are available to academic university degrees.

2.c Graduate School Structure in Montegancedo

Montegancedo is part of the new structure of the UPM International Graduate School. The campus has a privileged situation and resources for a Graduate school based in ICT-related issues, BIO-TECH and Space-Tech. It can create a scientific community since it has physical space to allow informal communication. All research centers and the IT seminar classrooms are ideal for seminars, academic and social joint activities.

The Graduate School will be developed in collaboration with other institutions (public research bodies, public research centers or private, domestic or foreign). In particular at the Montegancedo branch all schools and institutions associated with research centers, and whose interests are compatible may participate in the development of programs of this branch.

In addition, allowing both Masters and PhD programs being integrated into a structure will be a stimulus for creativity and an opportunity to build bridges between them with the possibility to share courses and activities.

Focused around the targeted areas of preference, Montegancedo researches around these different themes at high international level. This is something that the Montegancedo branch guarantees through the recruitment of senior and junior researchers that will enable the enrichment activities that are planned within the school.

In recent years, the UPM has made a considerable effort to fund the hiring of researchers in the new centers established in their respective campus. The case has been favoring specially Montegancedo, as a significant number of these new centers were installed there. These programs were designed both to young researchers (Juan de la Cierva program UPM) as those for I3 program (including the stabilization of the Ramón y Cajal hires) and the Isaac Peral new program for senior researchers (two of which were first calls assigned to Montegancedo's CTB).

Additionally, the strong partnership that is maintained in Montegancedo Institutions, research centers and companies such as INIA, Banco Santander, INDRA, ATOS, etc. allow doctoral programs not only cultivate the academic side of research but also its integration with the industrial fabric.

The Campus Montegancedo branch also facilitates communication between disciplines such as ICT, biomedicine, agroforestry technologies, and aerospace, through joint organized activities which particular emphasis on developed research projects.

Following programs have been positively verified and have been offered in this course.

Masters	R&D Center attached to Montegancedo	2010	2012	2015
Biomedical Engineering	CTB	48	55	60
Agroforest Biotechnology	CBGP	34	39	33
Plant Genetic Resources	CBGP (partially)	20	23	25
Advanced Forest Research	CBGP (partially)	27	31	34
Photovoltaic Solar Energy	CEDINT (partially)	38	44	48
Aerospace Engineering	CITA (partially)	85	98	107

Table 10. Master 2010 preinscriptions and R&D Centre linkage

Doctorates	R&D Center attached to Montegancedo	2010	2012	2015
Biomedical Engineering	CTB	28	32	35
Biotechnology and genetic resources of plants and agroforest microorganisms	CBGP	8	9	10
Advanced Forest Research	CBGP (partially)	18	21	23
Photovoltaic Solar Energy	CEDINT (partially)	13	15	16
Aerospace Engineering	CITA (partially)	15	17	18

Table 11. Doctorate preinscriptions and R&D centre linkage

2.d. Operating procedures of the UPM International Graduate School

A set of operational procedures aligned with standard R&D centre procedures will be approved. These regulations establish minimum indicators of the school in terms of criteria of quality, productivity, financing and internationalization of doctoral programs. Similarly it will establish requirements for own undergraduate and masters programs participation. Main procedures are the following:

- Any program will have a commission to guide, advice and completely assesses the life of the doctoral program in accordance with the regulations of the graduate school.
- Internationalization mechanisms to ensure that research is based primarily on cooperation between national and international researchers with direct involvement in the schools of foreign institutions. This will be realized through agreements and actions to attract talent from both teachers and students.
- Collaboration agreements for certain programs allowing obtaining joint degrees.
- Admission criteria set by the school.
- Criteria for appointing tutors and courts in the regulation of the school.
- Registration of all student activities such as teamwork, preparation of presentations to develop communication skills both oral and written aimed at skilled and unskilled audience, knowledge of the principles of ethics and integrity in the research, scientific project management, management of intellectual property and industrial property, prevention of occupational hazards, etc.
- Agreement to reach a minimum level in various indicators of quality. This will ensure that programs that do not meet their frame contract requirements may not be part of the graduate school.
- Assurance of program funding so that all researchers in training (students in doctoral programs) are funded by the programs.
- Quality Assurance. Not only for doctorate and master programs, but also for their own programs, that will have gone through the verification of a quality agency or an equivalent mechanism at the University

International Graduate Management School

As part of the teaching improvements, it also becomes a priority the creation of an international graduate management school. The aim is to create the Technical School of Management Madrid ", with a high international dimension.

The main objective is the creation of a School oriented at Technology and Innovation management. This point will act as a differentiating factor to the existing business schools (IESE, IE, ICADE, etc.).

A basic agreement will be reached with the proposed governance proposal of the school at campus Moncloa. Also graduate programs will be taught in collaboration with other European universities (Erasmus Mundus) in English. Finally to strengthen the international dimension, equivalent arrangements with foreign schools will be pursued (Sloan School, MIT, etc.).

3. Student and Teacher residency

In order to strengthen the postgraduate level, the UPM plans the creation of a residence primarily for teachers, researchers, graduate and doctoral students. Currently, there is no residence in the Montegancedo Campus, although in the first phase of the CEI 2010 call, € 70,000 was granted to support the basic project. Further funds are planned to be pursued through the Ministry of housing (Ministerio de vivienda)

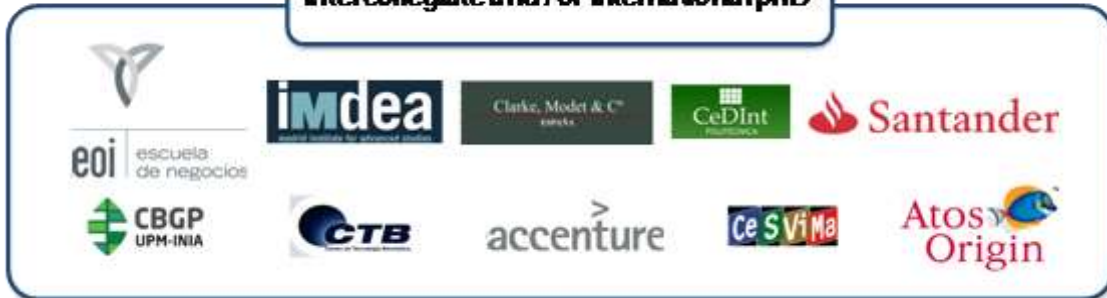
Due to the location of the Campus, the establishment of a residency becomes a top priority. There are planned the creation of six modular buildings (a total of 120 seats) for residential use and a modular building with shared services. It will also integrate a small Welcome Centre and Information and Support facilities for the on-campus university community.

The construction will be done using flexible processes and structures to enable its progressive growth.

Through innovative modular construction techniques, applied previously in residential solar modules, two-story building with 10 to 20 rooms per module will be constructed. The construction and subsequent management will be outsourced to a third party.

Aggregations

Creation of Doctoral Schools and intercollegiate and/or international PhD



Adaptation to EHEA



Teaching Improvement



Summary

2.1. Summary: Teaching improvements and EHEA adaptation

- 1 Teach postgraduate specialized programs in the R&D centers, after the statutory amendment (CBGP, CEDINT, CTB, IDR, etc.)
- 2 Create and develop branch of the International Graduate School of the UPM.
- 3 Create and develop of new spaces and learning methodologies

Timeline

	STRATEGIC PLAN CAMPUS OF EXCELENCE_FUNDING																
	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others	II Sem 2010	I Sem 2011	II Sem 2011	I Sem 2012	II Sem 2012	I Sem 2013	II Sem 2013	I Sem 2014	II Sem 2014	I Sem 2015	II Sem 2015
TEACHING IMPROVEMENT																	
Increase Masters in English related to CEI research centres.	Completed	X															
Master in Software Engineering ERASMUS MUNDUS and advanced computing, Computer Engineering, Software and Systems and Artificial Intelligence.	Completed	x															
Masters in biomedical engineering along with a doctorate and Biotechnology and Genetic Resources	Completed	x							x								
Computer Engineering Degree, Computer Science and mathematics (EES adapted)	Completed	x															
Strengthen training through the creation of the International PhD School	In progress	x	x	x													
Implement the UPM educational model.	In progress	x															
Project based learning support (CDF)	In progress		X	X													
Biomedical Engineering Degree	Pending	x															
Biotechnology Engineering Degree	Pending	x															
Graduate School Construction	Pending	x															
Create the Centre for Research and Technological Teaching Innovation(CIET).	Pending	X															
Enhance Educational Innovation Groups.	Pending	X															
Implement placements and final projects, business master's and doctoral degrees and abroad.	Pending	X															

Teaching improvement Indicators and EHEA adaptation

KEY INDICATORS		2009-2010	2012	2015	Variation 2010-15
Supply and demand	Student satisfaction index	66%	70%	75%	14%
	Graduate graduation rate (according to Aneca)	7%	20%	40%	471%
	Doctorate graduation rate (doctorate/ programme)	4	6	9	125%
	Efficiency rate (according to Aneca)	55,20%	65%	80%	45%
	New accepted students (graduate)	200	330	330	65%
HR	Number of UPM PDI's (Teaching and Investigator staff)	174	200	207	19%
	% foreign PDI	5%	7%	10%	100%
	% of foreign graduate students	4%	7%	10%	150%
	% of foreign master students	36%	40%	50%	39%
	% of foreign doctorate students	36%	40%	50%	39%
	% of professors participating in Innovative Education Teams	22%	27%	35%	61%
Activities	Master's Erasmus Mundus	2	4	6	200%
	Number of English ECTS (graduate)	30	60	80	167%
	% of English taught master's	30%	50%	70%	133%
	No. ERASMUS students received	50	65	90	80%
	No. Of students participating in ERASMUS	70	90	110	57%
	Number of international conferences	5	10	15	200%
	Number of bi-lateral agreements with other European universities	92	100	100	9%
	Number of bi-lateral agreements with non-European universities	23	35	50	117%
Adaption	Number of EEES adapted degrees	1	3	3	200%
	% EEES adapted degrees	100%	100%	100%	0%
	% EEES adapted doctorate degrees	80%	100%	100%	25%
	% EEES adapted postgraduate degrees	80%	100%	100%	25%
Activity	Colaborative work-rooms	2	6	18	800%
	Nº of Innovative Education teams in coordination with secondary education institutes	1	3	5	400%
	Colaborative work spaces and individual outside the classroom	3	15	30	900%

2.2 SCIENTIFIC IMPROVEMENTS AND KNOWLEDGE TRANSFERS

Scientific Improvements

Starting point

The UPM wants to associate with the actions of Campus Montegancedo a fundamental goal of improve science and technology based on several complementary actions. Some of them have been requested within the INNOCAMPUS call or aids to Science and Technology Parks this year and others in this proposal.

The selection has been done in the context of the priority areas identified in the strategic plan submitted in 2009.

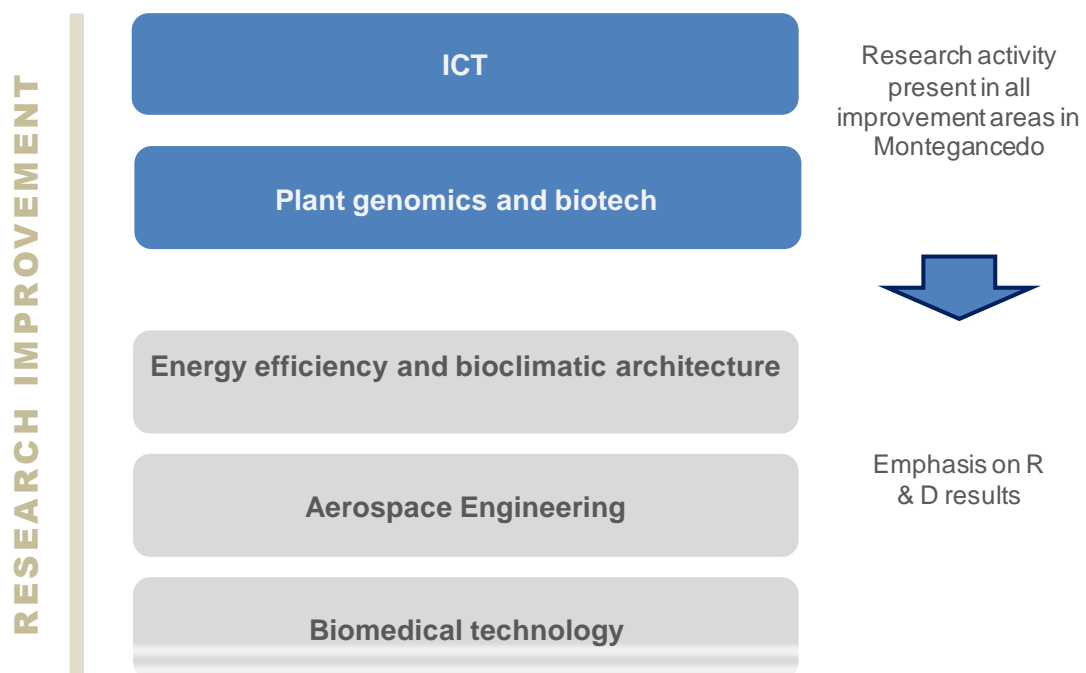


Fig. 21. Scientific Area overview

Campus Montegancedo gradually has established itself as a reference in applied research based on several additional factors:

- Creation and consolidation of R&D&I centers located on campus that in a short period of time have become national and international references (CBGP, CTB, CEDINT).
- Development of R&D&I structures associated with ICT including IT School, the IMDEA Software, E-USOC and CESVIMA.
- Launch of a new range of masters and doctoral studies with an enormous capacity to attract national and international talent.
- The growth spurt of researchers located in the Campus of Montegancedo in the last four years.

Researchers	Currently	150	CBGP
	Expected 2012	200	
	Currently	100	IT
	Expected 2012	150	
	Currently	100	CTB
	Expected 2012	150	
	Currently	50	IMDEA
	Expected 2012	100	
	Currently	60	CeDinT
	Expected 2012	100	
	Currently	40	CITA
	Expected 2012	50	
	Currently	0	Modular construction
	Expected 2012	50	
R&D&I for business	Currently	150	100 Spin offs, 50 LPI
	Expected 2012	300	

Table 12. Total of researchers planned in Montegancedo Campus

Areas of research activity aimed to be strengthened in 2010-2012

The development of these areas is not a change to the Strategic Conversion Plan to International Campus of Excellence presented in 2009 but a prioritization of some of its elements and the inclusion of a new activity.

The below mentioned activities of R & D & I strengthen those presented in the strategic plan designed by the UPM campus Montegancedo for the previous call:

	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others
SCIENTIFIC IMPROVEMENT						
Installing the virtual reality cave CEDINT	Completed	x				
Strengthen USOC E facilities(Space Tech Initiative)	Completed	x				
Aggregations development (Fraunhofer, CSIC; INIA, IMDEA, ISFOC, IEO, ATOS, Santander, INDRA, Telefónica, IBM, BICG)	In progress	x				
CTB construction	In progress	x				x
Create living labs	In progress	x	x	x	x	
a) Living Lab Bank of the future: Banco de Santander	In progress		x	x		
b) Living Lab Office 21 (Future of the World of Work): Fraunhofer Gesellschaft & BICG	In progress	x	x	x		
c) Living Lab Home Automation	In progress	x	x			
d) Living Lab Solar Houses	In progress	x	x		x	
e) Living Lab/ Demonstrator 3D HDTV	In progress	x	x		x	
IMDEA SW construction	In progress	x				
Strengthen CTB equipment (BIO Tech Initiative)	In progress	x	x			x
Strengthen IDR equipment (Space Tech Initiative)	In progress	x				x
Supercomputing Initiative (strengthen equipment)	In progress	x	x		x	
Food and Health Initiative (Biotech Initiative, strengthening equipment)	Pending				x	
Promotion of photovoltaic solar energy activities. Create demonstrators	Pending				x	
Creation of Research Centre of Sustainability in Architecture.	Pending	x		x		
Create Technological Development Centre providing support to institutional and technological activities of international cooperation and development	Pending	x		x		
Promoting research groups with international programs to attract young and experienced doctors	Pending	x				
Centre of integrated applications (GMES / Galileo)	Pending	x				
Establish mobile broadband services pilot	Pending	x				
Construction of the IT Security and Information Centre (CCTC)	Pending	x		x		
Centre of Excellence in Ocean Engineering (ICTI)	Cancelled	x				
Centre for Complex Systems Research (CIX within CESVIMA)	Cancelled	x				

Table 13. Actions by project

Strategy

The final strategy, as set in the strategic plan, remains the conversion of the Campus Montegancedo in a CEI oriented to international technological innovation.

The strategic objectives are:

1. To further enhance the quality of research and international recognition through the development of new research centres of ICT, Biotechnology and Plant Genomics, Space Tech, Bioclimatic architecture, 3D and ocean engineering.
2. Strengthen the supply of specialized research in the identified areas.
3. Consolidate knowledge transfer tools, to enable the campus become a demonstrator of technological innovation and innovative educational experiences.
4. Enhancing vertical actions related to ICT in the different lines of research on campus.
5. Continue the development of innovative horizontal actions in ICT: "The Campus as a place for experimentation"
 - o Value added services for telecommuting, education, etc.
 - o Digital Campus (wireless broadband). Chance of distributing phone / agenda that gives access to experimental services.
 - o Granting of an experimental license (not commercial) of a TDT carrier for the campus as a basis for educational experiences beyond the physical space of Montegancedo.
6. Enhance the Business Center and expand it to facilitate the UPM participation in companies to develop R & D & i.

On the current proposal, the request of funding is aimed at the following scientific and Knowledge transfer activities

1. **Strengthen R&D&i structures associated with ICT and their R&D activities in the photovoltaic field**
2. **Develop new R&D&i initiatives through the creation of the Centre of Sustainable Architecture**
3. Promote knowledge transfer by supporting the creation of a Support Centre for Technological Innovation Support (CAIT), **the establishment of living labs and enabling the introduction of technological demonstrators**

The development of these areas is not a change of the 2009 CEI Strategic Conversion Plan presented but a prioritization of some of its elements and the inclusion of a new activity

Strategic objectives

The strategic objectives are the following

- Develop international excellence research activities to enable further development of technological innovation activities. Continue the strengthening process of R&D units and structures to increase their research quality. This process should be delivered at the same time it seeks to involve these units in postgraduate education (research oriented master's degree programmes and PhD) and innovation oriented knowledge transfer activities.
- Create technological innovation programmes and actions to transfer knowledge and research results, to society and industry.
- As a high impact and long term institutional bet, enable the new research centres to implement ambitious R&D programmes built around the great scientific and technological initiatives of the UPM.
- Keep on significantly enhancing the transfer of knowledge to the business sector through four complementary approaches:
 - Increase research activity,
 - Increase and exploit UPM's portfolio of intellectual property,
 - Expand the business network through the creation of technology based companies or participation in business entities,
 - Enable teaching staff mobility between Academia and Business and vice versa

Action plan

Here, we describe the main R & D activities to be carried out in Montegancedo in 2010. Following Table 10, we will describe firstly R & D likely to be financed by the CEI program, secondly we will post those activities that have been presented in the INNOCAMPUS call and finally all those R & D activities presented in other projects for funding (such as call INNOPARQUES).

	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others
SCIENTIFIC IMPROVEMENT						
Installing the virtual reality cave CEDINT	Completed	x				
Strengthen USOC E facilities(Space Tech Initiative)	Completed	x				
Aggregations development (Fraunhofer, CSIC; INIA, IMDEA, ISFOC, IEO, ATOS, Santander, INDRA, Telefónica, IBM, BICG)	In progress	x				
CTB construction	In progress	x				x
Create living labs	In progress	x	x	x	x	
a) Living Lab Bank of the future: Banco de Santander	In progress		x	x		
b) Living Lab Office 21 (Future of the World of Work): Fraunhofer Gesellschaft & BICG	In progress	x	x	x		
c) Living Lab Home Automation	In progress	x	x			
d) Living Lab Solar Houses	In progress	x	x		x	
e) Living Lab/ Demonstrator 3D HDTV	In progress	x	x		x	
IMDEA SW construction	In progress	x				
Strengthen CTB equipment (BIO Tech Initiative)	In progress	x	x			x
Strengthen IDR equipment (Space Tech Initiative)	In progress	x				x
Supercomputing Initiative (strengthen equipment)	In progress	x	x		x	
Food and Health Initiative (Biotech Initiative, strengthening equipment)	Pending				x	
Promotion of photovoltaic solar energy activities. Create demonstrators	Pending				x	
Creation of Research Centre of Sustainability in Architecture.	Pending	x		x		
Create Technological Development Centre providing support to institutional and technological activities of international cooperation and development	Pending	x		x		
Promoting research groups with international programs to attract young and experienced doctors	Pending	x				
Centre of integrated applications (GMES / Galileo)	Pending	x				
Establish mobile broadband services pilot	Pending	x				
Construction of the IT Security and Information Centre (CCTC)	Pending	x		x		
Centre of Excellence in Ocean Engineering (ICTI)	Cancelled	x				
Centre for Complex Systems Research (CIX within CESVIMA)	Cancelled	x				

Table 14. R&D activities description

Activities and development

CTB Construction

The construction of the CTB is a key objective for the development of the campus. The UPM, once gained the necessary resources through the 2009 call for science and technology parks, has initiated the construction with completion expected in April 2011. The call of this year have applied the necessary resources for equipment of that building

As an illustrative example of the CTB, we show the current construction status of the building.



Fig. 22. CTB Construction. 2010 Status report.

IMDEA SW Construction

Hereby we display some pictures of the current construction status



Fig. 23. IMDEA SW building in Montegancedo. 2010 Status



Fig. 24. Project IMDEA SW

Strengthen activities related with solar PV energy

Description

In recent years there's been an extraordinary growth in the PV market as a source of clean and renewable energy. Despite the recent slowdown in its expansion in Spain, it seems clear that it will remain as an important energy source in the immediate future for most developed countries in sunny regions. However, the medium term is conditioned by the high actual cost of photovoltaic power source. This is due to the combination of the cost of silicon solar cells with relatively low efficiency.

There are basically two lines of investigation aimed to reduce the cost of photovoltaic energy: a more superficial one seeking to reduce the cost of the module, but gaining comparatively low efficiency, and another one based on the concentration CPV which uses very efficient (and expensive) photovoltaic cells and an optical system, allowing to focus radiation and to make the cost of the cell an small factor in the total cost of the module. Around this former line of investigation is where the UPM has had a prolonged activity through its body, the Institute of Solar Energy.

Objective

To design a pilot plant of the concentration systems developed by Boeing in cooperation with LPI and the center of the UPM Cedint. These systems combine the best cells (produced by Boeing-Spectrolab) with the best optical concentrators (designed by LPI-UPM) that currently exist. By doing so these CPV modules currently hold the world record HCPV efficiency (33.6%) Spectrolab holds the world record for photovoltaic efficiency (41.6%), although the cells used for the module object of this project are the ones in production, ie with an average efficiency of 38.5%. The solar concentrators are XR off-axis type and were designed and carried out by LPI and UPM.

To monitor the plant with special emphasis on optical components, as they are the ones on which we are lacking long-term information, as well as the components on which both UPM and LPI have more ability to measure and extract results.

Currently already exists a pilot plant of 100KW at the University of Northridge, California (see 9), with similar components to those described above.



Fig. 25. Installation at the University of Northridge, California, June 2010

Implementation and aggregations

The technology demonstrator is designed in conjunction with a number of key additions to its development.

Partners/ Aggregations

Boeing-SES

Boeing is a major aerospace corporation known worldwide. The manufacturing and deployment of his CPV system is performed by the Stirling Energy Systems (SES) company through a recently contract.

(<http://boeing.mediaroom.com/index.php?s=43&item=1139>).

CEDINT-UPM

Optical Engineering Group of CEDINT has a long experience in photovoltaic concentrator systems. In the early 90s, its researchers developed a new design method Nonimaging Hub (nonimaging in Anglo-Saxon literature) called method of simultaneous multiple surface (SMS) that provides efficient collection devices (or collimation) above 97% of the thermodynamic limit and are very compact (aspect ratio depth / aperture diameter less than 1 / 3) and very simple to manufacture. Examples of designs made with this method are: XR, RXI, RX etc. To some of them (RX and RXI prototypes have been made for solar applications, IR communications, LED's, photodiodes, etc...), The XR is the basic design used in the concentrator pilot plant project.

Several international publications back up this research work. One of its members (Prof. Miñano), recently received the prestigious AS Conrady Award from the SPIE Society (<http://spie.org/x40502.xml>) in recognition for his contributions to the carrying out NonImaging design methods, among which we find the ones that have produces the current concentrator

The Optical Engineering Group also masters a wide range of manufacturing technologies of optical components, both in glass and plastic, including metallic coatings (Ag, Au, Al), antireflex, hydrophilic, hardeners, additives, filtration and oxidation stabilizers, UV protection, etc. This allows them to successfully perform all types of prototypes to verify experimentally the research work.

Finally, the group provides a complete optical measurements laboratory with the necessary equipment to perform the whole characterization of light sources, characterization of optical properties of materials and analysis of quality manufacturing of lenses and mirrors.

Among the teams that are part of the Laboratory of Optics we can find: Reflet Blench for BTDF measures and BRDF (Light Tec Stil) MICROMEASURE 2. 3D Measuring system (Light Tec Stil), GS 1252 Spectroradiometer (Light Tec Gamma Scientific), Radiometer / Photometer DR 2000-1 (Light Tec gamma Scientific), LUCA Photometric bench (Light Tec Opsira controlling light), integrating sphere (Light Tec OPT Australia Pty Ltd), 3D Laser Scanner, CS-2822 Series [Laser Design], Xenon light source stabilized, tracer I-V for solar modules and solar tracking system (tracker) CELESTOM CGE PRO.

LPI

LPI performs, since its inception in 1999, a wide activity in R & D projects improving design processes and manufacture of advanced optical systems. All R & D projects undertaken in LPI have a clear application. The R & D activities are aimed at obtaining immediate end products of industrial application. The optical systems researched by LPI are used in lighting, signage, display and photovoltaic solar energy applications. LPI is expanding the scope of its optical systems to advanced systems for solar energy concentration.

LPI research activity is based around two pillars: the SMS design method (Simultaneous Multiple Surfaces) and the manufacturing process of high precision optical components. The SMS method of optical design allows the calculation of an optical system that fits perfectly several wave fronts in the entrance with as many wave fronts at the exit. In this sense it is unique and superior to conventional design methods. In general, the areas generated by this method (in its variant in three dimensions, SMS3D) have no spatial symmetry (called free-form surfaces). The advantage of the free-form surfaces is that an optical system that contains them usually requires fewer components than another one that does not use this kind of surfaces. Furthermore, these systems are more compact, efficient and with a greater degree of light control than conventional systems. The most important drawback, the difficulty of development, has been minimized by the recent improvements in diamond lathes (3 to 5 axes). When talking about solar energy, the SMS method provides better optical designs able to control the key parameters for the efficiency of a solar concentrator (geometric efficiency, uniformity and acceptance), better than any other design method.

LPI owns the intellectual property rights associated with the SMS method as well as the tools to build fast and effective SMS designs. This has enabled the company to address a large number of projects in a short period of time, especially in the field of optics Nonimaging (no image-forming), where most current applications of this method are happening.

The company has 25 patents in the field of optics for LEDs (collimation, concentration, signage, back and front lighting, substitutes for incandescent-based LEDs, lighting prescribed combination of several sources such LEDs to create light sources, creating white light from LEDs of different colors), increased screen brightness and solar energy concentration.

LPI has a laboratory for testing prototypes and optical studies. This laboratory is equipped with lux meters to measure lux intensities, goniometer to measure light distributions.

In addition, LPI uses several computer programs for simulation of optical and ray paths and a wide variety of own programs used to design free-form surfaces with the SMS method.

LPI enjoys extensive experience in the field of development of plastic optical systems with very high precision, both on optical designs tailored to the parameters of a high-volume production, and on manufacturing and testing molds and high precision molding. Furthermore LPI also is experienced with highly reflective metallization.

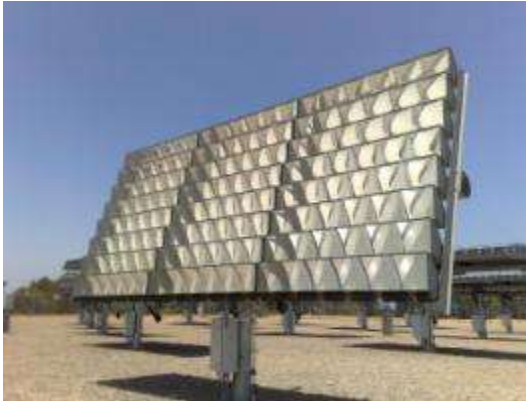


Fig. 26. Detail of an array of concentrators XR for CPV developed by Boeing



Fig. 27_ View of the SOE with the cell at its center



Fig. 28. View of an array so that the photographer is within the angular field of the core modules. The remaining modules are in operation. In the back, maintenance and measures booth.

Technical description of the demonstrator

The demonstrator described in this proposal consists of a 25KW photovoltaic plant to be built in the UPM Campus Montegancedo.



Fig. 29. Virtual view of Campus CEDINT in Montegancedo



Fig. 30. Side view of CEDINT building in Campus Montegancedo

The plant includes a total of 10 arrays developed by Boeing-SES (five C4MJ and five C3MJ). Each array dimensions are 2m x 5m (The plant total production installed would be 25 kW (2.5 kW per array)).

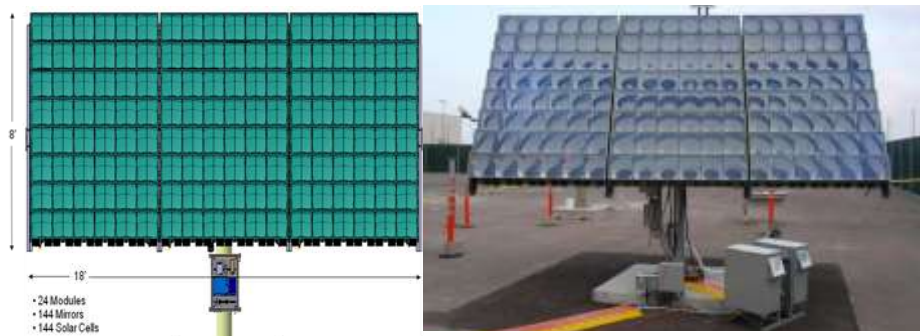


Fig. 31. Boeing Prototype Array. (Copyright © 2010 Boeing. All rights reserved)

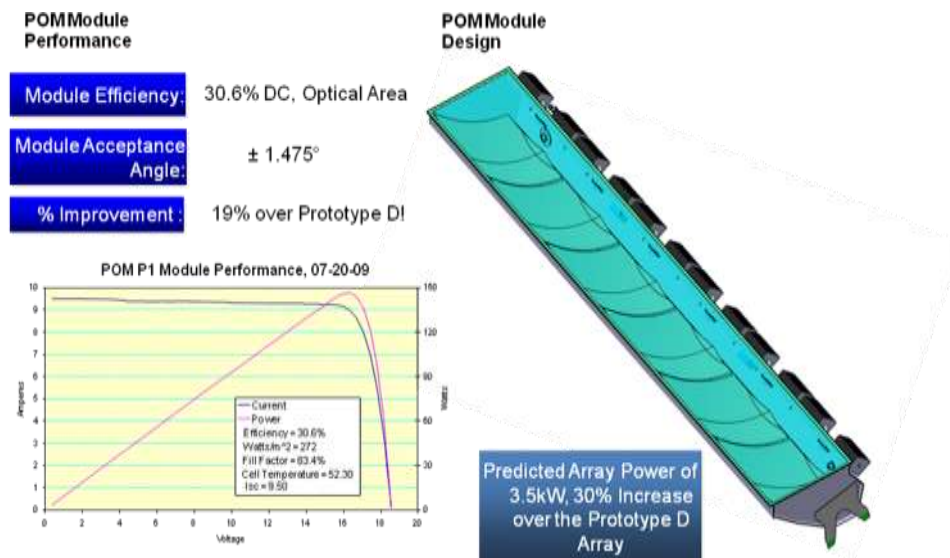


Fig. 32. Technical data and design of the module.

The project will comprise from the installation of the plant to the data analysis monitoring results. The aim of these measures is to study and model the power production of these modules with special emphasis on the evolution of the optical components and how it affects the electricity generation.

Below are the phases of the project and the participants in each of the tasks.

TASK		PARTICIPANTS
1	Plant design	CeDinT
		LPI
		Boeing
2	Manufacturing of the concentration arrays and follow up systems	Boeing
		LPI
3	Site preparation and building work	CeDinT
4	Design and implementation of the weather forecasting station	CeDinT
5	Design of the monitoring tools	CeDinT
6	Transport and fitting of arrays	Boeing
7	Plant kick off	LPI
8	Operation results analysis	CeDinT

Table 15. Task list

Time line

The following table specifies the length of each of the project tasks.

TASK		MONTHS																								PARTICIPANTS	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1	Plant design	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	CeDinT	
		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	LPI
		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
2	Manufacturing of the concentration arrays and follow up systems	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	Boeing
		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
3	Site preparation and building work	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	CeDinT
4	Design and implementation of the weather forecasting station	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	CeDinT
5	Design of the monitoring tools	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	CeDinT
6	Transport and fitting of arrays	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	Boeing
7	Plant kick off	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	LPI
8	Operation results analysis	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	CeDinT

Budget

TASK		PARTICIPANTS	BUDGET (€)
1	Acquisition, transportation and installation of arrays of concentration and monitoring systems	Boeing, LPI	140.000
2	Site preparation, civil works and house construction	Cedint	90.000
3	Material eléctrico, inversores y cableado para el conexionado a la red	Cedint	25.000
4	Electrical equipment, investors and network wiring.	Cedint	65.000
5	Implementation system for monitoring arrays	Cedint	150.000
6	Commissioning of the plant	LPI	30.000
			500.000

Table 16. Task budget

Impact

Thanks to this pilot we will be able to carry out studies on the spot and for the long term in order to obtain reliable results of the actual optical components. The evolution over time of the optical components is fairly unknown comparing with the rest of the CPV system components. Therefore the information collected as a result of this monitoring is particularly valuable in assessing the risk of financing such systems.

Additionally, we expect results that improve the efficiency and durability of the arrays as well as routines for developing and evaluating maintenance costs.

Center of Sustainable Architecture

Justification

The current situation of building construction has challenged many of the lessons learned throughout the 20th century. In the last decades, in fact, the problems related to environmental issues, energy efficiency, recycling, new materials and the increase in house prices have created a totally different scenario than the constructive optimism that prevailed throughout much of the last century, which centered the development concerns of the Modern Movement.

Currently, the sustainability in any human enterprise affecting the environment is a prioritized desired value, even though; most of the jobs and professions are still in the process of accepting the new situation and finding tools to cope. In the case of architecture in general, a field in which technology and innovation have always played a leading role, the question arises in a peremptory manner, especially if we consider the strong social, urban, and landscape and environmental impact it has in our world.

Nevertheless, the building sector has been characterized throughout its history by a great inertia to the adoption of new materials, building systems, work techniques or a technological novelty. In fact this is a sector that in many cases reproduced in the present working practices used at least conceptually during medieval times

In fact, in the construction field, specifically in the field of building construction, the innovations have been few and not proportionate to the technological progress achieved in other fields, probably due to the idiosyncrasies of this productive sector. It is therefore reasonable to say that we have before us a vast field of research, not only on materials but mainly on the building systems.

It is therefore evident, in the eyes of members of the building process that the construction of buildings must evolve and adapt itself to new standards of quality, safety, rationalization (industrialization, robotics, etc...) and sustainability, which are deeply embedded in other productive sectors. We believe it is the university, in close collaboration with the institutions and the productive sector, which should hold the leadership of this evolution.

Furthermore, this research center of sustainable architecture must be born with the firm proposal to create a network with national vocation led by the University of Madrid and also logically by the Ministry of Housing (Ministerio de Vivienda) The objective will be to place this new Centre as the coordinating institution of the network, integrating other existing centers or universities. The synergy achieved by this collaboration and its national scope, allow an initiative like this to achieve quick operating results, as well as act as a thought leader in the circle of transmission of knowledge. In summary, the center will cover the three basic steps in all technological research: basic research (theoretical), applied research (as scientific and technical advice to the sector) and transfer of results to stakeholders and society in general.

Thanks to the ICT tools, the maintenance of a virtual network is simple. The Centre can become a pilot project in which UPM has the role of founder and at the same time lead manager or reference.

Activity description

To organize a center that allows the research and training in all aspects that define sustainability in architecture (architectural building), especially the residential housing, namely:

- Modular and rational design
- Industrialization in the housing production
- New materials and construction systems
- Rationalization of the building construction processes
- Optimize building maintenance
- Energy use in buildings (self-sufficient and bioclimatic architecture)
- Home automation applications in architecture (Intelligent Building)
- Environmental analysis and landscape impact
- Possibility of a rational building “deconstruction” process

Apart from the specific centre, 3 technological demonstrators are available for testing in the Campus focused on these lines of research

- o **Self-sufficient solar photovoltaic's homes** designed and built by the UPM for the competition "Solar Decathlon" in the U.S., in its editions of 2005, 2007 and 2009. These houses have been recently installed in that campus, with funding and resources from the CEI 2009 call (Ministry of Science and Innovation part). They become an optimum demonstrator for technical innovations related to sustainability and serve as examples for other modular solutions that can be designed in the future.
- o The **residence of teachers, researchers and students** to be build on the same campus using sustainability criteria and with partial funding from the Ministry of Housing, Goal is to install a series of sensors that allow monitoring all the different spaces to ensure its sustainability, in addition to applying new techniques for monitoring and subsequent verification.
- o **The campus, as an environmental space**, where you can experience with the modern techniques of environmental protection, from the automatic garbage collection up to the permanent forest recovery, as well as special materials for paving and landscaping.
- o The activities of the Centre area, covering both new construction and rehabilitation in general and the intervention in historic buildings, uniting under one umbrella all the disciplines and fields relating to buildings. All the disciplines are in need for a rethink and a direction based upon recent changes and requirements.
- o Training (theoretical research), basic research (science and technology) and scientific and technical advice to the sector (technological, environmental, regulatory and market) have an equal importance and collaborate in achieving a global goal that involves a change in the current attitudes and knowledge and therefore a transformation and improvement of the building sector.

Activities objectives

We point out the following main objectives:

- o To train specialists in the various covered areas of sustainability by participating in graduate programs and supporting doctoral programs and supporting the preparation of doctoral theses.
- o Execute R&D work in the different mentioned fields of sustainability, covering both theoretical research and scientific and technical support to the industry, mainly to the businesses. Participate in all kinds of R&D calls, both nationally and internationally.
- o Create an exemplary centre, with direct relationship with all those schools where subjects are taught in relation with the fields around sustainability. The Centre, which will serve as head of the proposed national network, will improve the initial collaboration model and implant it in other universities. The Centre, in any case, should be the coordinator of the subsequent proposals. This can be exploited by using the Network of research Branches of architecture schools in Spain (SINE) currently chaired by the School of Architecture of Madrid.

It also should include some partial objectives in the different lines of action of the center, with a strong support from the UPM research groups. Details on those are mentioned in the next section

Execution

The centre demands a structure and governance according with the established basic objectives, what means:

- A general direction, which is capable of handling the various activities taking place, with least three depending departments
- Graduate training, including specialization and doctoral training, responsible for coordinating the various training programs, as well as classrooms and research.
- Research, including competitive projects, the scientific and technical advice to industry, and various laboratories for multiple uses depending upon generated needs
- External relations, to coordinate the actions of the future network of research centers. In addition it negotiates with the stakeholders of the construction sector for an optimal execution of the various activities.
- Teaching facilities, to develop the appropriate training activities mentioned above, including classrooms, study rooms, computer support rooms, etc.
- Research facilities, versatile enough to adapt to the different experimental needs as they arise, with adequate equipped research facilities and computing services, mechanical and physical testing halls, and multidisciplinary buildings to suit individual projects

The objectives more in detail are as follow:

a. Modular and rational design

Seek solutions that, from an architectural design facilitate consistent repeatability, especially in residential buildings and housing, to enable constructive solutions to be industrialized later. We should ensure that these constructive solutions can be carried out with materials and systems in the European market.

We should seek the collaboration of research groups associated with the ETSAM and the collaboration of companies in different fields, namely, production of building materials, development of computer aided design programs, computer specialist in mobilizing and assembling works, etc.

Furthermore, it should consider research projects that have recently being performed in these areas and have involved researchers from the ETSAM, as they are invisible, INDUSTRIALIZATION DIT, SOLAR DECATHLON, etc.

b. Industrialization in the housing production

Two objectives relate to this area

- Support in the industrialization of the production of different manufacturers and components for construction and modular coordination to facilitate joint use, either by coincidence of dimensions, either by the existence of interface elements enabling their coupling. All this is what has been termed "open Industrialization", applicable to any type of building, and can serve as a starting point for aided design programs, etc.
- Study of housing modules that can be produced in series out from industrial production lines of cars or boats. It enables the real industrialization of housing production. Also involves the collaboration of big industrial partners.

c. New materials and construction systems

This is probably the more traditional line of research in the construction sector, but not exhausted. It has an impact both in new construction and intervention in existing buildings, both for rehabilitation and for the restoration of architectural heritage. They have place in this line of research for all kinds of materials, self-cleaning and self-regenerative, waterproof protection techniques, etc for both existing buildings and for new construction. In addition you can add, kits for constructive solutions for easy mounting and recovery, deployable structural systems, complements of ventilated facades, etc

d. Rationalization of the building construction process

This is perhaps one of the most urgent specific areas to optimize as the current building techniques, are not sustainability friendly.

The priority must be to reduce the workforce in the process "in situ", to reduce production costs and debris, and ensure the quality of the buildings, and should continue with the "automation" of the implementation and assembly processes.

e. Optimization in building maintenance

As buildings have a significant duration, aim is to ensure sustainability. This requires clear improvement in three lines:

- Improvement in building monitoring systems
- Use of materials and products for easy replacement.
- Improved maintenance techniques and systems maintenance

In turn, this section should be using the standard research method in medicine and almost no one uses in construction, we refer to the monitoring of cases (of buildings) and drawing conclusions from the evolution in its use.

For this line it can be very useful, the solar houses and the residence, like other buildings on campus, which thus become authentic "living labs"

f. Energy use in buildings (self-sufficient and bioclimatic architecture)

This is one of the most common lines while improving sustainability, but not the only one that defines it. Here we develop designs and instruments enabling the building to achieve the comfort with minimal additional energy consumption, whether produced internally (self sufficient architecture) or by reducing their spending through the proper room disposal and external protections (bioclimatic architecture).

To support this research specifically, there are two types of infrastructure that can also function as "living labs" on this line. We refer to the solar home and the residence. We also add all those companies collaborating over the years in the different projects.

g. Home automation applications in architecture (Intelligent Building)

They seek to ensure the comfort inside buildings without the necessary user participation, or simply facilitating their work. Although the word itself refers to housing, these solutions are applicable to any type of building, and are in a still somewhat primitive stage, quite the contrary of what happens in transportation (cars, planes, trains, etc...) where the automatic control of indoor comfort is already old.

Many companies have collaborated so far on studies related to this line, both in the ETSAM and ETSIT, so we consider relatively easy to maintain collaboration with the companies as the sites of the UPM.

h. Environmental analysis and landscape impact

Sustainability should not be seen exclusively at the level of the buildings, but has to reach the territory, so the environmental impact study of building activities is an important line in the field of sustainability. This implies, of course, close collaboration with industry and the various stakeholders, from the local administration to the users, and other research groups from the university.

So far it is relatively common the execution of studies of environmental impact, but not so much the development of technologies and systems to reduce it. It therefore seeks to advance this objective.

The campus has a demonstrator where, among other things, you can experiment with new automated collection and processing of garbage.

i. Possibility of a rational building "deconstruction" process

The sustainability of a building does not end with its implementation and use, we must apply it to his disappearance ensuring the maximum reuse and recycling of their parts that further ensures a lower environmental impact. It is necessary to study this possible "deconstruction", which will be a function of architectural design, the construction and maintenance solution. Many companies are already prepared for the recovery and recycling of components and are interested in working in this line.

Again solar homes can be used as a clear demonstrator.

These are some of the sub-goals from the research mentioned above, which do not cover, let alone, the possible action of the Centre, but give an idea of the wide implications in the university and, of course, in society. Moreover, there is a clear relationship among, them that makes the actions of the center to be interrelated and very homogeneous.

Budget and time schedule

Three main expenses relate to this action

- o **Building construction**
4.000 m², including licenses and projects equal **5.500.000 €**
- o **Equipment**
Furniture, but above all computer and testing Systems. The latter may be obtained through other calls, or the revenue generated through the lab
1.500.000 €
- o **Adaptation of the solar houses**
Enable their use as demonstrators for the various graduate and doctorate programs. As they some investment has been made to install them we expect the expenditure to be around **200.000 €**
- o **Maintenance and Support personnel.**
This will be business as usual and recurrent expenses. The centre will comprise of FT personnel whether full time or part time

Project Phases

1. Execution project, license and plot of land preparation, 500.000 €
2. Solar home adaptation, derived from the current ones 200.000 €
3. Building construction once the permit is granted, 5.000.000 €
4. Building equipment, 1.500.000 €

Impact

We consider a double impact, in the university and the building sector.

- o Create a best practice centre in the field, with direct relation with other schools covering partially the subjects related to sustainability
- o Establish a collaborative network on the matter, being coordinated by the centre for sustainable architecture. This makes the UPM a clear leader in architecture and building, both nationally and internationally.
- o The actual design of the building should be a demonstration model in itself, allowing the analysis of the different technological solutions that can be applied in the building and at the same time give reputation. It could be used as "living lab.
- o Finally, the lack of research in the building sector, a sector which, as stated above, it is highly fragmented by the size of their enterprises and therefore not very innovative, makes the appearance of a reference as the proposed, a cause for collaboration
- o The proposals and future innovations will be what motivate companies to seek the services of the Centre. This will ensure an important part of the external funding, as the productive sector in general lacks the necessary human and technical resources for research activity.

In summary this is the way to improve a laggard sector from the point of view of technological innovation.

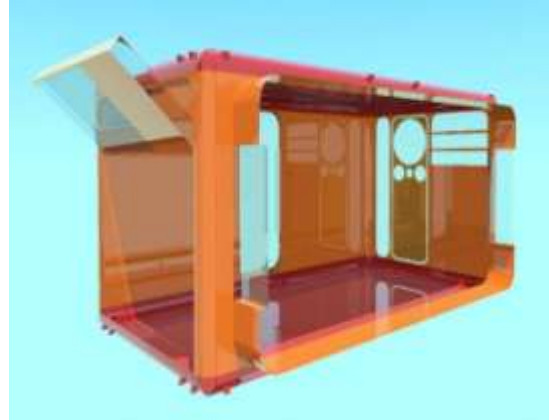
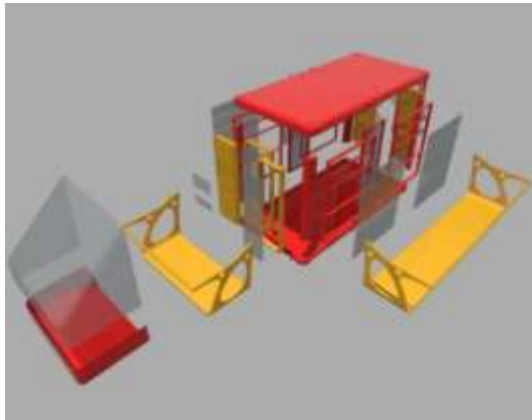


Fig. 33. Modules able to be industrialized. Design de J.M. Reyes (ETSAM)



Fig. 35. Solar tree in Vallecas (EMVS)



Fig. 34. UPM Solar House SDE 2010



Fig. 36. Solar Decathlon Europe 2010. General view

1. Strengthen R&D&I structures associated with ICT and its activity in R & D in the field of supercomputing, enabling new facilities and expanding the CESVIMA (Requested funding through INNOCAMPUS program. Further details available in the Innocampus Proposal MICINN).

Objectives

- a. Transform the CESVIMA centre, located on the Montegancedo Campus, in the Madrid node of the Barcelona directed and MICINN supported Supercomputing National Centre.
- b. Specialize CESVIMA as a user support entity centred around two international activities:
 - Supercomputing Laboratory of Techno Fusion's singular and technological installation. Participate in ITER Projects.
 - 3D visualization of medical imaging used in international projects. (MIT, Blue brain)

Implementation of the action

- a. In order to achieve this ambitious goal, the UPM team needs to acquire a similar equipment (but smaller) to the technology replacing the Mare Nostrum (being the Supercomputing Centre in Barcelona) super computer, allowing both machines to have the same architecture and performance level. The obsolescence of computing equipment is very fast. Generally, in three years supercomputing equipment is considered obsolete.
- b. However, this option, with the advantages of an improved performance, security, reduced consumption, etc. has the disadvantage of requiring a larger investment only justified if the UPM uses this investment as an opportunity to substantially improve CESVIMA's structure and positioning.
- c. **Negotiations have started with IBM Research to establish a joint research centre on parallel processors for visual displays. This is a line of research currently not investigated in Barcelona.**

Acquisition of new equipment

The undertaken analysis suggests the replacement of the current processors with a system costing 2,5 M € and with the following technical characteristics:

System: 196 PS702 nodes, 16 cores/node 3136 POWER7 cores
 RAM: 32 GB/node (2 GB/core): 6.24 TB
 Peak Performance : 82.3 Tflops (11.827 Tflops/rack)

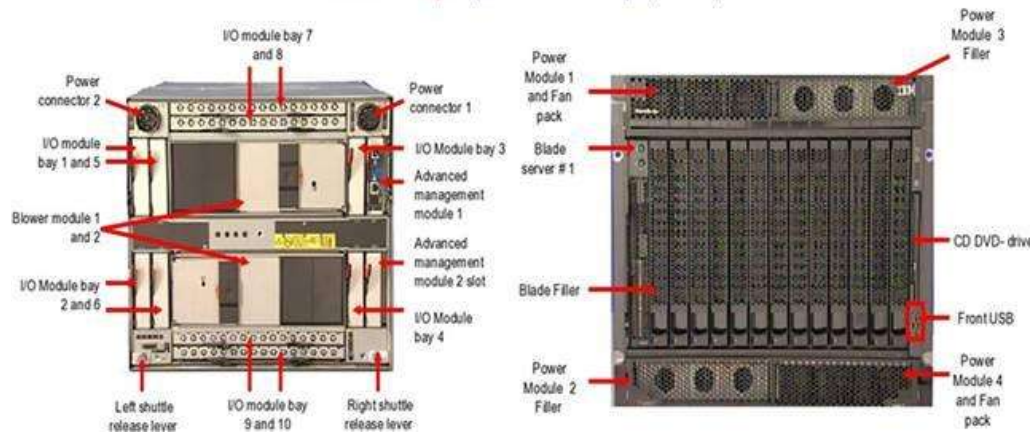


Fig. 37. New System Magerit 2

The processors have the following characteristics:

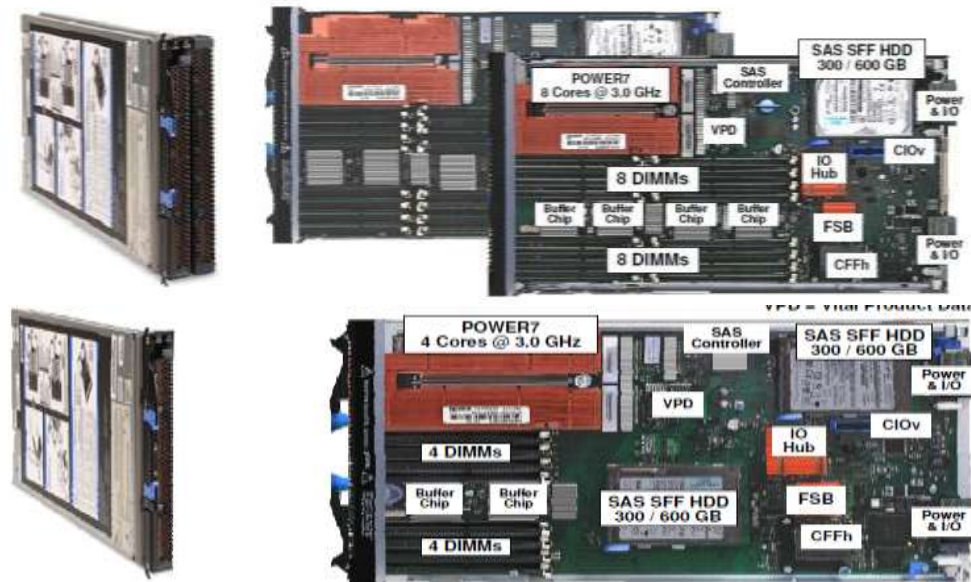


Fig. 38. Proposal for Magerit's new processors

PS700 Power blade (4-core)
 PS702 – POWER blades 16-core

To undertake these actions, it is necessary to habilitate extra space in the CESVIMA/ CEDINT building encompassing an additional area of 300 m².

Human Resources

Although not requested in the INNOCAMPUS call, the UPM considers it necessary to simultaneously initiate a human resources programme in the field of supercomputing. It should be considered that the conversion of CESVIMA into a research centre specialized in the above indicated fields will involve an effort to attract international talent in the 2010-2012 period.

With a total cost of 1,2 M € (0.4 M € per year in the period 2010-2012) it is possible to undertake actions in the following fields:

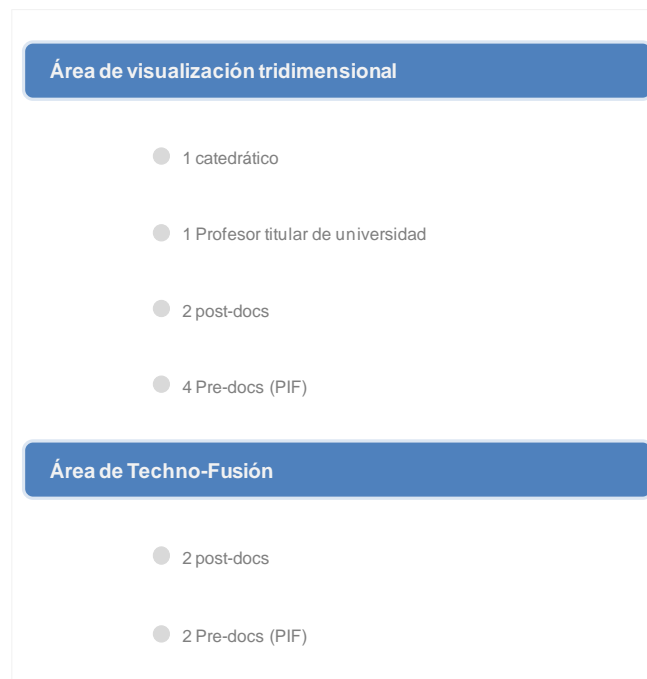


Fig. 39. RRHH

Impact

- Strengthen national and international research in the field of ICT. Promote the Spanish Supercomputing Network.
- Generate recurring revenues from the Supercomputer research results.
- Generate Income through airtime rental of new equipment for the execution of complex calculations.
- Attract and retain international talent specialized in these research areas with a specific training programs for doctors.
- Consolidate CESVIMA's equipment so they have competitive equipment.
- Support the supercomputing use among Spanish businesses

The UPM is confident that this research activity will generate enough resources to help the repayment of loans post 2012 after the three-year grace period.

	TIME SCHEDULE								
	2010	2011				2012*			
	4T	1T	2T	3T	4T	1T	2T	3T	4T
Supercomputing	█	█	█	█	█				
Agreement with BSC and MICINN	█								
Define equipment replacement process	█								
Install the equipment		█	█						
Technical Report			█	█					
Internal UPM approval				█	█				
Agreement signature					█				
Start of Activities			█	█	█				

Table 17. Supercomputing timeschedule

2. Develop new R&D&I initiatives in the Campus and consolidate existing centers through the development of the Food and Health Initiative (BioTech). Funding request through INNOCAMPUS, extended version and further detail in the Innocampus call)

Activity description

Responding to a social demand the improvement of food quality and safety is a priority for the agrifood industry. It contributes to the development, wellness and healthy living of citizens. In our neighbouring countries there's a growing awareness of the relation between food and health, along with a need to improve the nutritional quality of food and reduction of potential health risks.

Plant genomics and biotechnology provide a great potential of tools to meet these challenges by acting on different stages of the food production chain. This includes from plant breeding developing new products varieties with high added value, tailored to the market needs, to the identification of food allergens, the development of detection methods and bio health strategies able to mitigate its effect on the quality of consumer's life.

The **Centre for Plant Genomics and Biotechnology** (CBGP, UPM-INIA) has a scientific base and technological capacity to address these new challenges from the Agrifood industry. This initiative aims to develop this research.



Fig. 40. CGBP Building in Montegancedo Campus

Objectives

- Establish new lines of research in the food quality and safety areas, taking advantage of the synergies of research currently undertaken by the CBGP, facilitating significant interactions with new productive industries. This enables connections with other productive sectors under the BIO TECH initiative
- Research and develop the use of cultivated plants for the production of new compounds with pharmacological activity:

This project is based on five pillars:

1. Food Allergies
2. Nutritional quality of strategic crops
3. Development of new methods of analysis and detection of molecules in food
4. Molecular Pharming
5. Computational Biology Platform

Categories	Total	Men	Women	Spanish	Foreigner
Permanent Positions					
Professor	5	4	1	5	0
Lecturer	10	6	4	10	0
Substitute Lecturer	3	0	3	3	0
Lecturer hired with doctorate I3	11	6	5	9	2
Lecturer hired with doctorate	1	0	1	1	0
INIA researcher	3	1	2	3	0
INIA resident researcher	6	4	2	6	0
Researchers from Other Institutions - CSIC	1	1	0	1	0
Main researcher IMDEA	1	1	0	1	0
Postdoctoral					
Ramón y Cajal researcher	2	1	1	2	0
Juan de la Cierva researcher	6	1	5	6	0
Other Postdoctoral	18	5	13	15	3
Predoctoral					
Predoctoral labs	36	12	24	26	10
Other predoctoral	13	4	9	10	3
PAS					
Technicians and Administrative	33	10	23	32	1
Students					
Master student	32	8	24	25	7
Final year student.	20	10	10	17	3
Visiting Student	3	0	3	0	3
Totals:					
	201	74	127	172	29

Table 18. CGBP Staff

CBGP REQUIRED INFRASTRUCTURE			EXPECTED INVESTMENT	
Equipment and installation	Metabolomics Platform	GC-MS/MS equipment and accessories	120.000	€0,78M
		Team LC-MS-MS and accessories	320.000	
	Genotyping platform (Illumina)		45.000	
	High Resolution Melting platform (Roche)		65.000	
	Real-time quantitative PCR equipment(ABI Prism)		35.000	
	Proteomics laboratory: HPLC, GC, FPLC, lyophilized samples		90.000	
	Cell culture	Animal cells incubators	30.000	
Controls marked with radioisotopes and other materials		75.000		
Facilities set up				included
F _r H-CBGP Human Resources *	Researchers	Food Allergies	Available in UPM	€0,1M
		Metabolomics	Available in CBGP	
		Proteomics	Available in CBGP	
		Genomics (Doctor with +5 years of experience)	50.000 x 2 years	€0,1M
	Technician	Metabolomics (FPII)	25.000 x 2 years	€0,05M
		Genomics (FPII)	25.000 x 2 years	€0,05M

Table 19. CGBP Forecasted investments



Fig. 41. CGBP Equipment

Impact

- Implement new technologies in the CBGP, including those necessary for the separation of molecules (HPLCs, GC, etc.), which will be combined with technologies from MS / MS and MALDI-TOF.
- Allow interaction with the research topics of human health sector, both in its provision of care (hospitals) and business (pharmaceutical industry).
- Establish within the CBGP a functional genomics programme new metabolomics and genotyping platforms that along with the available proteomics platform will accelerate the improvement process and market introduction of plant varieties that produce foods with added value. The platforms combination of metabolomics / proteomics with genotyping one would benefit the business sector and through R&D projects could improve the sectors competitiveness in market areas where the current competitiveness is threatened.
- Through the available platforms develop methods to detect molecules / food-borne pathogens that are based on modern omics technologies.
- Substantially improve pharmacological options for diagnosis and vaccines by creating macromolecules. The development of this kind of research provides a new opportunity for interaction with the health sector.
- Integrate data and design/ model development by adopting a computational platform

Time Schedule

TIME SCHEDULE									
	2010	2011				2012*			
	4T	1T	2T	3T	4T	1T	2T	3T	4T
Food and Health Initiative									
Food Allergies									
Nutritional quality of strategic crops									
Development of new methods of analysis and									
Molecular Pharming									
Computational Biology Platform									

* The time schedule includes improvement and optimization activities not considered as usual



Fig. 42. New Lab at INIA

3. Promote knowledge transfer establishing living labs and enabling the launch of technological demonstrators (Funding request through INNOCAMPUS, extended version and further detail in the Innocampus call).

1. Installation of solar homes with photovoltaic technology
2. Development of a 3D TV demonstrator
3. Support patent generation and maintenance

Installation of solar homes with photovoltaic technology as part of research in modular and sustainable construction.

Description

The UPM has already begun proceedings with respect to the enhancement of permanent facilities for the demonstration of different architectural solutions in modularized and self-sufficient construction.

During 2010 various self-sufficient solar photovoltaic energy homes were installed in the Montegancedo Campus. These were designed by the UPM and built for the Solar Decathlon competitions in the U.S. in its 2005, 2007 and 2009 editions.

Objectives

Create a demonstrator in conjunction with companies in the construction sector of modular and energy saving solutions applying Self Sufficient and Bioclimatic Architecture.

This implies transforming the existing solar homes into living laboratories ("living labs") in order to test solutions and habilitate an additional module for services.

Execution

This action seeks to reuse the self-sufficient solar houses submitted by the UPM to various "Solar Decathlon" competitions (2005, 2007 and 2009) and the one constructed for the "Solar Decathlon Europe" out of competition, turning them into new modular solutions demonstrators.

Main objective is twofold; Probe the effectiveness of modular design in the different aspects of sustainability that affect them, namely:

- o Modular design Rationality
- o Feasibility of industrialization
- o Efficiency of new building material, applied systems, assembly processes and "deconstruction" processes
- o Maintenance optimization
- o Energy efficiency
- o Ease of use of home automation solutions
- o Environmental Impact Study

On the other hand, understand the degree of interior comfort, considering the following aspects:

- o Thermal comfort
- o Lighting comfort
- o Acoustic comfort
- o Ventilation

A constant monitoring with various types of sensors is required, to obtain timely data and correlations needed to achieve conclusions that will enable decision-making for the researched solutions.

Also it should be considered as an opportunity to keep the modules for residential use in order to function as "living labs", providing valuable architectural and life style data.

Impact

The installation of solar homes is complementary to the creation of a "Research Centre of Sustainability in Architecture", as the modules essential to ensure that researched theoretical works have a practical testing place to make them valid for further development.

In this connection, it should be borne in mind that research in the field of architecture must always be complemented by the appropriate development in order for the results to become and innovation that can be used in the sector.

This ensures that the credibility of UPM's proceedings in that research centre is maintained at the highest level, resulting in an increased demand for scientific and technical advice from multiple industry players and public administrations.

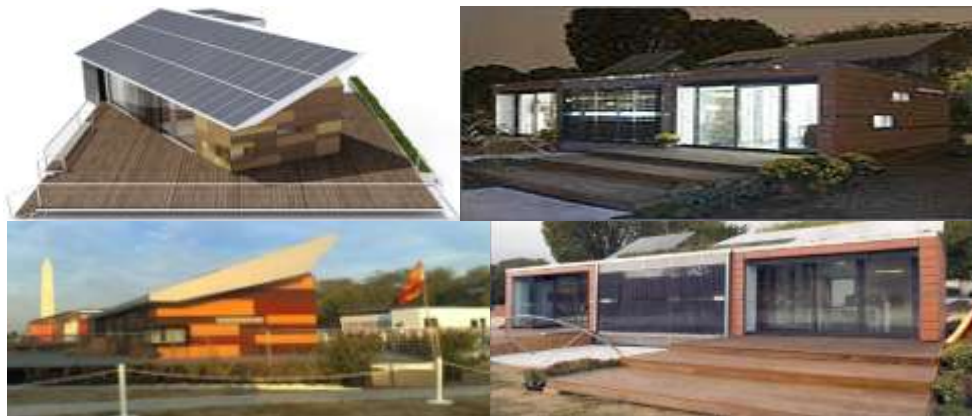


Fig. 43. PV Homes

	TIME SCHEDULE									
	2010		2011				2012*			
	4T	1T	2T	3T	4T	1T	2T	3T	4T	
Demonstrator for modular solutions- solar houses										
First installation of the houses										
Monitor the 4 modules										

Development of a 3D TV demonstrator (Funding request through INNOCAMPUS, extended version and further detail in the Innocampus call).

Description

The three-dimensional television (3DTV) is the current frontier of research on television, since the distribution of visual information that allows for the depth perception is crucial in the evolution of audiovisual systems. Although there is an excellent mature technology with high quality available, there is increasing demand for new research and developments that help new applications based on depth perception such as: international standards for 3D video, methods for the conversion of 2-D materials into 3D, common measures of 3D quality, content adaptation to the new monitors, etc.

Therefore, the CEI Montegancedo plans the development the UPM 3DTV research platform.

Firstly it will establish a working laboratory for the processes of acquisition, characterization, compression, distribution and display of 3D audio-visual materials.

Secondly it will consider the distribution of content. Hereby the Campus Montegancedo will strengthen its position as a leader & Campus of Excellence in advanced telecommunications services, where new concepts of TV consumption converge to the 3DTV, where the combination of high resolution and immersive 3D produce a new sensation to the viewer, and where the ubiquity for content reception becomes a reality.

The 3D TV demonstrator lab will focus mainly on distribution and production. Following the "user driven open innovation methodology", the lab is conceived to attract activities of research groups and companies, domestic and international, large and small, and to actively participate in standardization bodies such as MPEG.

Within audio systems there is currently an extended global trend to provide visual information that allows depth perception of the observed scene. There are many possibilities, from the widely known "shape from motion" (perception of forms by the movement of the camera), achieved with monocular camera to the construction of "complex caves (caves complete with video display in all walls) showing a complete surround audiovisual information. Lately, this trend has reached the consumer electronics market in cinemas first and then on TV.



Fig. 44. Simulation of a monitor allowing depth perception

However, there is an even greater demand for R&D to support the development of new applications based on the depth perception. Therefore, there is an urgent need for global

standards for encoding, video compression and transmission of 3D visual communications.



Fig. 45. Stereoscopic cameraq

The main objective of this proposal is to have an infrastructure serving as support for research, development and testing facilities for the acquisition, characterization, compression, distribution and viewing of media that provide depth perception.

Although there is a common goal, the results are applicable to different scenarios classified according to the type of information delivered. Thus, in terms of depth perception, there are two main types of formats:

- Video-only formats that include Classical Stereo Video (CSV) with two views, Mixed Resolution Stereo video (MRS) with a spatially sub-sampled view, and Multi-View Video (MVV) with more than two views.
- Depth-enhanced formats including Video plus Depth (VD), Multi-view Video plus Depth (MVD), and Layered Depth Video (LDV).

Also there are more variations depending on (a) monitor and (b) of the interaction with the user. So if we anticipate the evolution of the current television scenario, there are different ways of uni-directional distribution services as:

- o **Three-Dimensional Television (3DTV):** provision of information left-view/right-view (CSV, MRS) and texture depth (VD, LDV) to advanced monitors stereoscopic or auto-stereoscopic
- o **Multi-View Video (MVV):** provision of a range of views that the user can select at will. If the user can choose a virtual viewpoint different from the location of either camera is called Free View-point Video (VVF)..

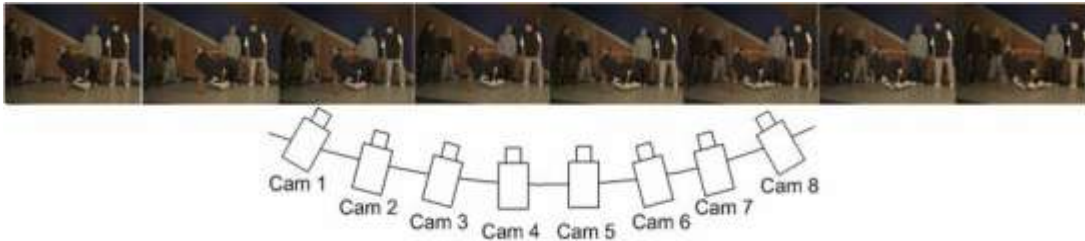


Fig. 46. Multiview sequence example (MVV): Breakdance generated by Microsoft



Fig. 47. Bullet scene in the movie Matrix

However, there are many different situations depending on the number and location of all cameras, ranging from linear and circular equidistant arrays (e.g. bullets scene in the movie Matrix) to the irregular placements of dense and scattered ones.

However, if we consider other scenarios such as interactive services (bidirectional), information flows from both ends and immersive services (or semi-immersive) can be deployed, permitting personal communications with presence sense. So in the new generation of communication systems the distance feeling between speakers disappears due to the depth perception and, therefore due to the size of the observed.

Finally, the current audio-visual communications are deployed over IP networks (e.g. Internet) and the potential for depth perception can be integrated into a wide range of services creating the so-called "3D Internet." This will be based upon new generation IP networks (IP Next-Generation Networks - NGN) and will allow the multidimensional use of the network where information will flow in all directions. The considered technologies can be used both at the technical level to improve the efficiency of the transmission or at a user level to provide an enriched experience. Although current research efforts are aimed at the television or related systems, it is evident that the development of video processing technologies pave the way for the 3D Internet.

Objectives

Aim is to have an infrastructure that serves as support for research, development and testing of three-dimensional television sets, including the complete chain of signal handling, comprising:

- Acquisition: A system of cameras to acquire visual information in multiple views
- Representation: A set of common and joint procedures and standards for the characterization of signals enabling their exchange, storage and transmission
- Coding: A set of procedures and standards aimed at reducing the volume of data required to represent the signals achieving an efficient storage and transmission.
- View: A display system of signals, which offers different images depending on the position of each viewer, allowing them to perceive visual information with depth and perspective.

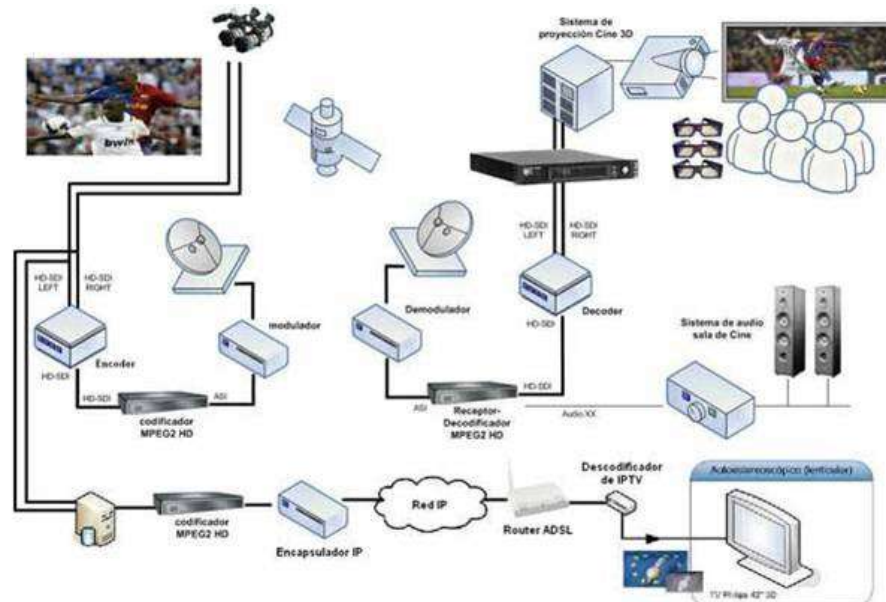


Fig. 48. Complete 3DTV System

The infrastructure will provide a platform for the demonstration of R&D results and for the testing of three-dimensional television equipment, permitting work on new schemes:

- Acquisition of content that provides depth perception
- Production, management and monitoring of contents
- Post-production with special emphasis on the treatment of depth
- Analysis of Quality of Service (QoS) by considering separately the generation of signals and their distribution.
- Analysis of quality of experience (QoE) perceived by users
- Multiformat presentation including a natural and synthetic video mix

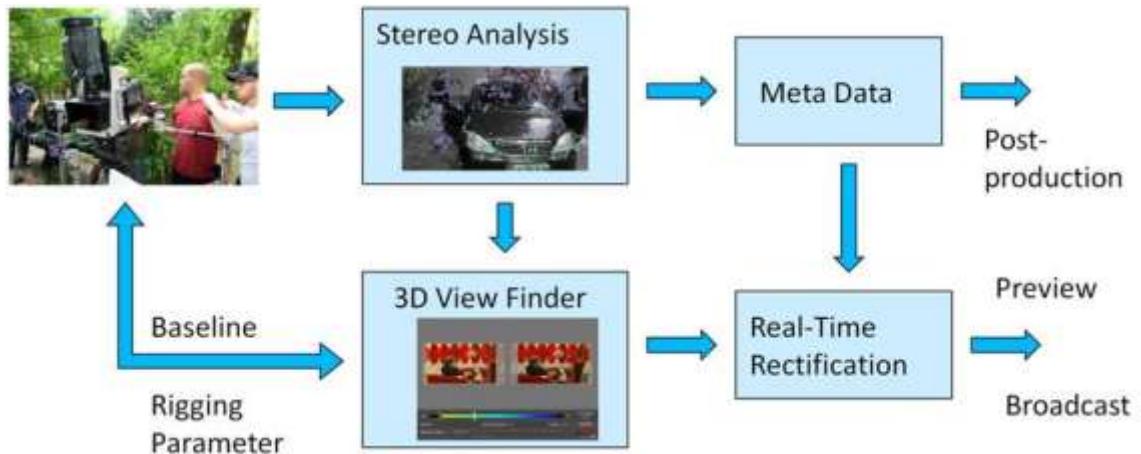


Fig. 49. Stan Technology Architecture

Execution

In the Campus there is equipment available for the acquisition, handling and storage of three-dimensional visual information signals, but it must be complemented with some visualization and three-dimensional visual information systems.

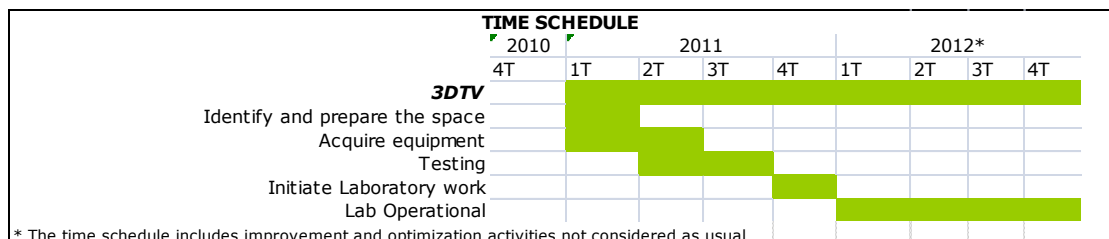
We propose to set up a 3DTV demonstrator lab that offers R&D results demonstration by providing a complete set of equipment on which following services are performed:

- o Complete system use for staff training in 3DTV
- o Partial or complete system use for R&D activities, primarily for the presentation of results for the integration of specific developments
- o Integration of developments carried out by companies in the audiovisual sector

The collaboration with companies in the audiovisual sector is part of the theme of "user driven open innovation" involving users in all stages of the innovation process. We aim to establish with the audiovisual sector, partnerships to generate cross-fertilization with research groups in order to achieve synergies similar to those considered in the Living Labs.

The mentioned research fields have the backing of previous activities carried out inside the UPM, such as the Dimensional TV Laboratory (Lab-3DTV) an infrastructure to support research, development and testing of 3DTV equipment, developed by the ETS Telecommunications Engineers, in cooperation with Spanish firms.

Timeline



Support patent generation, maintenance and internationalization (Funding request through INNOCAMPUS, extended version and further detail in the Innocampus call)

Description and impact

Support the generation and maintenance of patents: As an intrinsic part of the transferral and protection of knowledge, we are looking for financing to develop these activities, alongside our close collaboration with the new university chair, Clarke y Modet, facilitating the internationalization of some of the UPM's patents and technology vigilance studies.

Budget

Required budget is €60.000.

Improving and deepening the R & D in the field of medical imaging. Reference centre for diagnosis based on image. (Application for project funding INNOPARQUES).

In April 2010 the relocation of researchers assigned to the CTB to their temporary headquarters on the campus of Montegancedo was made. The area equipped for that purpose was at the Center for Plant Genomics and Biotechnology (CBGP). In this temporary building the laboratories considered to be more urgent were installed, giving priority to those related to the topic of biomedical images. The rest of the laboratories and CTB staff will move once the building of the CTB is finished, scheduled for February-March 2011.

During the year 2010 the laboratories related to Biomedical Image of the CTB have been established since its start at Montegancedo Campus, and the research lines on this subject have been defined. These laboratories are the following:

1. Biomedical Imaging Laboratory

Neuroimaging Laboratory (UPM-URJC)

The Neuroimaging Laboratory is created by the UPM and URJC, in late 2009, for the development of neuroimaging methods for early detection of neurodegenerative diseases, the study of pain and associated diseases and development of technology for the diagnosis and surgery of epilepsy, and other neurological diseases. It also includes other institutions that share imaging systems available in these institutions and numerous clinical and research projects:

- o Fundación Reina Sofía (FRS).
- o Fundación CIEN (Instituto de Salud Carlos III)
- o Hospital Rúber Internacional (HRI)
- o Anillo Radiológico de la Comunidad de Madrid (in study)
- o GE-Healthcare (GE)

Some examples of research activities in the Laboratory of Neuroimaging are described here

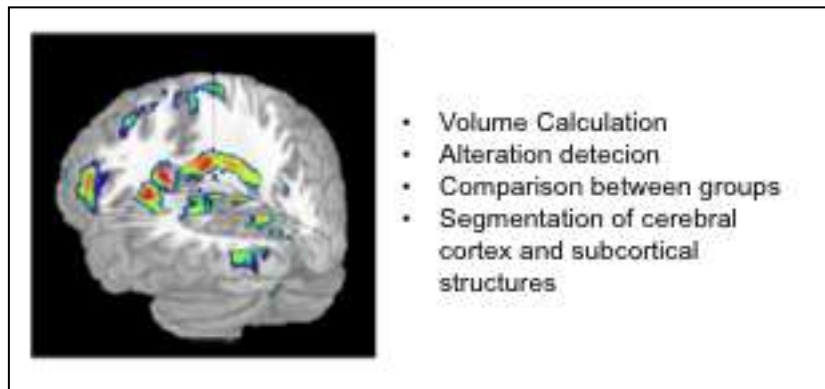


Fig. 50. Illustration of some of the results obtained: volumetry, Voxel-based morphometry, deformation-based morphometry

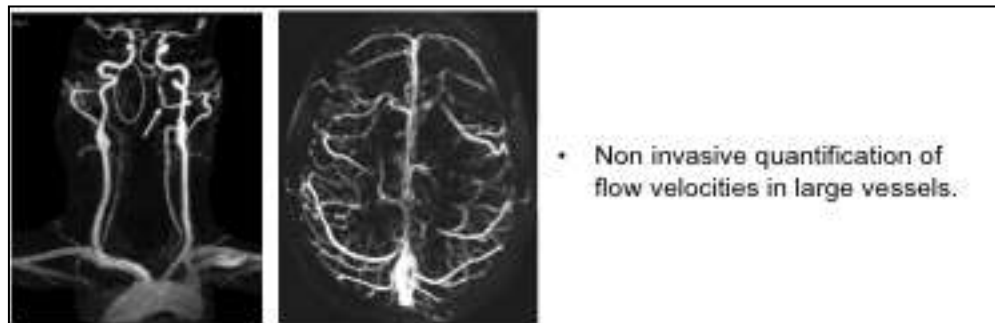


Fig. 51. Segmentation of subcortical structures

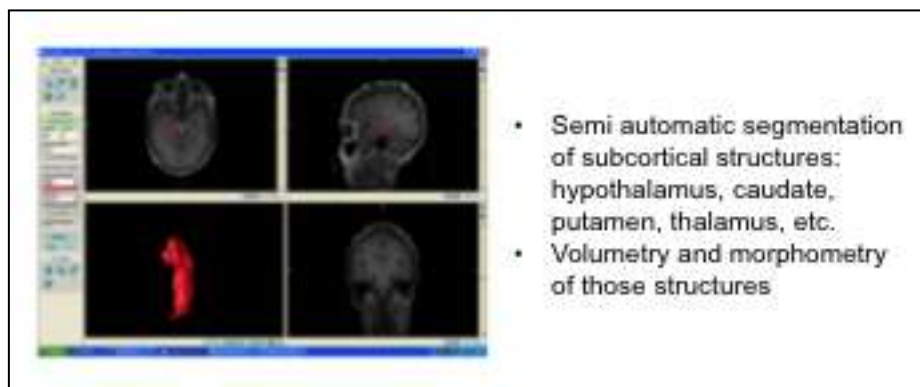


Fig. 52. Flow velocity measurements

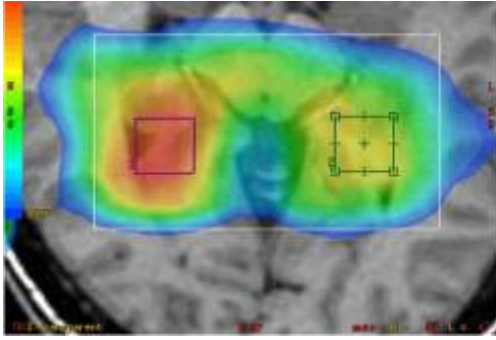


Fig. 53. Spectroscopy

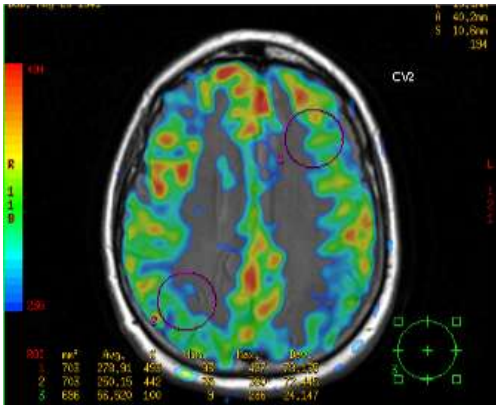


Fig. 54. Perfusion through arterial spin labelling (ASL)

Quantification of absolute blood perfusion without exogenous contrast

Laboratory of Biomedical Imaging:

Cardiovascular

Laboratory of Imaging Microscopy and others

Laboratory of Medical Imaging, Surgical Planning and Simulation

For these research lines a partnership with GE-Healthcare Company was established

2. Laboratory of Cognitive and Computational Neuroscience (UPM-UCM). Acquisition and implementation of the Magnetoencephalography (MEG). Agreement with Elekta.

The Cognitive and Computational Neuroscience Laboratory is created by the UPM and UCM in July 2009. It was created to develop methods of image analysis and neurophysiological signal for: The characterization and modeling of synchronization phenomena and neural Networks. Study of memory, executive functions and emotion: normality and pathology. Neuroplasticity in patients with head trauma. Neurodegenerative and neuropsychiatric diseases. Preoperative assessment: epilepsy, tumors. Cerebrovascular Accident. Neurobiological basis of pain. Computational models of brain function. Analysis and modelling of brain signals: functional, effective and network connectivity, and development of hybrid imaging systems MEG-MRI.

- a. Laboratory of Magneto encephalography
- b. Laboratory of neuronal synchronization analysis and reverse engineering
- c. Laboratory of Clinical Magneto encephalography

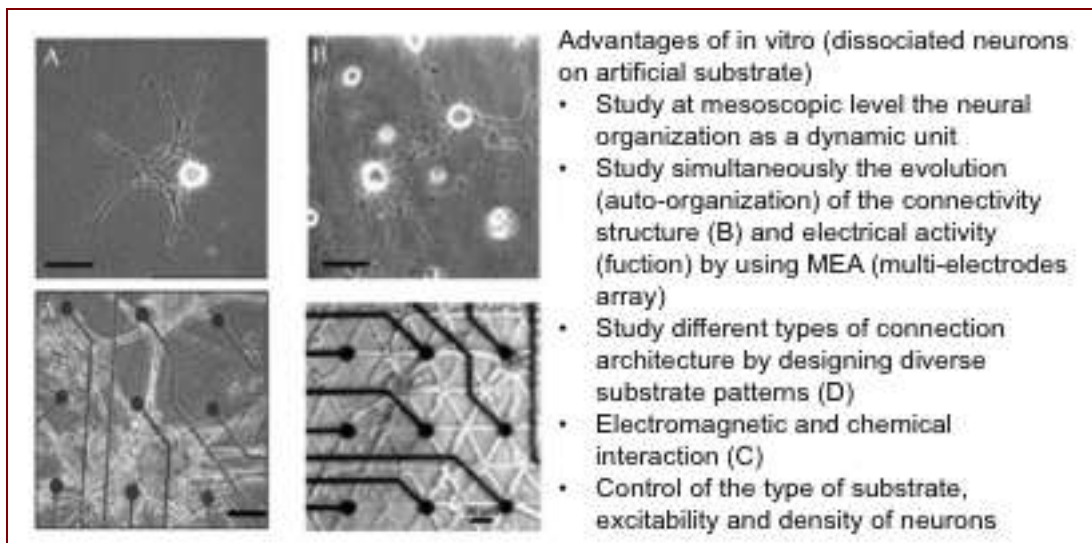
For these research lines a partnership with ELEKTA Company was established

3. Laboratory of Computational Systems Biology (UPM-BBVA)

The Laboratory of Computational Systems Biology is the result of the team recently selected to fill one of the chairs of the program UPM-BBVA Isaac Peral, and the laboratory of Biological Networks created by the UPM and the URJC by recently signed agreement to: 1) multivariate analysis and nonlinear electromagnetic brain signals using tools of complex networks, 2) development of models for the study of complex neural networks and its alteration under certain neuropathology, and 3) the experimental study of the relationship between the structure and function of neural networks in models of primary cultures of neurons.

4. Laboratory of Biological Networks (UPM-URJC)

The laboratory of Biological Networks is focused on understanding the relationship between structure and dynamics in cultured neural networks. During the last decades much effort has devoted to explore the operation of individual neurons, which structure and the mechanisms governing its activity have come to know very well.



5. Laboratory of Bioinstrumentation

6. Laboratory of NanoMedicine (UPM(CTB-ISOM)-UCM)

One of the main objectives of the Nanomedicine Laboratory is the development of contrast agents (magnetic nanomarkers) for MRI, made of bio functionalized nano structures with different biological molecules that recognize and bind specifically to amyloid plaque that develops in patients with Alzheimer's disease (AD).

This allows developing strategies, based on MRI, for in vivo early detection and the analysis of progression of AD. This activity was carried out in close collaboration with the ISOM of the UPM and various research groups and infrastructure of the CIBER-bbn in the area of nanomedicine.

7. Laboratory of Experimental and Computational Neurology (animal and cellular models) (UPM-HURyC)

8. Laboratory of Cell Culture

9. Laboratory of Biochemistry and Biofunctionalization

10. Laboratory of Bio electromagnetism

- Cell studies Unit
- Clinical Applications Unit
- Dosimetry of the environmental electromagnetic field Unit

11. Cajal Laboratory of Cortical Circuits (UPM-CSIC: Blue Brain)

12. Laboratory of Biomaterials and Regenerative Engineering

13. Laboratory of BIO-TICs

- Health care systems staff Laboratory
- Laboratory decision support. Personal Assistants on mobile devices. Multiagent architecture for patient monitoring. Synchronous collaborative platforms for comprehensive care of patients.
- Remote rehabilitation systems

14. Laboratory of Biomedical Informatics

- Laboratory of integration and analysis of heterogeneous biomedical information. Modelling and simulation. VPH. Interoperability.

An agreement with MIT for transnational research in medical imaging is also being developed. It shall also determine arrangements for medical imaging in neurology and advanced medical imaging services to hospitals. There is also relationship to the medical imaging ICTS by the MEG incorporation to the future ICTS medical Imaging of Madrid.

Attraction of talent for Biomedical Image

Under the program UPM-BBVA "Isaac Peral" two of the three candidates have been recently selected to serve priority areas of the CTB in Biomedical Technology:

1. Biology Computational Systems
2. Bioinformatics
3. Biomedical Images

The selected senior researchers and their teams will be integrated as soon as the building is finished. The teams (each consisting of 3 post doctoral fellows and 3 PhD students) will be selected by the UPM in the coming months in order to be incorporated at that time.

Support the acquisition of scientific-technological equipment for Ignacio da Riva microgravity Institute (Funding requested through Innoparques initiatives).

Description

Microgravity University Institute "Ignacio Da Riva" of the Polytechnic University of Madrid (IDR / UPM), is a center oriented in research, development and training in the areas of science and aerospace technology. Founded in 1974, one of the major highlights was the launch in 1996 of the microsatellite UPM-SAT. Aside of Aerospaciale lines of research, two other lines have gained relevance: civil aerodynamics or the effect of the wind on buildings and infrastructures and the calibration of anemometers.

The IDR has been characterized by the pursuit of scientific excellence in its research to place themselves as a reference in its field worldwide. To do so, it must maintain its facilities constantly evolving in order to adapt to continuous technological change your work area.

This request is aimed at the acquisition of new equipment

Objective

The objectives are to provide the research centres in the Park with more innovative scientific-technological equipment that will consolidate and build on the existing lines of R & D developed by the UPM in the field of aerodynamics and space technology, while promoting knowledge transfer to the domestic industry and the Spanish aerospace sector. Aim is to lead in innovation in each of their fields while improving their competitiveness.

The institute is developing studies related to the aerodynamics (civil and birds) and space technology. In order to increase R & D lines and intensify research and tests on existing lines, is considered essential to undertake this action. Therefore, its objectives are summarized below:

Equip the IDR with scientific-technological equipment of last generation, so you can

- o Start new lines of research in the field of aerodynamics.
- o Strengthen R & D in the field of civil aero and space, thanks to the equipment of the new Centre
- o Convert IDR in a center of reference to European and global R & D for aviation and aerospace sector
- o Strengthen partnerships and developing new R & D projects with companies and research centers nationally and internationally

The UPM will need to purchase equipment for the following lines of R & D:

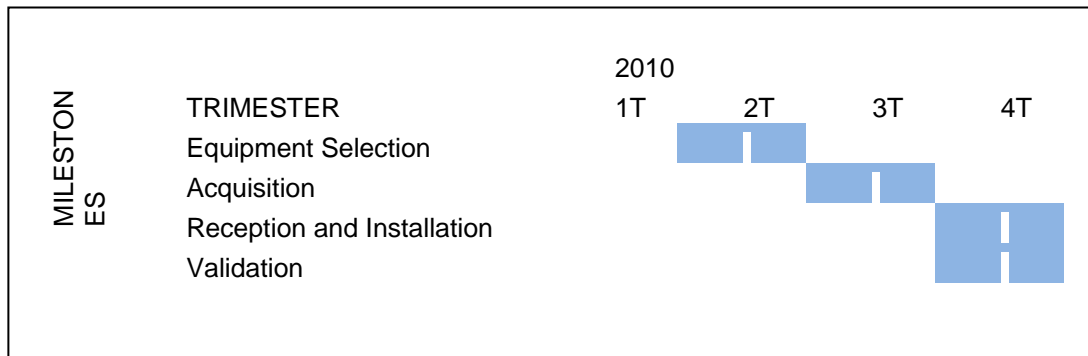
- o **Space Technology:** thermal vacuum chamber
- o **Experimental Aerodynamics and Energy**
- o **Eolic:** Hot-wire anemometry and PIV, pressure Readers multichannel manometric capsules, Rotary tables of one and three shafts, with their control systems

Execution

These are the activities for 2010:

- a. Order.
- b. Delivery and installation.
- c. Train staff in use and maintenance
- d. Realice inspections and tests
- e. Receive the final equipment.

Time line



Impact

- o Technological activities of the University will be enhanced through: Consolidate and strengthen partnerships and agreements with other technology centers, enterprises and universities as a means to expand the depth, size and number of research.
- o Channel scientific and technological knowledge generated, promoting result transfer. Foster cooperation between players in the science, technology, business and citizen areas,
- o Creation and participation in interdisciplinary and international research teams and research projects
- o Attract new talent

Budget

- o Overall 400,000 in different type of equipments such as
- o **Space Technology:** thermal vacuum chamber
- o **Eolic:** Hot-wire anemometry and PIV, pressure Readers multichannel manometric capsules, Rotary tables of one and three shafts, with their control systems

Tabla 1. Presupuesto

Summary

2.2. Summary: Scientific improvement and knowledge transfer

- 1 Create and consolidate R&D centres located in Montegancedo Campus. These centres have become international and national leaders (CBGP, CTB, CEDINT)
- 2 Development of R&D and ICT structures having as a reference the Faculty of Informatics, IMDEA Software, E-USOC and CESVIMA
- 3 Implementation of a new offer of master and graduate programmes with a big capacity of attracting international talent
- 4 Increase research located in Campus Montegancedo in the last 4 years
- 5 Foster activities related to solar and photovoltaic energy
- 6 Creation of a Research Centre of sustainability in the field of architecture
- 7 Strengthen R&D structures in ICT and several fields such as supercomputing, Biotech, medical image
- 8 Supporting activities related to knowledge transfer by creating the CAIT, Living Labs and technological platforms.

Timeline

	STRATEGIC PLAN CAMPUS OF EXCELLENCE_FUNDING																
	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others	II Sem 2010	I Sem 2011	II Sem 2011	I Sem 2012	II Sem 2012	I Sem 2013	II Sem 2013	I Sem 2014	II Sem 2014	I Sem 2015	II Sem 2015
SCIENTIFIC IMPROVEMENT																	
Installing the virtual reality cave CEDINT	Completed	x															
Strengthen USOC E facilities(Space Tech Initiative)	Completed	x															
Aggregations development (Fraunhofer, CSIC; INA, IMDEA, ISFOC, IEO, ATOS, Santander, INDRA, Telefónica, IBM, BICG)	In progress	x															
CTB construction	In progress	x				x											
Create living labs	In progress	x	x	x	x												
a) Living Lab Bank of the future: Banco de Santander	In progress		x	x													
b) Living Lab Office 21 (Future of the World of Work): Fraunhofer Gesellschaft & BICG	In progress	x	x	x													
c) Living Lab Home Automation	In progress	x	x														
d) Living Lab Solar Houses	In progress	x	x		x												
e) Living Lab/ Demonstrator 3D HDTV	In progress	x	x		x												
IMDEA SW construction	In progress	x															
Strengthen CTB equipment (BIO Tech Initiative)	In progress	x	x														
Strengthen IDR equipment (Space Tech Initiative)	In progress	x															
Supercomputing Initiative (strengthen equipment)	In progress	x	x		x												
Food and Health Initiative (Biotech Initiative, strengthening equipment)	Pending					x											
Promotion of photovoltaic solar energy activities. Create demonstrators	Pending					x											
Creation of Research Centre of Sustainability in Architecture.	Pending	x		x													
Create Technological Development Centre providing support to institutional and technological activities of international cooperation and development	Pending	x		x													
Promoting research groups with international programs to attract young and experienced doctors	Pending	x															
Centre of integrated applications (GMES / Galileo)	Pending	x															
Establish mobile broadband services pilot	Pending	x															
Construction of the IT Security and Information Centre (CCTC)	Pending	x		x													
Centre of Excellence in Ocean Engineering (ICTI)	Cancelled	x															
Centre for Complex Systems Research (CIX within CESVIMA)	Cancelled	x															
		x															

2. KNOWLEDGE TRANSFER

Starting Point

To make knowledge transfer effective, new tools are required as the ones explained below. In the quest of achieving a dynamic knowledge transfer in open collaboration with the productive sector, the Montegancedo campus will host services that support innovation, the creation of spin off and new technology-based companies, encourage the mobility of researchers, and achieve commercialization results for technological research.

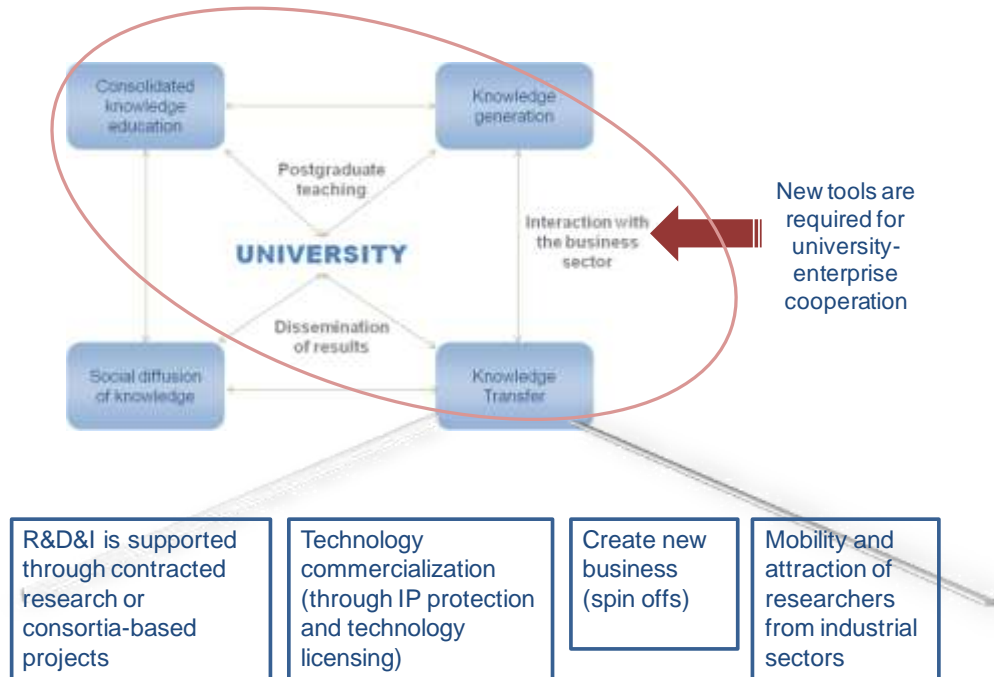


Fig. 55. Knowledge transfer strategy

The Campus Montegancedo on this second phase has as a priority the **Improvement of the Knowledge transfer**, mainly between university and business. As well it pretends to consolidate innovation as the process to exploit research results. The aim is to support new technological open innovation models, with an increased participation of end users, in order to accelerate the exploitation of R&D results.

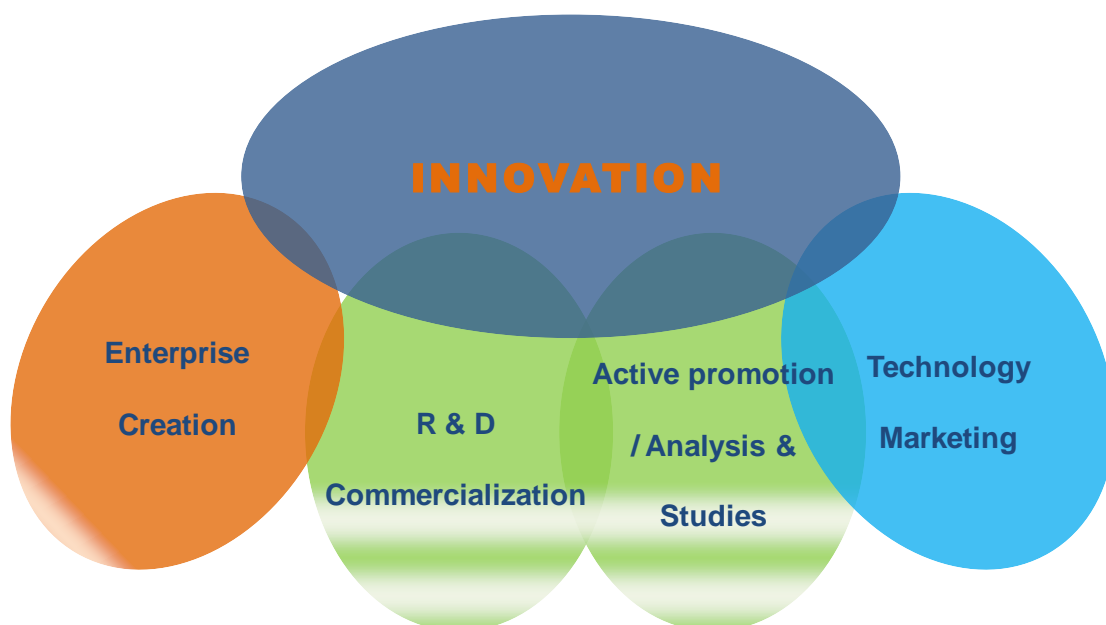


Fig. 56. New Models of Innovation Technology

On the table we list all those activities related to Knowledge transfer as they are listed in the Strategic Plan. We highlight the completed one, in progress and pending ones.

KNOWLEDGE AND TECHNOLOGY TRANSFER AS A RESULT OF THE ACADEMIC RESEARCH TO THE BUSINESS SECTOR	STRATEGIC PLAN CAMPUS OF EXCELLENCE_FUNDING					
	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others
	Completed					
Develope the software for creating and supporting UPM companies(funding, advice, ..)	Completed	x				
Hire qualified transfer and approval staff .	Completed	x	x			
CAIT: Project and Licensing	Completed	x				
Promote interaction between R&D&I structures and business to comply with the support role for innovation and performance enhancement.	In progress	x				
Expand the current Business Centre supporting spin offs and technology demonstrators.	In progress	x				
Create the Support Centre for Technology Innovation (CAIT)	In progress	x	x			
CAIT: Construction	In progress	x				
Create 600 direct and indirect jobs in Campus centres	In progress	x				
ULAB agreement	In progress		x	x		
Make innovation a continuous process integrated in teaching and train innovation and entrepreneurship leaders.	Pending	x				
CAIT: equipment resources	Pending			x		
Locate technology platforms at the Campus	Pending	x				
Locate Community of Madrid clusters at the Campus	Pending	x				
Locate business associations in close interaction with UPM at the campus	Pending	x				
Support patents generation and maintenance	Pending				x	
Locate KICs	Cancelled	x				

Table 20. Knowledge transfer activities

Strategy

Transform the Campus Montegancedo in a promoter and facilitator of knowledge transfer tools and international agreements. In order to achieve this, the following must take place:

1. Increase the interaction between the R&D&I facilities and the business community, supporting innovation and incrementing the ability to bring products to market
2. Develop company formation and support programmes, for the UPM based businesses (financing and advisory services)
3. Hire personnel specialized in transfer and valuation
4. Make innovation a continuous process integrated into the teachings. Create leaders in innovation entrepreneurship
5. Extend the Business Centres capacity, increasing its ability to create spinoffs
6. Relocate technological platforms, clusters (from the region of Madrid), KICS and business into the Campus
7. Create direct and indirect employment

An improved knowledge transfer results in the creation of institutions that enhance and support the innovation process.

With no doubt, the construction and equipment of the CAIT gives a mark and differential nature to the campus Montegancedo in innovation, understood as the exploitation of user led research results and experimentation from the living labs.

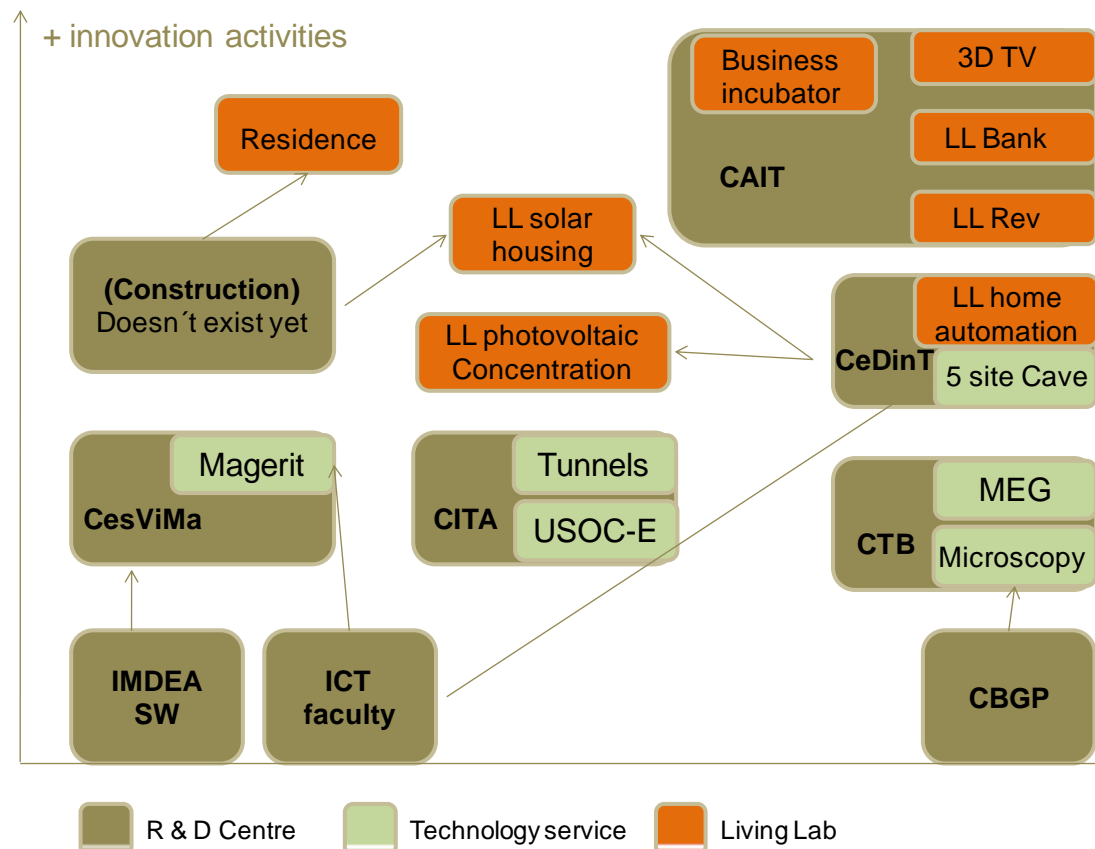


Fig. 57. Centres in Montegancedo

Table: Campus components arranged based on the level of innovation

Action Plan

For this reason the UPM wants to obtain additional financing to develop the CAIT. Main areas of interest and activities are

- a. CAIT: Support centre for technological innovation
- b. Living lab concept
- c. ULAB: University Lab
- d. Innovation Technology platforms

Activities

Support centre of technological innovation (CAIT)

CAIT's development and its equipments is one of the main aspects of differentiation in the Campus in their differentiation strategy. Therefore we request further funding to MEC under this call.

In order to become successful in the process of technological innovation and knowledge transfer between academia and businesses, a completely new set of tools and models are demanded. These ought to be institutionally supported, facilitating the valuation of the different R&D activities. UPM uses the set up of the Campus Montegancedo to create as an opportunity to create the Support Centre of Technological Innovation (CAIT) (see fig 58)

The CAIT replaces the existing business center and allows its extension. It will consist of informal, versatile, multifunctional and innovative spaces geared towards informal contact and exchange of ideas (mini agora). It will also host laboratories that develop the concepts of user-driven open innovation and technological demonstrators. The CAIT will consolidate the goals already set in the entire University to strengthen the entrepreneurial spirit of the UPM and the exploitation of technological R&D results.



Fig. 58. CAIT drawing, close to the business center)

The occupation of CAIT will happen gradually given the current space availability at the Business Center Montegancedo. This will permit to explore a number of actions without having to wait for the completion of its construction.

As part of UPM's objectives of supporting innovative activities, the Concurrent Design Facility will be installed in the CAIT. As explained in the section on teaching improvements and EHEA adaptation, the concurrent design of complex engineering systems becomes a clear differentiator. This systematic approach will help accelerate the innovation process.

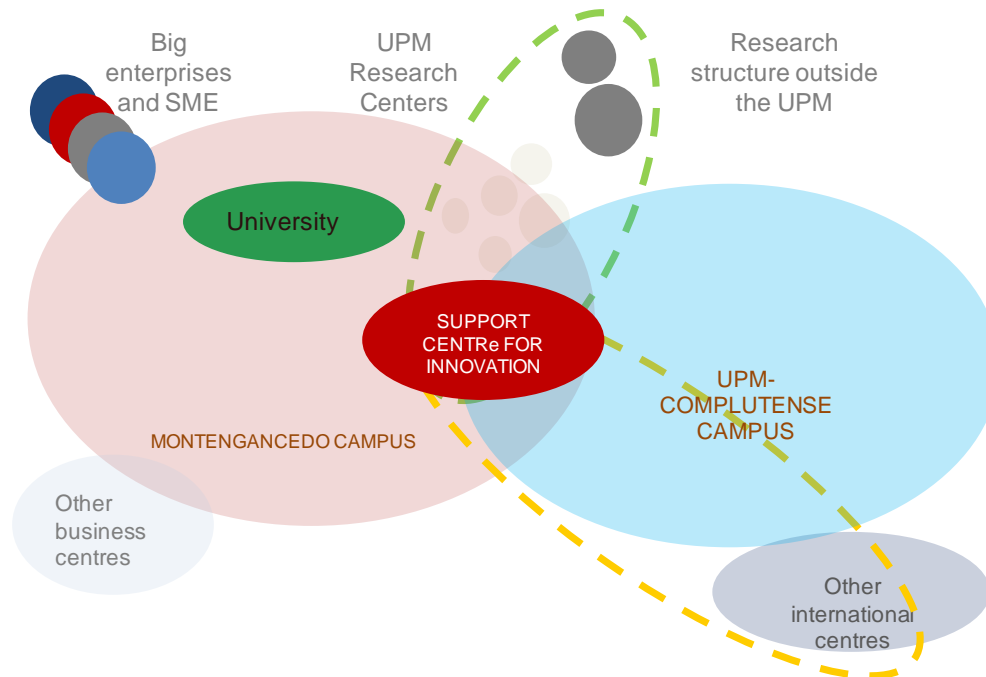


Fig. 59. CAIT scope

CAIT Objectives

CAIT main objectives are:

- o **Exploitation of results and improving knowledge transfer** from the academic to the business world. Provide visibility to the actions.
- o **Increase the exploitation of technological research results.**
- o **Promote the concept of technological demonstrators and living labs,** attracting strategic aggregations around key lines of research.
- o **Promote innovation** by creating a factory of ideas and creativity.
- o Promote **entrepreneurship** in technology-based companies.
- o Integrate the various fields of action, with **ICT as the backbone.**
- o Use the CAIT as a **lever of change** for a cultural transformation and strategic collaboration around innovation.
- o Promote the **campus internationalization** to attract talent, aggregations and participate in international programmes.



Fig. 60. CAIT como palanca de cambio

Main CAIT components are

- o **Valuation and R&D results commercialization unit.** Additionally it will manage the UPM-Business relations in regards joint marketing actions (jointly research groups with business)
- o **Project Office:** Managing European Projects
- o **Entrepreneurship support:** incubators and business angel network
- o Market intelligence and technology surveillance unit: Permanent unit
- o Living labs and technological demonstrators: real experimentation areas
- o Technological integration units: concurrent design installation



Fig. 61. CAIT Structure

Budget

Construction and CAIT equipment

Actions

- Data networks, wiring and cabling, solar panels: 0.3 M€
- Install the “Concurrent Design Facility” : 0.3 M€
- CAIT Support personnel: 0.2 M€

Estimated budget **0.8 M€**

- Use of 1st Phase resources: 0,2 M€ (excluded)

“Living Lab” Concept

Presented as an heir to the traditional technology demonstrators known for years (from "showrooms" to demonstrations of new services in open environments) but with a more complex approach, the creation of Living Labs becomes a strategic priority for the UPM. The concept of Living Lab is based on a systematic user co-creation approach integrating research and innovation processes within a public-private-people partnership. These processes are integrated through the exploration, experimentation and evaluation of innovative ideas, scenarios, concepts and related technological artifacts in real life use cases. The results will allow the development of products, services and processes. These Living Labs can be defined as "a real time experimental environment, enabling different actors with common interests to collaborate within a line of research and/ or technology in the development and use of innovative ideas to solve current real problems in an integrated way". Figure 62 illustrates this idea where the lab integrates itself in a real environment accelerating new product introductions.

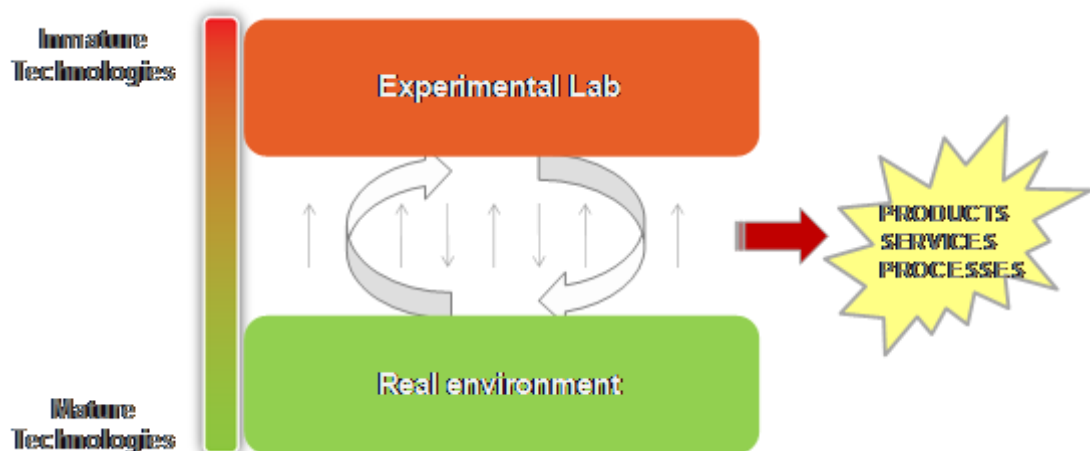


Fig. 62. Need for experimentation to mature technologies

Living Labs allow **end users** to become involved in testing the demonstrators, leading to the creation of a community of **open innovation**. It promotes know-how and facilitates the ease of commercialization. The LL also requires that teams of R & D (especially technological development) are part of the laboratory in contrast to what happens in the case of a demonstrator in which the degree of maturity of the technology "demonstrated" is much higher.

Some of the benefits are the internationalization of these laboratories through the membership to the European Network of Living Labs (currently limited to the ICT area in 7FP), the co-creation, and technological and business risk reduction.

Figure 63 represents schematically the way in which this process can be accomplished, reducing the gap between public funding and business resources. It should be noted that the existence of technological demonstrators or pilots can fit into this concept but as an element subsumed in a broader objective.

UPM and has practical experience of this model in two cases: a "living lab" in the health area by facilitating the monitoring of patients with chronic conditions or the use of solar homes to establish reactions and feedback of final users.

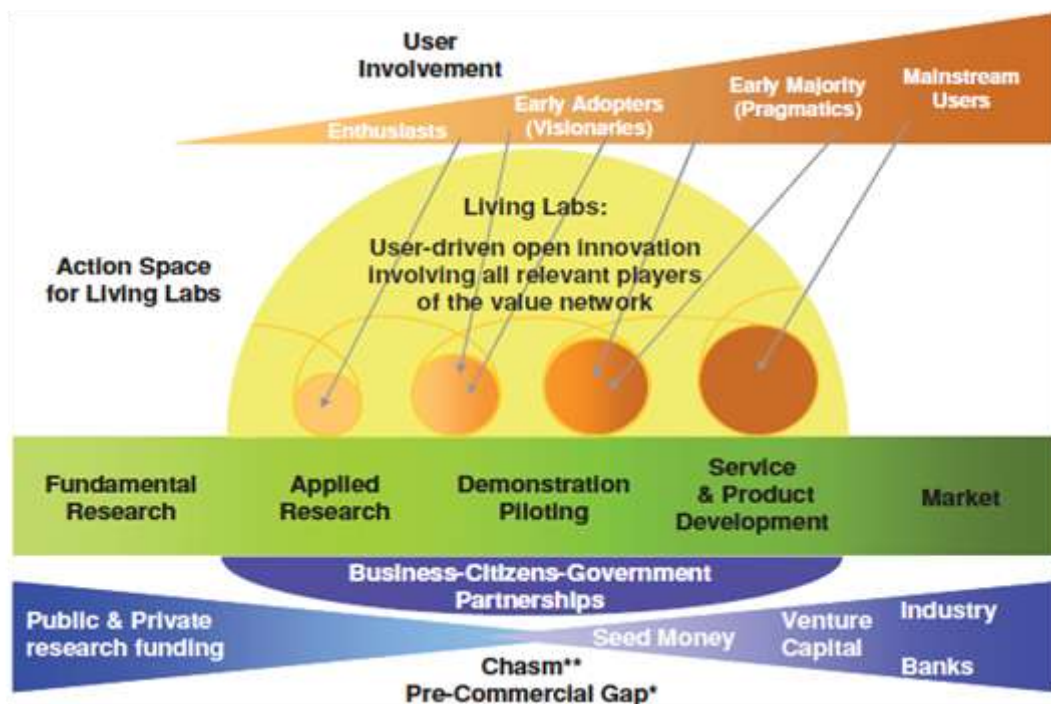


Fig. 63. : Innovation process linked to Living Labs (Source: European Commission)

This model also has implications in the research activities of the UPM. As Figure 64 indicates, the effect for the companies involved in the partnership is very different. In this case, the lead in determining the objectives to be achieved and the way they are carried out should be on the "leading company" This Company should:

Areas	Living Lab	Research
Type of research	<ul style="list-style-type: none"> Applied research and development of user solutions. Co-creation. Open Innovation 	<ul style="list-style-type: none"> Basic research or isolated research hired
Financing	<ul style="list-style-type: none"> Joint funding with a strong private component 	<ul style="list-style-type: none"> Financing has a strong direct or indirect public component
Participants	<ul style="list-style-type: none"> Tractor company and selected technology partners collaborating with University 	<ul style="list-style-type: none"> Grant participants or unilateral relation services
Governance	<ul style="list-style-type: none"> Tractor company makes decisions along with the University 	<ul style="list-style-type: none"> University tends to govern the relation
Testing	<ul style="list-style-type: none"> Double experimentation: A safe environment followed by a pilot for market 	<ul style="list-style-type: none"> Multiple activities focused on the lab
Location	<ul style="list-style-type: none"> Physical environments to support research activities 	<ul style="list-style-type: none"> Traditional lab
Intellectual Property	<ul style="list-style-type: none"> Intellectual property and use rights of the tractor company 	<ul style="list-style-type: none"> Intellectual property lies in the funding source

Fig. 64. Conceptual living lab concept

Establish a set of Living Labs that allow the analysis of technological developments and consumer behaviors in certain sectors.

The UPM in Campus Montegancedo has basically 2 initiatives around living labs

Types of "living labs" integrated in the strategic partnership Fraunhofer + BICG

- Retail industry jointly with el Corte Inglés
- Consumer behavior trends
- Improve shop efficiency and security
- Modular construction industry (with leading construction company to be disclosed)
- Modular systems and space use trends
- Assisted catering (possibly Iberia and other non disclosed partners)
- Experiment and understand user eating and drinking habits

Development of the strategic partnership with Banco Santander

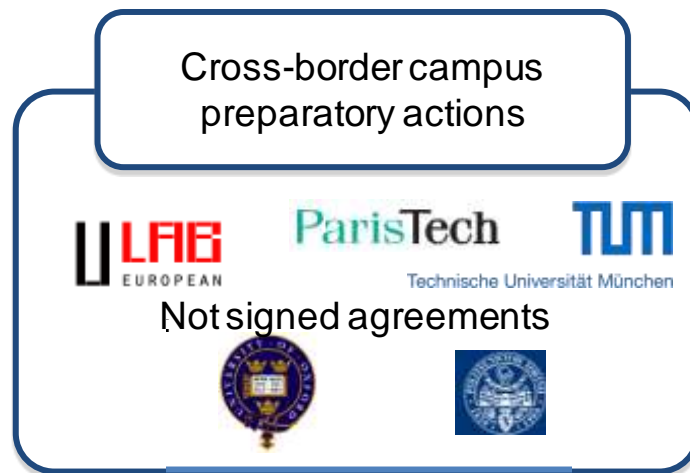
- Interactive Lab that enables the testing of Technology and consumer uses of certain banking services
- Identified research areas
 - Area 1: Data Mining
 - Area 2: Sensor
 - Area 3: Web 3.0 (interactive social networks)
 - Area 4: Biometrics (voice, faces, etc.)
 - Area 5: Mobile banking (applications SW, HW, etc.)
 - Area 6: Simulation
- Project budget is around **0.5 M€ a 1 M€** annually
 - This is a multidisciplinary Group, where other companies may join as subcontractors

ULAB (University Lab)

UPM wants to collaborate with other Excellence Campus. The ULAB project focuses on the design and creation of the Technical University of the Future. ULAB is a joint research project of five leading technology universities: UPM, Politecnico di Torino, TU Munich (Germany CEI), The University of Oxford and Paris Tech (France promising CEI). The project focuses on establishing new policies on research, valuation and entrepreneurship.

The ULAB will operate as a university experimental laboratory to implement best practices. It also will demonstrate how the creation of open innovation networks between universities can increase the quality of research and innovation in the pursuit of excellence.

The results will be disseminated to 4000 higher education institutions, of which 1800 are universities with more than 19 million students and 1.5 million personnel assigned. The UPM as project coordinator strongly influences the general direction of the project.



Relevance

Project has 4 phases: Best practices interexchange, experimentation and piloting, valuation and dissemination

ULAB Project
Research Area
Best practices interchange in research, planning, R&D structures and HR management
Knowledge transfer Area
Best practices in entrepreneurship education
Idea generation competition and new company support
Influencing
Initiative oriented towards the diffusion of Science and Technology among the citizens

Fig. 65. ULAB Parts

This is an institutional project awarded to the UPM in the Capabilities Programme of VII Framework Programme for R & D in the EU. The project is called "Designing Tomorrow's Technology University".

The actions are focused on defining the research laboratories strategy, the link with entrepreneurship, commercialization of intellectual property and finally the area of scientific diffusion.

Technological Innovation Platforms

Innovation platforms linked to the Center of Sustainable Architecture

- o **Self-sufficient solar photovoltaic's homes**, designed and built by the UPM for the competition "Solar Decathlon" in the U.S., in its editions of 2005, 2007 and 2009. These houses have been recently installed in that campus, with funding and resources from the CEI 2009 call (Ministry of Science and Innovation part). They become an optimum demonstrator for technical innovations related to sustainability and serve as examples for other modular solutions that can be designed in the future.
- o The **residence of teachers, researchers and students** to be build on the same campus using sustainability criteria and with partial funding from the Ministry of Housing, Goal is to install a series of sensors that allow monitoring all the different spaces to ensure its sustainability, in addition to applying new techniques for monitoring and subsequent verification.

The campus, as an environmental space, where you can experience with the modern techniques of environmental protection, from the automatic garbage collection up to the permanent forest recovery, as well as special materials for paving and landscaping.

Technological Innovation & research platform UPM 3D-HDTV

Establish a working laboratory in the areas of acquisition, characterization, compression, distribution and display of 3D audiovisual materials considering the distribution of content both online (IP3DTV) and via radio.

Opportunity and strategic value

ACTION PLAN

- New models for the acquisition of content in the different formats: 3D, HDTV, Super Hi-Vision
- New systems allowing for the data feeding, monitoring and management of content
- New post production mechanisms; quality analysis, control studio, generation of media in the various forms of quality and resolution and its adaptability to the various distribution mediums (Channel Bandwidth, Service Quality (QoS) and Experience Quality (QoE)
- New multi-presentation systems, adhering to the QoE criteria
- Experimental distribution through various mediums, land, satellite, cable/FP. In order to achieve this, the required licences will be purchased and there will be agreements formed with companies that transmit the content.

Fig. 66. Main lines of action

This project is supported by the Ministry of Industry and coordinated with UPM- Campus de Moncloa. The research lines are endorsed with previously carried out activities inside the UPM, as CAMPUS-HD, pilot experimental HDTV broadcast by terrestrial broadcasting in the University City, and the Laboratory for Three-Dimensional Television (3DTV-Lab) with infrastructure to support research, development and testing of 3D TV equipment in cooperation with Spanish firms. As part of the strengthening program, a 20,400€ grant was provided for the IP-TV license.

Summary

2.2. Summary: Knowledge transfer	
1	Boost knowledge transfer with the establishment of a Support Centre for Technological Innovation , Living Labs and launch of technological demonstrators
2	Make transfer of knowledge and open innovation the core theme of Campus Montegancedo
3	Develop the concept of Living Lab in the Montegancedo Campus, allow the campus to become a LL
4	Participate in the ULAB project: with international technological universities to create the technological university of the future
5	Create platforms for technological innovation within Campus

Timeline

KNOWLEDGE AND TECHNOLOGY TRANSFER AS A RESULT OF THE ACADEMIC RESEARCH TO THE BUSINESS SECTOR	STRATEGIC PLAN CAMPUS OF EXCELLENCE_FUNDING																
	STATUS	CEI 2009	CEI 2010 Phase I	CEI 2010 Phase II	INNOCAMPUS	Others	II Sem 2010	I Sem 2011	II Sem 2011	I Sem 2012	II Sem 2012	I Sem 2013	II Sem 2013	I Sem 2014	II Sem 2014	I Sem 2015	II Sem 2015
Develop the software for creating and supporting UPM companies(funding, advice, ..)	Completed	X															
Hire qualified transfer and approval staff .	Completed	X	X														
CAIT: Project and Licensing	Completed	X															
Promote interaction between R&D&I structures and business to comply with the support role for innovation and performance enhancement.	In progress	X															
Expand the current Business Centre supporting spin offs and technology demonstrators.	In progress	X															
Create the Support Centre for Technology Innovation (CAIT)	In progress	X	X														
CAIT: Construction	In progress	X															
Create 600 direct and indirect jobs in Campus centres	In progress	X															
ULAB agreement	In progress		X	X													
Make innovation a continuous process integrated in teaching and train innovation and entrepreneurship leaders.	Pending	X															
CAIT: equipment resources	Pending			X													
Locate technology platforms at the Campus	Pending	X															
Locate Community of Madrid clusters at the Campus	Pending	X															
Locate business associations in close interaction with UPM at the campus	Pending	X															
Support patents generation and maintenance	Pending				X												
Locate KICs	Cancelled	X															

Indicators

INDICATORS		2009-2010	2012	2015
Scientific activity	Number of projects and national research agreements with the AAPP	389	450	500
	Number of scientific publications	1.348	1.500	1.800
	Number of patents (2005-2009)	190		
	Number of defended thesis's	176	200	250
	Number of graduate doctors in the past 5 years	891		
	Number of foreign doctors	503	700	800
	Number of researchers	4.100	4.500	5.000
Financials	Budget domestic R & D expenditure	174.651.948	190M€	200M€
	Revenue generated by the research activity (2005-2009)	155.274.023		
	Participation in the 7th Framework Programme	62	70	80
Univ.- Business	University business chairs	85	90	100
	Number of spin-off companies (2005-2009)	42		

INDICATORS		2009-2010	2012	2015	Variation 2010-15
Scientific Activity	Number of research groups	22	25	28	27%
	Number of projects and national research agreements with the AAPP	80	110	150	88%
	Number of international R&D agreements	30	50	80	167%
	Number of technological platform agreements	5	7	10	100%
	Number of scientific publications	100	140	212	112%
	Number of patents	4	8	15	275%
	Number of registered software applications	4	13	20	400%
	Number of Start-ups	8	20	30	275%
	Number of defended thesis's	18	25	35	94%
Number of professors participating in competitive projects	60%	65%	70%	17%	
Phd	Number of graduate doctors in the past 5 years	880	1250	1700	93%
	Doctors with international experience	30%	60%	90%	200%
	Number of foreign doctors	220	412,5	680	209%
Financials	Total annual budget CEI Montegancedo (UPM)	70 (420)M	95 (450)M	130 (500)M	19%
	% for research	28%	30%	30%	7%
	Research Income (UPM)	10M (120)	16M(140)	25M (150)	100%
	% of patents currently in use	10%	30%	40%	300%
	% of software applications currently in use	30%	50%	65%	117%
	Participation in projects in International programs	17	20	25	47%
Infrastructure	Number and type of unique available facilities	2	3	4	100%
	Number of laboratories	5	10	20	300%
	Number of new R&D&I centres built	2	3	5	150%
	% of identified support services launched	30	60	100	233%
HR	Number of Researchers	650	1100	1400	115%
	Number of foreign researchers	20	30	50	150%
Univ.-Business	University business chairs	4	10	15	275%
	Number of projects advised or participated	60	80	100	67%
	Number of spin-off companies	8	20	30	275%
	Number of business ideas presented to the business creation competition	20	40	60	200%
	Number of associated external businesses	10	30	50	400%
Transfer	Business Centres and CAIT	1	2	2	100%
	Number of specific transfer units	1	2	2	100%
	Earnings from business related activities and transfer centres	8M	12M	20M	150%
	% Business ideas being exploited	30%	40%	50%	67%
	Number of researchers from business based in the Campus's centres	35	55	100	186%
	Number of researchers employed (contractors)	10	20	43	330%
	Number of research fellows	35	65	100	186%

2.3 CAMPUS TRANSFORMATION

Starting Point

During the 2009 – 2010 period, the campus of Montegancedo got new R&D&I buildings fully integrated with each other and around the IT School. Additionally the creation and development of the CAIT, with a catering facility that will serve all the R & D centres, the placement of technology demonstrators and the new residence become new landmarks in the campus. Particularly relevant is the CAIT a Support Center for Technological Innovation that will serve as the backbone of communication and coordination between the various stakeholders located on campus

CAMPUS TRANSFORMATION FOR THE DEVELOPMENT OF AN INTEGRAL SOCIAL MODEL	STATUS	CEI	CEI	CEI	INNOCAMPUS	Others
		2009	2010 Phase I	2010 Phase II		
Reuse perimeter ring road.	Completed	x				
Improve security, buildings and people perimeter	Completed	x	x			
Sustainable Design (eco_urbanism), restricted traffic networks, energy harvesting, water purification and waste management.	In progress	x		x		x
Campus urban plan and environmental improvements	In progress	x	x			
Improve communication services and wireless broadband	In progress	x	x	x		
Improve energy efficiency	In progress	x	x			
Establish conferences and diffusion events	In progress	x		x		
Students and teachers residence construction	In progress	x	x			x
Construction and design of unique buildings fully integrated into the natural space with maximum energy efficiency	In progress	x				
Adopt new ways of working: flexibility, efficiency and staff motivation.	Pending	x		x		
Create virtual and physical spaces of transformation and knowledge exchange (Agora)	Pending	x		x		
Adapt urban design to the site.	Pending	x				
UNE 17 001 Implement and buildings and environments accessibility	Pending	x	x			
Create spaces for university associations and unions	Pending	x				
Create an observatory of gender and equality	Pending	x				
Recruitment of urban management specialized staff	Pending		x			
Improve Sports facilities	Pending	x	x	x		
Improve Transport infrastructure	Pending	x	x			
Improve Watercourse recovery	Cancelled	x				
Create Welcome centre	Cancelled	x				
Computer Museum extension	Cancelled	x				

Table 21. Knowledge transfer activities

Strategy

- Further develop and transform the current campus urban planning with various sectorial activities, in order to develop an integrated model of sustainable innovation.
- Increase the overall activity and outputs of the campus thanks to the CAIT
- Construct a transverse architectural axis that acts as a walk, meeting place that allow students and staff of enterprises and R & D centers to meet and exchange ideas.
- Transform the Campus in place for work, learning and research. A WIFI network will be enabled in the whole Campus.

2009 ACTIONS	2010 ACTIONS
<ul style="list-style-type: none"> Improved electrical power distribution 	<ul style="list-style-type: none"> Campus signposting
<ul style="list-style-type: none"> Improved security. CCTV cameras, perimeter fence, access barriers 	<ul style="list-style-type: none"> Road resurfacing and pavement improvement
<ul style="list-style-type: none"> Road illumination with low consumption lamps 	<ul style="list-style-type: none"> Low consumption illumination roll out
<ul style="list-style-type: none"> Campus cleansing and pruning 	<ul style="list-style-type: none"> Wiring replacement
	<ul style="list-style-type: none"> WIFI roll out in the Campus

Action Plan

In order to achieve the transformation of the campus and the development of a comprehensive social model, following actions are required:

Urban redevelopment

Execute building, urban and services improvements

Better university Community services

- Develop actions to promote a comprehensive social model of campus life
- Improve physical and virtual campus accessibility through usage of TIC.

Activities and development

- Urban redevelopment

The conversion of the campus permits the creation of an urban efficient environment and innovative spaces of knowledge transformation. It will allow the harmonious coexistence of university, research centers and companies.

The new urban campus will be assessed for their ability to generate and transform ideas and encourage innovation by acting as an element of social cohesion.

The creation and design of knowledge-intensive campus environments should take into consideration innovation management, corporate culture and the dynamics inside the campus (university, research centers, and businesses in the same technology park). To articulate / enhance knowledge transfer between them is key to prevent them from being independent entities acting on different targets.

- Execute building, urban and services improvements

From the architectural and urbanistic standpoint, we propose to build a unique landscaped setting to create an environment that is perceived as a real "cultural landscape". It ought to be a campus capable of ensuring an adequate and stimulating atmosphere for the development of research activities.

2. Partial Design

- a. Improve access to the Campus
- b. Construction of learning centres and research centres
- c. Construction of the residential area

3. Sustainable design

- a. Restricted traffic areas
- b. Network of sustainable energies
- c. Network of water purification devises
- d. Recycling Network



Fig. 67. Future view of the Campus

○ Communications improvements

In order for the virtual communications network to achieve the planned objectives of complete connectivity and ease of use, we will have to make the following upgrades in our hardware and software.

- Network with a 10bps bandwidth capacity (RedUPM10)
- Special independent services, for select projects, with a network capacity of 1Gbps-10Gbps, linked to the “Red Académica y de Investigación Española” (RedIRIS) network
- Connection to international research networks (GEANT2, Internet2, RedCLARA, etc.)
- Access to the broad band service, with a minimum bandwidth of 1Gbps
- VoIP service, which will open up the possibilities of other services such as: message system; call centre, video and audio conferences, etc.
- Mobility enabling services/devises: Wi-Fi-b/g/n, WIMAX, 3G Mobile, IP telephones connected to the Wi-Fi, Eduroam and Wi-Fi-UPM, invite only access, connectivity with meetings and events, etc.
- Housing and hosting services
- UPM Television, broadcast through a multicast service, connected to RedIRIS
- Video IP surveillance technologies, linked to the wireless network

In order to offer these services, it is important that the following is completed:

- Installation of new hardware such as wireless connections, fibre optics, IP telephone gateways, etc.

○ **Energy efficiency improvements**

The following has been proposed:

- Create an **energy efficiency and saving plan**, with consumption meters placed in visible locations around the campus, allowing for people to gauge their electricity consumption and become conscious of their use
- **Advanced public lighting systems**: solar powered LED light system, used in the street lamps and building lights
- Install **PV solar panels**, powering certain buildings
- Install bioclimatic windows (Intelliglass) on every new building as a prerequisite. The Agora will become a demonstrator for these technologies
- **Place a concentrated Panel Display area** in conjunction with ISFOC & IES as a demonstrator

○ **Sport facilities improvements**

Montegancedo already has various sporting facilities, however the aim of this is to make sport transversal and take it out of the current facilities and place it in the fabric of the campus. The location of Montegancedo, the vegetation, its flora and climate, make it the perfect choice for outdoor activities. Some of the identified options are:

Open the sports facilities to the rest of the university community, with a controlled access
Create an electric and sports bicycle lending facility with 200 bikes. This will help with campus mobility as well as aiding sports.

Build a bicycle line.

Create an automated Gym

Build a running circuit, both on and off campus with outdoor fitness equipment

Relocation of the sports facilities

○ **Transport improvements**

The Montegancedo Campus already has an advanced transport system linking it to Madrid. There is a highway, two busses and a light rail, which come from the city centre; however we believe there is room for improvement.

- Improve the transport routes from Madrid and Pozuelo, by both increasing their frequency and the number of stops.
- Create a mini bus system, powered by renewable energies.

- c. Develop actions to promote a comprehensive social model of campus life

The successful design of a campus should transcend buildings and focus on the individual, their experiences and capacity to generate ideas.

One of Montegancedo's key objectives is the **urban transformation** of the Campus, with sectorial actions to create a social integrated model, focused on people, how they interact and work. With this in mind, the Campus will implement **New Ways of Working**, enabling an increased flexibility, efficiency and motivation of the people. (See fig. 68)



Fig. 68. Social relations model

Community support services

- Install a Banco de Santander bank branch part of the Living Lab UPM-Santander
- Install a catering area in the CAIT (with two levels of service and prices)
- Teachers and Student residence

As stated previously due to the location of the Campus, the establishment of a residency becomes a top priority. It is planned the creation of six modular buildings (a total of 120 seats) for residential use and a modular building with shared services. It will also integrate a small Welcome Centre and Information and Support facilities for the on-campus university community. The project encompasses six buildings of two floors each with a total surface of 300m² and 250m² useful ones. Capacity is planned for 120 people (90 students, 30 teachers). Every housing will have 45m² with a 30% dedicated to shared services. 25% of the space will be reserved to families.

The construction will be done using flexible processes and structures to enable its progressive growth. Through innovative modular construction techniques, applied previously in residential solar modules, two-story building with 10 to 20 rooms per module will be constructed. The construction and subsequent management will be outsourced to a third party.

The complex will be equipped with advanced ITC equipment and technology. In order to finance the work and following one of the themes for the campus, part of the premises will be technology demonstrators.

Home automation demonstrators (Experimenting with sensors, interface human matching, remote applications, etc). Objective is to attract brown and white goods providers.

Hotel of the future demonstrators: Idea is to simulate hotel rooms and services in the residence, as they resemble an aparthotel. Spanish hotel groups and again White and Brown goods companies are good potential partners for these demonstrators

Welcome Center (located in the residence)

This two-story building includes the welcome and information center for the University Community. It has an informal interchange area and a common area with vending machines.

Location

The Project is located at the SE of the plot. The land as a qualification that allows it to be used for university services. The residence topography adapts itself to the terrain.

The project is located in the SE sector of the plot. The land has the urban classification for use of university services. The architecture of the residence is adapted to the topography of the land and is aligned to the ring perimeter of campus. Its location allows quick access from the outside and an easy connection with the rest of the campus including a pedestrian communication with the Light Rail Station

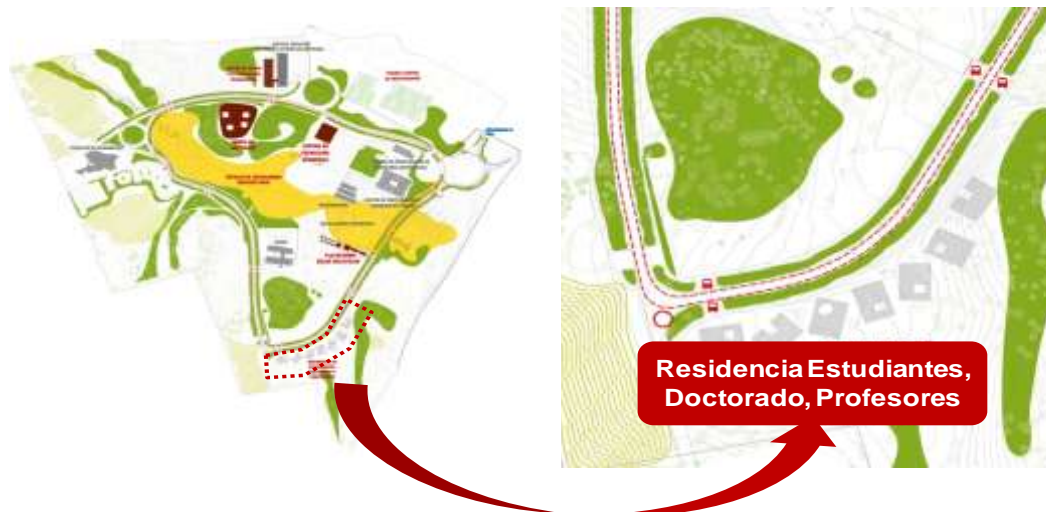


Fig. 69. Location of the residence and welcome center

Environment integration

The project is urbanistically part of campus. The intervention aims to create a permeable architecture, respecting the existing trees and topography.

The project will use pre-existing infrastructure and the plot intervention will respect the surrounding landscape. An acoustic study will be commissioned in order to achieve an acoustic isolation.



Fig. 70. Entorno CEI Montegancedo

Campus accessibility

Access is via bus, light rail, private transport and pedestrian traffic. The main entrance is on the perimeter ring inside the campus distribution. Signposting as well as adequate parking

- Entrepreneurship support
- With the construction of the CAIT, the business building unit has been strengthened, as jointly with the incubator, a wider array of services become available (set up of a network of business angels)
- Accesibility

Accessibility services: Total access for disabled people in line with the UPM general strategy. Personalized support and voluntarism

Participation in the University community

- For students (presentations of various campus activities, organized tours of the various facilities and informal spaces for student interaction)
- For the PDI's (information on the R&D results, recreation area)
- For the PAS (general information, recreation area)
- For the Campus based businesses (professional services, access to the campus facilities)
- For society (open days, school tours, participation in Science Week activities)

The ICE is also aiming to develop an ex-alumni society, which will be linked to the UPM through continuity programmes, job network, and the promotion of postgraduate students among potential employers.

By doing this the Campus aims to increase the relationship between postgraduate students and the UPM, this process will continue throughout their working careers combined with training days and free help services.



Fig. 71. Integridad del Campus

Usability

- Use the event halls in the research centers for events, theatre, spectacle, conferences, presentations, use of ICT Technology in musical events, etc.
- Physical and virtual accessibility tools using ICT solutions

THE CAMPUS MONTEGANCEDO

Over the past 4 years the Campus has developed as part of the UPM's Science and Technology Park, located on a 480,000m² (will be extended to 520,000m²) campus within the district of Pozuelo de Alarcón, to the northwest of Madrid, directly connected by the M-40 highway with Moncloa Campus.

UPM's endorsement for the Montegancedo Campus is clear: in the last five years, Montegancedo has been developed as a venue the Scientific and Technological Park of the UPM running an investment of 65 M € from 2004 to 2010 with a further commitment during 2010 for € 16M.



Fig. 72. Mapa de Montegancedo

Montegancedo Campus now has a population of about 4000 people including students, teachers, researchers and R & D i staff in companies. Researchers and staff in R & D companies have a growth forecast of between 40 and 50%.

PERSONNEL	POPULATION	TOTAL	SCHOOLS/ CENTRES
Students	Degree	2600	IT
	Graduate	400	IT, CTB, CBGP, CeDinT
Teachers		300	IT
Researchers	Currently	150	CBGP
	Expected 2012	200	
	Currently	100	IT
	Expected 2012	150	
	Currently	100	CTB
	Expected 2012	150	
	Currently	50	IMDEA
	Expected 2012	100	
	Currently	60	CeDinT
	Expected 2012	100	
	Currently	40	CITA
	Expected 2012	50	
	Currently	0	Modular construction
	Expected 2012	50	
R&D&I for business	Currently	150	100 Spin offs, 50 LPI
	Expected 2012	300	

Table 22. Staff distribution in the Campus. As is situation and 2012 forecast

The architectural interventions in 2010 will help transform the campus into a comprehensive social model facilitating the interaction with the environment. The buildings planned are:

- R&D&i Centres
 - Center of Sustainable Architecture
 - Support Center of Technological Innovation (CAIT)
 - Living labs, technological demonstrators, exploitation units
- UPM International Graduate School
- UPM International Technical Management School
- Teacher and Student residence (capacity 120)
- Catering centre and restaurant located at the CAIT

The building and or set up of these various centres (particularly the residence) will enhance life in the campus significantly

There is the intention to transform the residence into an innovative best practice and example in modular architecture, capable of growing and adapting to the needs. It will have a strong integration with the environment.



Fig. 73. Teacher and student residence

Summary

2.3. Summary: Campus transformation

- 1 Improve the environment through actions aimed at getting better general services of the Campus for the benefit of the university community
- 2 Creation of a residence for students, teachers and researchers with marked modular character acting Living Lab
- 3 WIFI access allowing to mix work, study, learning anywhere in the Campus

Timeline

STRATEGIC PLAN CAMPUS OF EXCELLENCE_FUNDING

CAMPUS TRANSFORMATION FOR THE DEVELOPMENT OF AN INTEGRAL SOCIAL MODEL	STATUS	CEI 2009	CEI 2010		INNOVOCAMPUS	Others	FUNDING PERIODS													
			Phase I	Phase II			II Sem 2010	I Sem 2011	II Sem 2011	I Sem 2012	II Sem 2012	I Sem 2013	II Sem 2013	I Sem 2014	II Sem 2014	I Sem 2015	II Sem 2015			
Reuse perimeter ring road.	Completed	X																		
Improve security, buildings and people perimeter	Completed	X	X																	
Sustainable Design (eco_urbanism), restricted traffic networks, energy harvesting, water purification and waste management.	In progress	X		X		X														
Campus urban plan and environmental improvements	In progress	X	X																	
Improve communication services and wireless broadband	In progress	X	X	X																
Improve energy efficiency	In progress	X	X																	
Establish conferences and diffusion events	In progress	X		X																
Students and teachers residence construction	In progress	X	X				X													
Construction and design of unique buildings fully integrated into the natural space with maximum energy efficiency	In progress	X																		
Adopt new ways of working: flexibility, efficiency and staff motivation.	Pending	X		X																
Create virtual and physical spaces of transformation and knowledge exchange (Agora)	Pending	X		X																
Adapt urban design to the site.	Pending	X																		
UNE 17 001 Implement and buildings and environments accessibility	Pending	X	X																	
Create spaces for university associations and unions	Pending	X																		
Create an observatory of gender and equality	Pending	X																		
Recruitment of urban management specialized staff	Pending		X																	
Improve Sports facilities	Pending	X	X	X																
Improve Transport infrastructure	Pending	X	X																	
Improve Watercourse recovery	Cancelled	X																		
Create Welcome centre	Cancelled	X																		
Computer Museum extension	Cancelled	X																		

Indicators

Key transformation of campus improvements indicators

KEY INDICATORS		2009-2010	2012	2015	Variation 2010-15
Agreements	Local and regional civil service agreements	2	2	2	0%
	Agreements with local associations	1	5	7	600%
	Agreements with local universities	0	1	2	
Infrastructure	Km of bicycle lane in the Campus and its surrounding districts	1	5	8	700%
	Number of sport facility users from the surrounding districts	0	400	2000	
	Number of local associations present on Campus	0	3	6	
Joint projects	Cultural and artistic activities	12	24	48	300%
	Number of joint awareness programmes	1	6	6	500%
	Number of university and school visits to the Campus	4	15	25	525%

2.4 THEMATIC AREAS OF EXPERTISE: SPECIALIZATION

Starting Point

The Campus is committed to promoting the development of sustainable technology innovation focused on ICTs. In the future, more than 1,000 researchers will investigate on campus within the following lines of research: ICT, plant genomics, home automation, virtual reality, energy efficiency and bioclimatic architecture. Currently, aside from the IT School, the Campus houses: The CITA research institutes (including the USOC-E and the Institute of Microgravity Ignacio de la Riva), CBGP (Biotechnology and Plant Genome Centre), CESVIMA (Supercomputing and Visualization Centre of Madrid) & CEDINT (Integral Home Automation Centre) with a further two, the CTB and IMDEA Software Centre, currently under construction.

Strategy

The main thematic area of expertise in the Campus is ICT Specialization and their vertical and horizontal applications. It plays a key role in the campus as it acts as the integrator, being applied in all the R&D areas of the Campus.

In particular, these new focus areas for the 2010-15 periods do not represent a change of the Strategic Conversion Plan presented last year as part of the CEI process. It represents more a prioritization of some of its elements and the inclusion of a new activity.

Action Plan

The campus specialization focuses on 4 areas

- Research lines/ sector
- Research model
- Aggregation model
- Internationalization

Activities and Development

RESEARCH LINES/ SECTOR

- The campus has a strong specialization in ICT R&D processes and its horizontal and vertical application. (software, biomedical technology, plants genomics, home automation, virtual reality and aerospace)
- Energy efficiency and modular and sustainable architecture.

RESEARCH MODEL:

- An oriented applied research to explore the use of scientific results in products in a brief period of time (science driven engineering)
- An open innovation model oriented by the users and closely connected with the technological developments (user driven open innovation)

AGGREGATION MODEL

- Alliances and agreements with national and international industries focused on technological innovation
- Create and expand R&D&I centers, established in close collaboration with the industry
- Aggregation of the diverse R&D&i centers with leader public entities

INTERNATIONALIZACION

- Support the recruitment of doctors through diverse international programs.
- Support the process of internationalization by Spanish companies which have closed agreements with Montegancedo

Participant aggregations

On the next point we will detail all the aggregations completed under the Campus of Montegancedo. Its high specialization enables a close connection to the private industry, being this a differentiator to other countries.

Summary

2.4. Summary: Specialization Areas

- 1 Establish of research lines of marked specialization in the field of ICT and vertical and horizontal application
- 2 Focus on an applied research model aimed at exploring the use of R & D results
- 3 Establish an open innovation model driven by users

2.5 AGGREGATIONS

Starting Point

One of the keys to the success for Montegancedo, is undoubtedly the strong commitment and institutional support received. The campus of Montegancedo has reached collaboration agreements with multiple public and private agencies. This has allowed having within the Campus technical and research staff of these entities, creating a collaborative framework than can be extrapolated to other institutions.

During the first round in 2009, Montegancedo was highlighted due to the high number of aggregations signed with public and private institutions.

During last year's 2009 CEI call, Montegancedo stood out due to the high number of agreements signed with public and private entities. Noteworthy were the 22 aggregations agreements signed with private entities³ who believed in a new model and way of working. This model surpasses the traditional scope of mere business relations or straight R&D collaboration by entering the field of technological innovation through stable partnerships.

Excellence in science and innovation can only be achieved through collaboration between the public and private sector. The collaboration between University research centres and industry is critical to a successful exploitation of research results spurring a development and revitalization of the innovation process. A typical distinctive characteristic from the campus is the active involvement of business in R&D activities

The Ministry of Education and the Ministry of Science and Innovation encourage the Campuses of Excellence to "add" aggregations open to establish tie knots with the University and develop joint common strategies. The UPM has addressed this goal in Montegancedo through a complementary and unique approach: **select aggregations with private entities able to strengthen their commitment to technological innovation.**

The campus had as a distinctive characteristic from the first round of the CEI, the active involvement of the business sector in R & D & i. Thanks to this; aggregations have been established between collaborating companies with the UPM in areas of technological development and innovation.

Action Plan

³ Aggregations were signed with the following private entities: DEIMOS, GE, GMV, INDRA, ATOS, IBM, ZEISS, ROCHE, T-SYSTEMS, TELEFÓNICA I+D, ELEKTA, FRAUNHOFER, BICG, SANTANDER, FENIM, VODAFONE, ISFOC, LPI, ZETA SEEDS, ACCENTURE, CLARKE&MODET, AETIC.

As part of the strengthening and the signed agreements during 2010, following activities have initiated

- o **Banco Santander:** Aggregation expanded through the creation of the Living Lab: Bank of the Future Living Lab; and executive education. Also agreements to support supercomputing within the Blue Brain Project.
- o **BICG / Fraunhofer Institute IAO:** Aggregation expanded through the creation of a joint strategy for the launch of two Living Labs: One in the retail sector (presumably with the el Corte Inglés as a tractor company) and the other one in the catering business (currently in definition stage).
- o **Clarke and Modet: Sponsoring of** a university industry chair in Montegancedo Campus orientated towards intellectual and industrial property, technology surveillance and patents scrutiny in technological areas of common interest.
- o **T-Systems:** Agreement for the joint exploitation **of the virtual** reality cave with third parties and development of processing data software.
- o **Zeiss:** Development of software for the automation of neural imaging capture through cross-beam microscopy systems of dual-beam.
- o **IBM:** Extend the agreement on the supercomputer Magerit and future agreement on the development of Cloud Computing. A university-industry chair with IBM Rational, has also been signed
- o **Elekta:** MEG installation and subsequent exploitation
- o **INDRA:** Agreement for simulation activities in the area of biomedical engineering

We detail the various agreements reinforced during 2010 with public institutions

- o **INIA:** participation at the Center for Plant Genomics and Biotechnology (CBGP): installation of new laboratories. .
- o **CSIC:** Instituto Cajal incorporation in the Blue Brain project (temporary facility at the CTB).).
- o **Universidad Complutense de Madrid** in the joint laboratory of Cognitive Neurosciences (CTB for the MEG).
- o **Universidad Rey Juan Carlos** de Madrid in the joint laboratory of Neuroimaging (CTB): Capabilities of Alzheimer's image processing.

In addition, the UPM is working to expand this type of agreements with new entities that will facilitate the implementation of new demonstrators, living labs and postgraduate training. Thus, Boeing, MIT, El Corte Inglés and FOUNDATION Madri + d will join the previously mentioned set of aggregations.

Specifically, the agreements being underway are:

- **Atos** (extensión of 2009 agreement)
- Pending an agreement on simulation
- Relocate ATOS simulation activities to Montegancedo as part of a strategic agreement with the UPM on the Aerospace sector.
- ISFOC
- **Field test for PV solar energy:** Collaboration with ISFOC to set a testing ground of half acre in Montegancedo capable of accommodating a plant of 200 KW of photovoltaic concentration with multifunction cells hosting an enterprise willing to use these services.



Fig. 74. PV Concentrator Plant with triple-junction cells at ISFOC in Puertollano

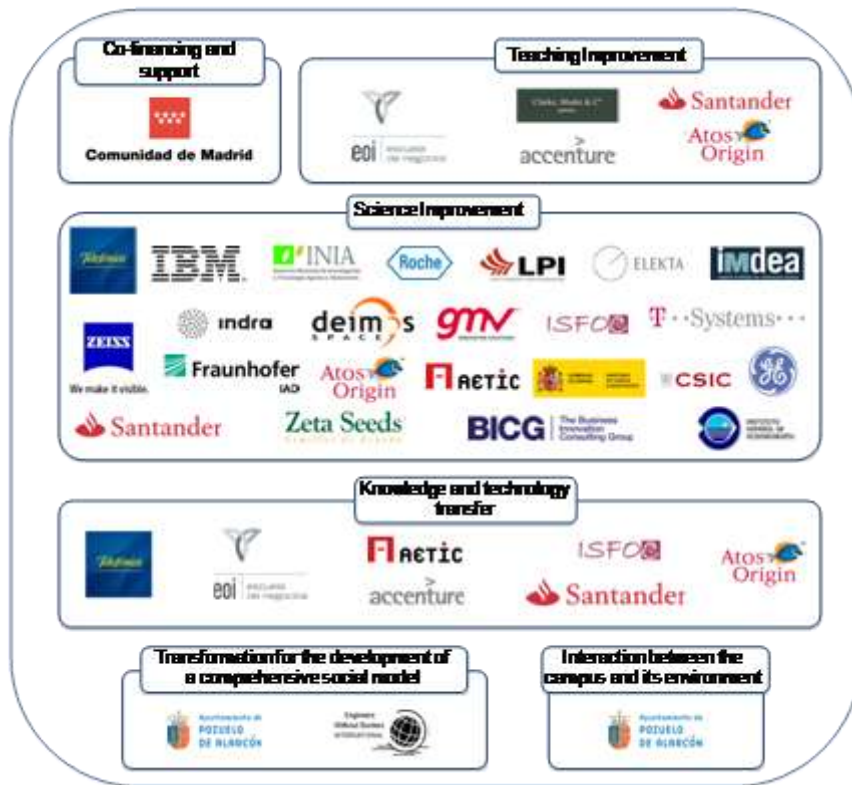
- **Boeing** (new agreement)
- Install a high performing experimentation centre of PV concentrators
- Pilot plant for PV concentration system Boeing-LPI
- **Hospital Ramón y Cajal.** Agreement to establish a neurological lab
- **MIT:** Teaching and research agreement on medical imaging jointly with Foundation Madrid+D as part of the M+Visium project
- **Foundation Europea para la Sociedad de la Información:** Support in the roll out of TV over internet (IP-TV)

Additionally, the UPM has expanded these kinds of agreements with new entities that help the implementation of new demonstrators, living labs and postgraduate training. So Boeing, MIT, El Corte Inglés and Madri + d FOUNDATION join the suite of aggregations mentioned above.

In relation with the **Entrepreneurship and Innovation programme** agreements were implemented with the following firms: Accenture (Innovation, Entrepreneurship and ICT) Digital Ideas Factory (Internet and Business Creation); Savior Venture Capital (Business Creation); Rousaud Costas Duran (Entrepreneurship), Bancaja (Entrepreneurship), Microsoft (Entrepreneurship), FLUOR (Entrepreneurship) Emprendedores Magazine (Entrepreneurship); EOI (Entrepreneurship); Axon Capital (Entrepreneurship); Global Incubator (Business Creation).

In a different area, the **coordination of a network of European technological universities** (Paris Tech, Politecnico di Torino, Oxford University and Technical University of Munich) in an institutional project funded by the European Commission, which will allow for the identifying and adapting of R&D best practices and spread them to all European universities. This will be carried out taking advantage of the resources of the Vice President for Research and the structure associated with CAIT.

LOGOS 2009



AGGREGATION EXPANSION



Governance Model

The UPM has introduced into its governing structure diverse measures as well as developing an internal normative, which like its statute, values and prioritizes aspects relating to research and investigation.

As a result of this process, in the past 5 years, diverse normative reflected in the figure 75, have consolidated the development of their statutes.

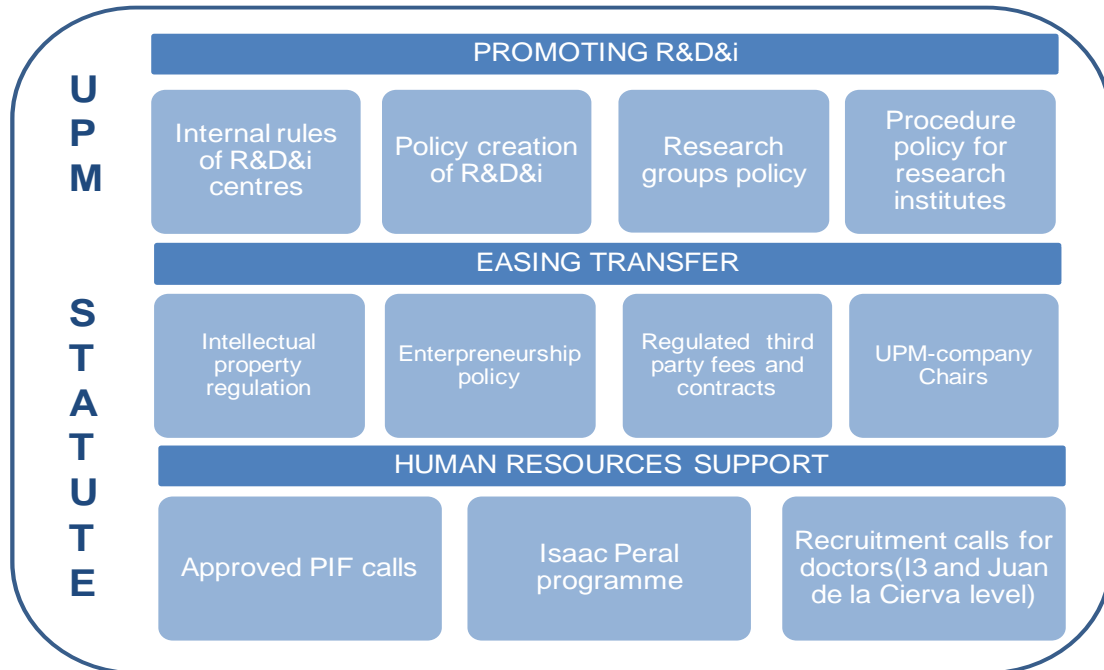


Fig. 75. Statute evolution (2004-2010)

As it can be seen, the developed normative have been classified into three distinct areas: 1) normative governing the promotion of R&D activities oriented towards the creation of new units; 2) normative governing the ease of transfer results, oriented to the exploitation of results; 3) Normative linked to HR in the area of researchers.

It should be noted as the global commitment of the UPM, that all the normative have been approved by the government council.

Other less important normative (that is not present in the figure), which have also been approved are:

- o Normative for associations, governing research structure
- o Normative for the hiring process of public and private entities
- o Normative for entities associated with R&D centres and institutes

Diverse rectorate resolutions have been developing the cited normative and, in certain cases, publishing calls related to them.

In addition, and also with the government council consent, the UPM commenced an **UPM Institutional Quality Plan** (2005). It is a generic plan and affects all areas of the university; however it has a specific focus on research (including aspects related to research).

The application of the Institutional Research Quality Plan, is carried put through a group of indicators, which are applied annually to research groups, centres and R&D&I institutes (applicable to all effects, except those of creation and elimination, which are established in the LOU), These indicators refer to the following aspects.

- o Generation of economic resources
- o Researcher training
- o Diffusion of research results
- o Exploitation of results and technology transfer
- o Recognition of merit (every six years)

The evaluation is performed through the application of the following formula:

$$Y_i = K_i \frac{T}{\sum_j PDI_j * K_j}$$

Y_i is the quantity per PDI of the unit i
 K_i is the weight of the unit i
 T is the total quantity to report
 PDI_i is the number of PDI(doctors) of the unit j
 K_j is the weight of the unit j

As part of the Quality Plan and as a set commitment, the UPM has initiated it own policy to equip its own EFQM Quality Certificates for the groups within the UPM. Its is notable that the European Foundation for Quality Management, has confirmed in their oral report, the concession of the EFQM stamp in its 400+ level to the Technical Architecture University School of the UPM. It is the first Centre in the UPM to receive as silver stamp (400+) from the EFQM.

The support for institution quality is reinforced within the education field through the prioritization of the doctorate programmes and ERASMUS MUNDUS, at the initiation of the UPM International Doctorate School.

In addition to this, they aim to improve the research management with the training programme "management and promotion of international R&D&I programmes", during the formation of a unique specialist degree supported by the MICINN (CDTI, Carlos III and the International Cooperation General Management). With this, they aim to create managers, who will aid in the improved participation in European R&D Programmes (principally the EU R&D Framework Programme).

Summary

2.5. Summary: Aggregations provided

- 1 Great collective effort from UPM to materialize the aggregations
- 2 Strong commitment of others companies in long-term partnerships
- 3 Joint participation in R & D & i long-term projects
- 4 Internationalization effort
- 5 New models of research results exploitation in collaboration with the business sector aggregations

2.6 INTERNATIONAL POLICY

Starting point

The **internationalization of knowledge** is one of the key aspects to greater competitiveness. The competitiveness of the university, and in this case the Montegancedo Campus, should be based upon R&D efforts and an innovation centric culture. This overall effort should involve different stakeholders at a national and international level.

The internationalization of Spanish universities requires not so much of a deep legislative change but instead, a substantial change in **mentality, governance and implementation of concrete** actions.

In order to achieve these aspects, they must be willing to eliminate internal barriers to the opening to the world starting by recognising their own weaknesses in this process. The challenge of international competitiveness requires dilute national boundaries in order to achieve greater efficiency in this multidisciplinary mission of the university.

From an UPM's perspective, regardless of positive factors to the training cooperation in national and international graduate and postgraduate school, the internationalization process is also limited to the need of serving in a better way **international interests of the business sector** with whom it has historically intensively collaborated. The aim is to **anticipate the consequences of a gradual internationalization process** through knowledge obtained by Company networks. These networks have push companies to avoid limiting its contact to a neighbouring university. Many of the companies collaborating in R&D with the UPM are multinational companies with limited pre-established links with universities.

Strategy

Montegancedo Campus is created in response to international challenges. According to the European Vision, international challenges are tackled through the following aspects: the **promotion of the knowledge triangle**, coherent and efficient research programmes, access to excellent research facilities worldwide, the full exploitation of knowledge and Intellectual Property, coherent strategies for international cooperation in science and technology and mobility as well as attractive careers for researchers.

Montegancedo Campus competes since its creation in an international context avoiding being too anchored neither to the territory (diverse backgrounds, diverse geographical areas but common financing) nor in class origin, nor in its activities focused on geographical areas but in the funding sources.

The objectives of internationalization are the following:

- Capture researchers or faculty with competitive salaries
- Attract bright students from other countries with especial focus on third cycle
- Join Spanish companies in their process of internationalization

UPM and consequently Montegancedo Campus have developed an internationalisation strategy that follows an identical evolution. The Campus, as a reference in **open innovation and technology** must have an international dimension based on a global R&D activity. As it is mentioned below, internationalization and open collaboration help to improve innovation process, a key element of our campus.

We support the use of a **model of progressive internationalization** where universities can develop their own policy on this issue and move forward step by step in a "ladder of international excellence." Figure 76 shows all the levels that correspond to the current and future situation where Spanish universities would like to position themselves.

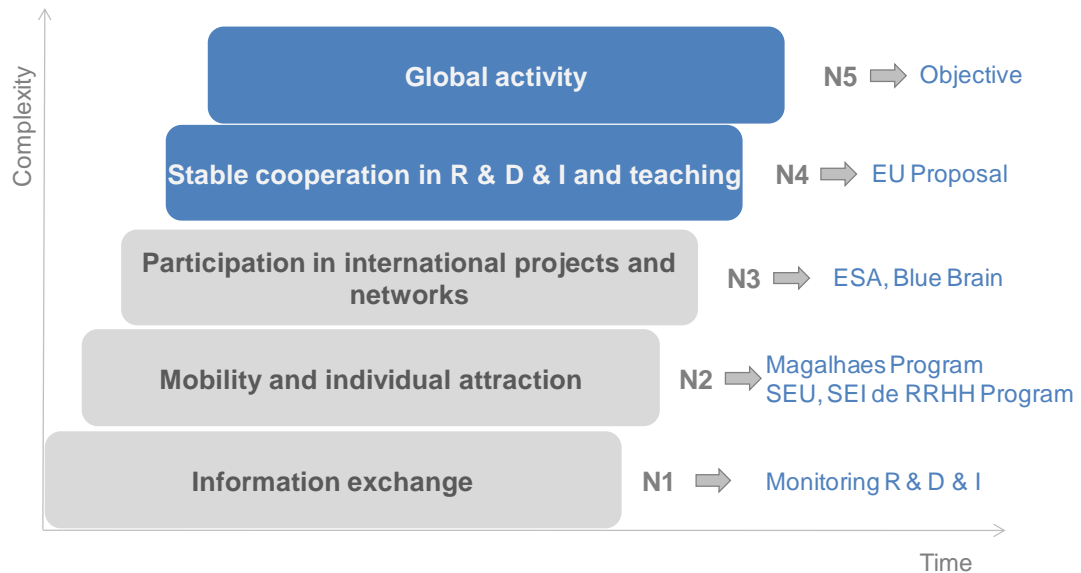


Fig. 76. Internationalization ladder

Assessing UPM’s current scoring it indicates it has comfortably reached level 2 and completed significant actions of level 3. The institutional challenge is to adopt a strategy and a set of measures allowing reaching higher levels in the period 2010-2015. To complete this objective, the UPM should strengthen international cooperation focused mainly associated in the third cycle.

The strategy to be followed should address simultaneously the international training of doctors, mobility of researchers and PhD students, long term strategic alliances and public-private commitments.

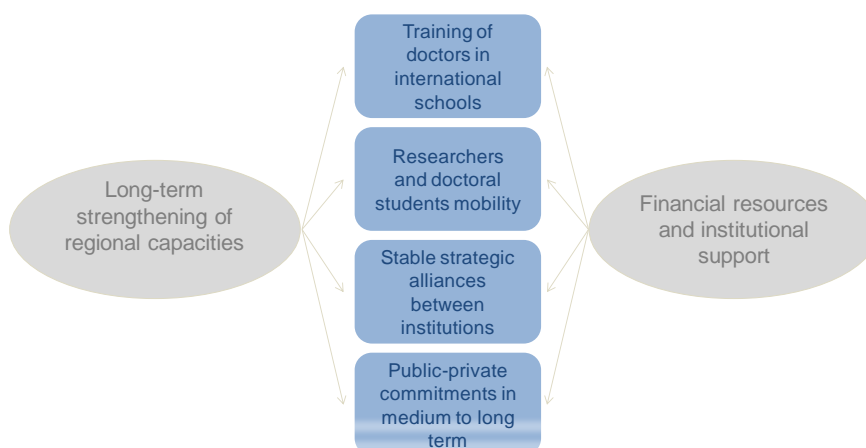


Fig. 77. UPM’s institutional strategy

Most relevant objectives and internationalization actions

1. Set **measurable targets of internationalization in students**, teaching, research, academic staff, economic resources and international presence. This, realistically, will enable the UPM to had achieved level 4 and in some actions level five by 2015. Additionally it will permit the creation of a process of regular monitoring and reporting to the public administrations.
2. Select three or four **academic partners** around the world to **establish institutional arrangements** covering the three core areas of the knowledge triangle forcing concrete action commitments.
3. Develop a financially incentivized **plan for master's and doctor alumni attraction**, permitting an increase in numbers and UPM's visibility
4. Actively participate in international networks of universities.
5. Tackle the **permanent presence** in other countries through the establishment of self-financed joint centres in the areas of greatest strength and international recognition of UPM. In the period 2010-2015 two centres could be created: one focused on R & D activities and the other focused in teaching activities.
6. Develop a recruitment and retention plan for **researchers**. Provide competitive payments channelled through annual international open calls.
7. Support UPM's participation in large **international scientific facilities** from their initiation
8. Support a **joint presence between Spanish companies** and the UPM to cooperate internationally through actions with local members.
9. Create the appropriate **internal structures** to accommodate international students and teaching and research staff.
10. Increase the current teaching and research staff presence in international projects valuing it for their professional promotion.

The proposed measures cannot be achieved immediately and they each have different implantation difficulty levels. In the 2010-2015 period many of the proposed actions must be prioritized. The next table summarizes the relation between all these elements.

LEVEL	GOVERNANCE	TEACHING	RESEARCH	INNOVATION
N1	Alumni comitee	Mobility Agreements	Technological platforms Org. Conferences	
N2	Welcome office International Networks Projects Office	Students stays Attract students	Institutional participation in R & D projects Participation support	Institutional participation in innovative projects
N3	Develop Statutes English Information	Research staff attraction Master Recognition. Double degree	Hire research & teaching staff	Broker Agreements international labs
N4	Administrative staff fluent in English	Doctoral Schools Former foreign students Registration fee	lab creation along with non spanish companies	Support for foreign companies New incubators
N5	Statutes for admin. Staff in English	Campus international	Campus international	Campus international

Table 23. Global vision of suggested measures

Activities & Development

The **internationalization effort** of the UPM and therefore of the Montegancedo Campus, **is focused on three key areas: teaching, research and innovation**. On these three areas, institutional actions and individual actions generated by faculty or researchers based on their own interest are overlapped.

In the information below, we will go more in depth explaining the content of internationalization activities related to teaching, governance, research and innovation that applies to the whole UPM and especially to Montegancedo Campus.

Internationalisation activities focused on teaching

In the teaching perspective an effort has been made in the last years to strengthen relationship with other universities. This aim is mainly to open to students the possibility to take advantage of the teaching offer in other countries. As a result of this, 88 agreements on double diploma have been signed in different fields. Out of this, the mobility of 2000 students has become a reality each year.

Some examples of European organisations with whom they have set an agreement are mentioned in figure 78.

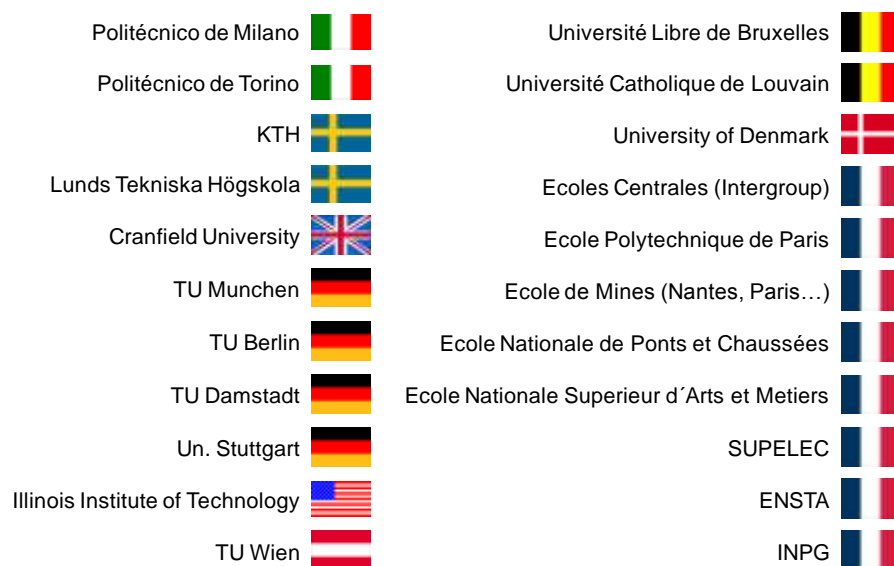


Fig. 78. Examples of agreements with other universities

Mobility for foreign students

Marketing actions abroad to attract new students:

- Hosting of Erasmus Mundus students
- Agreements with other universities
- Priority activities in India, China, LAC, EU, USA
- Increase number of visiting faculty for new postgraduate programmes

In the South American context, it should be highlighted that the UPM is promoting a mobility programme between European and South American technical universities. Additionally and effort is made by the UPM and Montegancedo Campus to send students to do their end of career project in developing countries. In these particular actions, pedagogical aspects and development cooperation aspects are combined.

In the past, international activities have been more developed in the field of teaching. However, there is place for further improvement creating a close link with other fields.

Objetives

1. To improve the degree of internationalisation by favouring the student stay abroad. The objective will be to reach 30% of grade students and 50% of postgraduate students in 2015.
2. To increase students coming from other countries in order to reach 10% of grade students and 30 % of postgraduate students.
3. To increase the teaching offer in English in order to reach 30% of the total offer of grade and 50% of postgraduate programmes in 2015.
4. To set joint programmes with other entities that could be offered out of Spain.
5. To set up a fee model, within the limits established by Local Administrations, that will bear in mind the level (graduate, postgraduate) and the origin of the student (Spain, European Union and third countries)

Implemented measures linked to the education process

1. To increase the stay of students in other countries as a culmination of the process of graduate and post-graduate level.
 - The aim of this activity is to host a high level of students for a minimum period of 3 months (more likely a semester) in another university and to continue studying there for a specific training recognised by the UPM's system.
2. **To attract master and PhD students coming from** different countries with scholarships agreed with interested companies.
 - Even if this decision could focus on the student origin instead of their CV, it is consider an adequate measure to book a % of places for foreign students.
3. To promote the existence of master programmes of international acknowledgement (e.g., ERASMUS Mundus)
 - For this purpose, support measures could be implemented as part of the plan for quality research. These support measures will be materialised in grants for visiting faculty, creation of English support material, mobility of researchers and students.
4. To create and participate in European graduate school with PhD programmes in English.
 - Development in accordance with the Royal Decree of the Ministry of Education.
 - To take advantage of the strategic partners of Montegancedo.
5. To set up quality criteria to sign double degree agreements with other universities.
 - The aim is to create a table of minimum criteria for establishing agreements on double degree.
6. To create the concept of foreign "ex-alumni"
 - This may allow maintaining contact with the aim of having them as especial ambassadors that will help to increase the visibility of the Campus.
7. To establish higher fees for foreign students
 - Use of the maximum cost allowed by the Community of Madrid with ECTS credits on graduate and postgraduate degree.
 - Increase the number of scholarships for the best students.

International governance and structure actions

Main mission is to help the implementation of the internationalization strategy with two key temporal milestones: 2012 and 2015.

Objectives

1. Consolidate or create stable structures in the rectorate, schools and colleges to support the internationalization of the university.
 - The aim is to increase the visibility of UPM's international strategy with a reflection on the UPM organizational structure and decision-making:
2. Implement actions to level 4 in 2012
 - Increase the overall level of internationalization of the UPM in order to be recognized in all Spanish universities and the AAPP:
 - Election of three or four universities that can become strategic partners in UPM's internationalization. This should increase the level of cooperation around the three main pillars: teaching, research and innovation.
 - Selection of three or four Spanish business groups with a strong international presence to reach strategic agreements.
3. Implement Actions to level 5 in 2015
 - Create an integrated approach to maximize the results achieved to date.
 - Establish a linkage with UPM's overall strategy on Development **Cooperation** to allow teaching and knowledge transfer of students in support of developing countries.

International governance actions

1. Formal adoption of the **UPM Internationalization's Strategy** by the Governing Council and later presentation to the Board of Trustees.
 - The aim is to obtain institutional support for the internationalization strategy and separate it from any particular board team as it needs to be address as a long term process
2. Analyze and adjust the **regulations development of the UPM statutes** to suit the goals of internationalization.
 - It is intended that the development of the Statute has an international perspective in all its aspects, thereby avoiding internal barriers in the implementation of strategic development measures.
3. Create an **Internationalization Advisory Commission (CAI)**, 8-10 members from the business sector or other entities that help to define actions in this field.
 - The aim is to provide information and feedback by taking an external point of view.
4. Create the UPM non-Spanish Student Committee.
 - There is a proposal to create a Commission composed of non-Spanish undergraduates, masters and doctoral Alumni in order to meet their particular needs and problems and support them explicitly.
 - The aim is to have representation of this group in all the UPM Students Delegations.
5. Monitor and analyze indicators of international activity.
 - The goal, once defined, is to have a scorecard that allows a tracing of the success of measures implemented and if necessary take necessary corrective actions. It is also intended that this report has an annual basis and make it public within the academic community.

International structure actions

1. Create the **International Welcome Office (OAI)** depending on the International Relations vicerectorate
 - This Initiative has to emerge from the currently existing unit but with a distributed structure with a presence in schools and colleges.
2. Strengthen the European Project Office (OPE)
 - The OPE's goal is to consolidate its existence beyond the Euroscience programme and extend its scope to the human resource activities from international researchers (Not just limited to projects in the strict sense of the term)
3. Adapt the **international relations sections** of schools and colleges to address all aspects of internationalization.
 - The aim is to share this international vision with schools and colleges
4. Participate in **institutional networks** with other European universities to take a proactive role in the implementation of the UPM actions of interest.
 - Priority should be given to participation in networks of technological universities.
 - The case of ULAB (with Oxford, Paris Tech, Politécnico de Torino and the Technical University of Munich) can be a good example.
5. Have all the UPM information in English
 - This effort should be strengthened both on the website as on paper information used to disseminate activities and academic offer.
 - Preparation of consistent, unified and integrated institutional material to support the presence of the UPM in fairs, exhibitions and international conferences.
6. Increase the **percentage of support staff with English proficiency** to 20% in order to make feasible its introduction.

This performance is necessary for the services that will directly relate to international aspects: Department for International Relations, doctoral and postgraduate, research, and related services in schools and colleges

International actions in research

Objectives

1. Improve the **international rankings position** specifically the Shanghai ranking.
2. Increase the **resources obtained through participation in international projects** annually, with the aim of 20% of the resources obtained in R&D&I in 2015.
3. Attract **non-Spanish researchers** in order to reach a 10% of the research staff doctors in 2015.
4. Establish two laboratories or R&D joint ventures with other non-Spanish entities by 2012 (either in Spain or outside).
 - The cases of Brazil and China can be particularly interesting for the UPM.

Key Actions in the research process

1. **Institutional participation in R&D projects** allows for an increase in the international visibility of the UPM
 - Participate primarily in large projects following the experience of Blue Brain or Hipper.
 - These actions can complement the participation in PM or the ESA calls in which the weight and person-years should be increased.
2. Institutional participation in technology platforms or other forums in cooperation with the industry
 - It would be important to have a role in their governance. The experience with “The Future Internet” may be relevant.
3. Support the organization of congresses, seminars. of international character in the UPM facilities
 - Redefine the current call with a new focus on international conferences.
4. Support the participation in European R & D programmes including programme management
 - It would be necessary to strengthen the services offered by OPE.
 - Continue the Finnova programme 2 aimed at recruiting international project managers
5. **Recruit researchers** from other countries
 - Continue and strengthen the UNITE programme part from the COFUND scheme in the People programme.
6. **Establish joint laboratories or research centres** with selected partners in other countries and, if possible, with the participation of multinational Spanish companies.
 - One possible option may be plant genomics in Latin America

In the context of international R&D cooperation one must distinguish UPM's situation with that of the existing one in other EU countries. In EU (or European), the UPM participates in all international R&D programmes (PM, ESA, EUREKA, EDA) but the most important economically is the FP (Framework programme) where we obtained better results than the rest of the Spanish universities. The data available up to July 2010 indicates that UPM has submitted 589 proposals, with 130 having been accepted, as shown in Table 26.


From January 2007 until now	July 19th 2010
Number of internacional projects proposals	730
Number of proposals in 7th Frame Program	589
coordinated by UPM	121(20,5%)
	
From January 2007 until now	July 19th 2010
Number of internacional projects granted	193
Number of proposals in 7th Frame Programs projects granted	130
Coordinated by UPM	22(16,9%)
Total grant UPM in FP7	33.805.717 €
Number of international proposals to be evaluated	54(36 of FP7)

Table 24. Participación en programas de I+D internacionales

The rest of the international R&D projects are distributed in the corresponding European Space Agency (ESA) and other EU programmes. Annually, since 2007 figures are valued at about 10 M €.

Outside of international programmes, UPM should be noted for its qualitative and quantitative importance with its participation in the international Blue Brain Project funded through the Ministry of Science and Innovation with a budget that exceeded one million Euros annually for 10 years. UPM's participation in the in the HiPER project (scientific infrastructure design contained in the ESFRI roadmap) and funded by the Government of the United Kingdom, should also be noted.

UPM International Cooperation with Spanish businesses. In the current situation, there is minimal cooperation in R&D's FP (in most of the pools no Spanish company is involved or there is limited cooperation with UPM).

The UPM considers necessary to increase its cooperation with Spanish businesses in other countries, seeking a better synergy in global R & D & innovation, particularly Europe and Latin America

It would be desirable to have agreements with local entities in geographic areas in which the interests of Spanish industry allow it to establish relations with an institutional presence.

International actions in innovation

Objectives

1. Reach 25% of patents with international extensions
2. License technology in other countries to increase this revenue stream.
3. Support Spanish companies in international relations
4. Support the internationalization of UPM's spin-offs

Proposed actions on the innovation process:

1. Institutional participation in international innovation projects in cooperation with businesses
 - Implement UPM's technological demonstrators (or living labs) in other countries. The limited experience with one of the solar houses in Beijing can be used.
2. Reach **agreements with intermediaries** (brokers) to exploit the technology developed by the UPM in other countries.
 - Need to identify 2-3 field experts.
3. Promote the **internationalization of testing services** through agreements with organizations in other countries.
 - Build upon the growing efforts of internationalization made by UPM's official laboratories (e.g. LOM with ANCA in the U.S.).
4. Use of official research centres to support Spanish companies in their internationalization process by establishing branches in other countries.
 - It may help the certification of products or services
5. Open the **UPM's incubator** to spin-offs from other partner institutions.
 - On a reciprocal basis it may help the internationalization of UPM's spin offs.

On this topic and to promote the internationalization of activities related to incubators, the aim is close agreements with foreign incubators in order to exchange information, experiences and best practices. One of the activities to be undertaken will be to host spin-offs that appreciate the opportunity to open new markets (customer and investors). Business incubators can perform the role of "host" for companies that come from other countries and vice versa. The immediate actions are:

- Access to a physical space.
- The possibility of agreements with local companies installed in the incubator.
- Access to networks of investors with business interests in spin-offs and start-up.

In this regard, the European project led by the UPM U-Lab will act as a driver and allow the contact with European universities including Oxford, TÜM, ParisTech and the Politecnico di Torino.

In relation to International patent extensions these are made based on the real possibilities of exploitation through agreements with other entities (controlled costs). In July 2010 the number of international patent extensions filed during the current year was 18.

There has been limited success in relation to the internationalization of the spin-offs from an institutional point of view. The entrepreneurship programme and the use of incubators are aimed at Spanish companies (predominantly related to UPM).

Finally, there is an area linked to knowledge transfer in developing countries where UPM is particularly active. Firstly, it covers the direct activity of "international projects" with their own calls and secondly there is a relation with two NGOs: **EHEA** (Enlace Hispano de Salud) and **Engineers without Borders**.

Talent promotion and attraction policies

Actions in the field of Human Resources in research

- To contract international doctors
 - Permanent positions within Isaac Peral programme
 - 3 years contracts for young doctors

Montegancedo Campus is the ideal place for experiencing public and private new programmes for contracting researchers.

UPM programmes

- Isaac Peral Programme: New research groups computational biology, Systems biology and medical imaging linked to the CTB centres.
- Contract with doctors
 - Contracts Juan de la Cierva UPM
 - Contracts of young doctors
- Scholarships and contracts with homologated PIF

Even though these programmes apply for the UPM in general, R&D centres located in Montegancedo have taken advantage

- Effort in 2010 concerning Bio Tech initiative of the UPM

In the field of doctors

- The UPM has received a grant from the FP7 People to initiate an institutional programme to contract doctors at international level
 - The only Spanish university participating in COFUND
 - European Union Financing of 40% of the total costs
- Publication of regulatory bases and call for tender in July 2010:
 - 13 postdoctoral contracts of reintegration and incoming (3 years)
 - 3 postdoctoral contracts of outgoing (2 years abroad, 1 year in Spain)

In Montegancedo Campus will be provided

- 5 postdoctoral contracts associated with new research groups of the Isaac Peral Programme
- Co-financing of 3 researchers senior in Isaac Peral Programme

Promotion of the offer abroad

The UPM has generated a new web page of the Montegancedo Campus. In this web page, information will be available (Innocampus and CEI). Moreover, this web page will be the special witness of the evolution of all the activities. This will allow us to follow up the development of the different activities. This web page will be in English and Spanish.

The actual challenge is to adopt a strategy and a set of measures that will allow the strengthening of international cooperation associated to the third cycle and through strategic aggregations.

The UPM wishes to act combining these types of activities simultaneously in a concrete country. In addition to this, they are several areas where this activity could be implemented outside the European Union: BRIC countries. In all cases, a geographical area of activity has been identified.

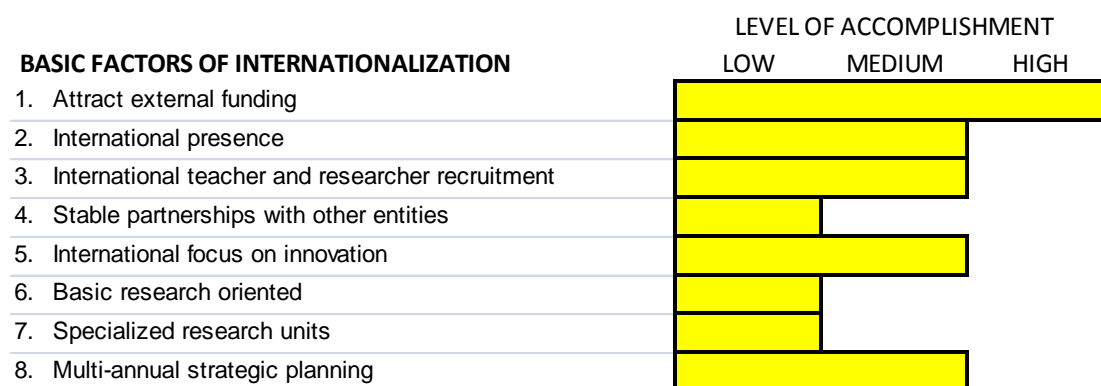
In an international partnership context, finding the right partner in other countries represent an essential element to guarantee of success.

- Strategic aggregations with multinational companies that help to implement activities outside Spain
 - Already existing: Elekta, Zeiss, General Electric, Roche, IBM
 - New ones: Top-Tec, Boeing, MIT, ADFIRM, Repsol, etc.
- International participation in other countries of R&D centres of the Campus
 - Accompanying Spanish companies
- In the field of knowledge transfer
 - Spin offs location in foreign universities or research centres
 - Focused action in South America

Internationalization oriented governance

We consider it necessary to have a university governance profile oriented towards internationalization in order to be successful and achieve higher levels than in the previously presented scoring system

The international governance profile of a university may be summed up in eight basic factors.



UPM wants to address them all, through joint decision committees with R&D centres.

Figure 79 represents the case of two universities with different profiles. The red profile university corresponds to the case of a more conventional university prioritizing research, while the blue one has an international focus.

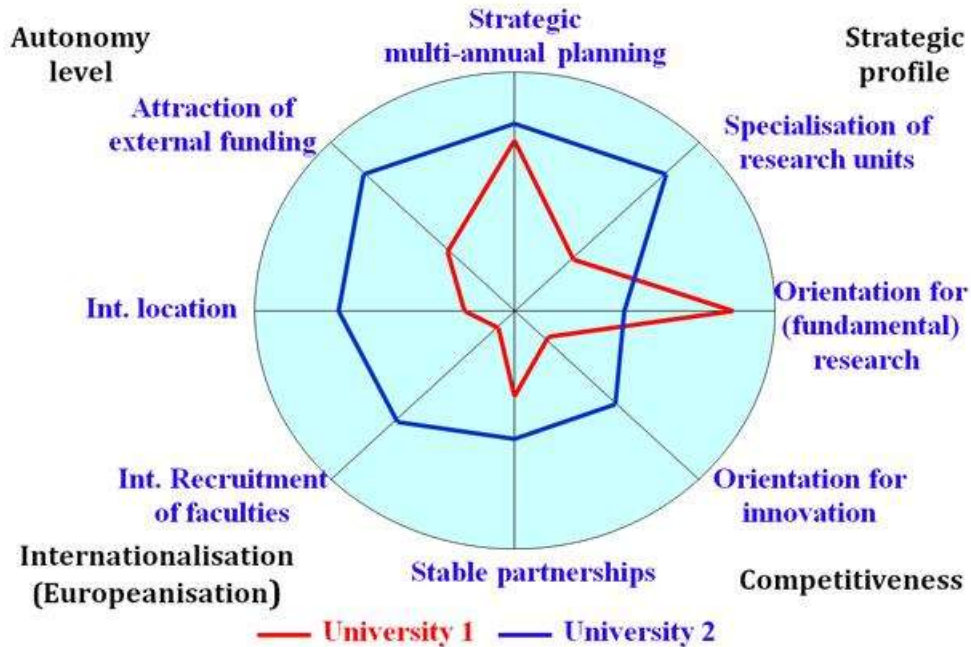


Fig. 79. Factores de gobernanza internacional

The message to transmit is that the governance of intense international cooperation should go beyond the responsibility of a specific unit in the UPM & should rather **permeate the whole university**. In this way all the vice-rectors and sections of schools, colleges, institutes and R&D&I centres (each within their competence) must assume specific responsibilities related to international cooperation.

To prevent issues, such as lack of coordination and overlaps of activities, this model should be based on a **flexible information exchange** with a fluent reporting on actions taken or considered in the governing agencies. Of Importance would be the board's regular meetings with the centres managers.

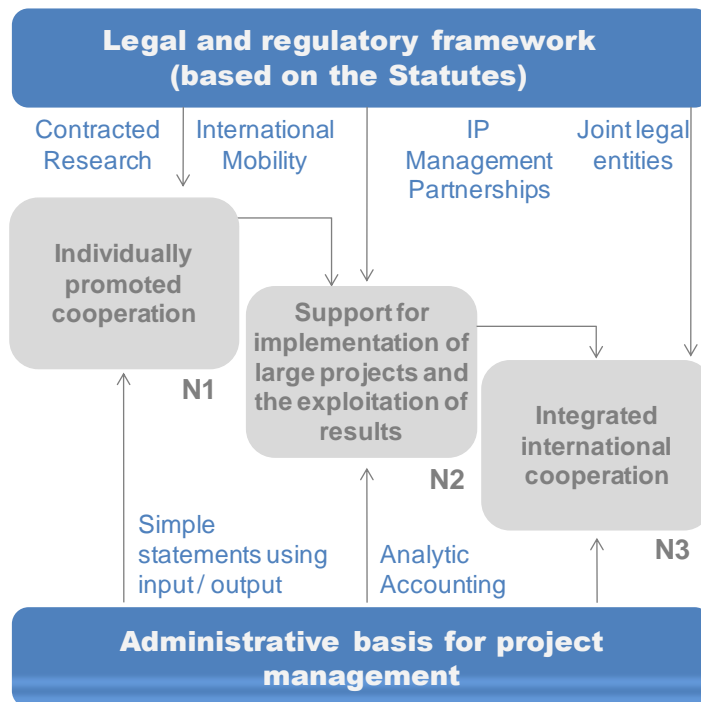


Fig. 80. Marco legal

Summary

2.6. Summary: Internationalization Policy

- 1 UPM internationalization strategy and consequently of the Montengancedo Campus: strong orientation towards internationalization
- 2 Increase internationalization of the teaching activities to attract students and professors from other countries
- 3 Promote the internationalization of researchers and strategic aggregations
- 4 Internationalization of knowledge exploitation through patents and licenses in other countries
- 5 Implementation of HR internationalization programs: Isaac Peral program (in Montengancedo), UNITE program

Indicators

Key International improvements indicators

KEY INDICATORS		2009-2010	2012	2015	Variation 2010-15
Teaching	% foreign PDI	5%	7%	10%	100%
	% of foreign graduate students	4%	7%	10%	150%
	% of foreign master students	36%	40%	50%	39%
	% of foreign doctorate students	36%	40%	50%	39%
	% of professors participating in Innovative Education Teams	22%	27%	35%	61%
	Master's Erasmus Mundus	2	4	6	200%
	Number of English ECTS (graduate)	30	60	80	167%
	% of English taught master's	30%	50%	70%	133%
	No. ERASMUS students received	50	65	90	80%
	No. Of students participating in ERASMUS	70	90	110	57%
	Number of international conferences	5	10	15	200%
	Number of bi-lateral agreements with other European universities	92	100	100	9%
	Number of bi-lateral agreements with non-European universities	23	35	50	117%
	Scientific	Number of international R&D agreements	30	50	80
Doctors with international experience		30%	60%	90%	200%
Number of foreign doctors		220	412,5	680	209%
Participation in International Programs		17	20	25	47%
Number of foreign researchers		20	30	50	150%
Number of associated external businesses		10	30	50	400%

2.7 PARTICIPATION IN THE MODEL OF SUSTAINABLE ECONOMY

Starting point

The Campus Project is in line with the contents of the Sustainable Economy Law and the Law in Science. It contributes effectively to establish an economic model based on knowledge and innovation processes.

Strategy

Integrated sustainability is part of the essence of Montegancedo Campus. Its integrated perspective will be focused in social, environmental and economic aspects.

Action Plan

Economic sustainability refers to re-use of facilities, energy efficiency measures, or a gradual expansion of campus facilities with a low debt ratio. For Montegancedo, the investments made by the UPM have been raised with the requirement to ensure a strong ability to generate revenue outside the classical funding sources.

From a **social perspective**, it has enhanced internationalization, development of equality programs, accessibility, and the student and researcher residence, all of these closely integrated in the environment. The campus becomes a place of teaching, working and researching. Its social engagement is enhanced through collaborative efforts with developing countries, open day activities in the campus and access facilities to the people of the Council, etc.

Finally, **environmental sustainability** implies implementation of CO₂ reduction measures, energy efficiency, photovoltaic research and solar houses, environment adaptation, etc. UPM will commit on gradually improve these aspects in the period 2010-2012 as long as economic resources allow us to do so.

Montegancedo campus is in line with the contents of the Sustainable Economy Law sharing the spirit of competition and differentiation, business aggregation and environmental adaptation to the demands of research and teaching.

Activities and development

Adjustment to the Sustainable Economy Law	
Priority list (Art. 70.2)	Campus Montegancedo activities
Generate highly competitive university campus and high level of differentiation	<ol style="list-style-type: none"> 1 National and international leader 2 Special focus on research results' exploitation 3 Creation of Center for Technological Innovation Support 4 Creation of Living Labs
Encourage campus improving research, transfer of knowledge and	<ol style="list-style-type: none"> 1 Specialization in ICT area and its applications 2 Enhancing knowledge and technology transfer to the productive sector
Promote the aggregation of institutions	<ol style="list-style-type: none"> 1 High number of aggregations with public institutions 2 Strong link with the productive sector (financial sector, technological, legal)
Improve university infrastructure	<ol style="list-style-type: none"> 1 IMDEA Software construction 2 Center for Biomedical Technology Construction 3 Equipment: biomedical, MEG, microscopy, supercomputing 4 Creation of an innovative virtual graduate school, between universities and research related to the CEI Montegancedo
Build a high level of performance of public services to the university community	<ol style="list-style-type: none"> 1 Creation of a students and teachers residence versatile and multifunctional 2 Restoration Services 3 Creation of a campus to live, learn, study, teach
Concentrate on one urban space schools, support services, environments and services that promote sustainable development	<ol style="list-style-type: none"> 1 Concentration in an urban or periurban space: schools, support services, environments and services that promote sustainable development 2 Create virtual and physical spaces of transformation and exchange of knowledge
Strengthening development cooperation, setting CEI as spaces for socialization, of human values transmission and ensuring equality	<ol style="list-style-type: none"> 1 Create spaces for interaction and socialization at the Campus Montegancedo
Add flexible organization of work, including work-life balance measures	<ol style="list-style-type: none"> 1 Implementation of new ways of working related to flexibility, efficiency and staff motivation 2 Creation of new knowledge environments by reducing costs and optimizing space

Table 25. Adaptation of the activities to the LES

Summary

2.7. Summary: Participation in sustainable economic model

- 1 Adjust to the new model of sustainable economy
- 2 An integrated approach to sustainability in the proposed Campus

Indicator

Key participation in a sustainable economy model improvements indicators

	KEY INDICATOR	2009-2010	2012	2015	Variation 2010-15
Facilities	Number of spaces in the hall of residency	0	200	200	
	Number of disable people adapted buildings	100%	100%	100%	0%
	WIFI coverage	100%	100%	100%	0%
	classroom spaces / number of students	1,10	1,00	1,00	-9%
	Laboratory spaces / number of students	0,20	0,30	0,30	49%
Social Integration	Number of programmes aimed at public transport	0	1	2	
	Number of bus line servicing the Campus	2	4	4	100%
	Quantity of renewable energy	10Kw	300KW	1MW	10000%
	Number of events/month open to the public	8	15	20	150%
	Internship agreements	448	500	600	34%
	Students in internships	69	100	150	117%
Diversity	% Female PDI	31%	32%	33%	6%
	% Female students	12%	15%	18%	50%

2.8 ALLIANCES AND NETWORKS

Starting point

The UPM could not achieve its goals without developing links with various institutions, both domestic and foreign. These links enable the ever-scarce resources to be used more efficiently and with greater impact. The complexity and magnitude of R&D challenges, makes imperative the need for alliances. This collaboration with other institutions also allows a rich exchange of experiences.

International networks allow identifying and putting into perspective problems faced by R&D centers, the IT School, companies and the CAIT. As a result of it, global solutions could be found and applied.

Strategy

The UPM intention, in line with its desire to formalize and systematize the process of internationalization, is to strengthen its involvement in the creation of new networks and alliances with other universities, international companies and organizations that support the innovation process.

Action plan

Two key initiatives will mark the UPM and Campus Montegancedo establishing new alliances:

- o ULAB Project
- o Madrid MIT M + Visium Consortium

In addition to the many partnerships presented in the CEI 2009 (see figure 26) we introduce 2 new alliances of special relevance and significance for the campus.

Collaborations	
Projects and Actions	Collaborators
Agreements with large companies	BBVA, Santander Bank, Telefonica, IBM, ROCHE, ZEISS, AETIC, ING, BICG, GE, Elekta, Dragados, Zeta seeds, T-System, LPI, Deimos, GMV, ING
Agreements with public and private entities	European Space Agency (ESA), Astrocarn, Infobiomed, various hospitals (Puerta de Hierro, Gregorio Marañon, Clínico, Infanta Sofia), INIA, IMDEA Energy, IMDEA Software, ISFOC, IES
Agreements with national programmes	Cenit, PSE, Avanza, Profit, OTRI, Eurosciences and Magerit
Agreements with international programmes	EU R&D Programme, EUREKA, CO-Fund
Agreements for the participation in international projects	Plant Genome Centre (bi-national programme with Argentina, Rosario), Blue Brain (EPFL, Switzerland, CSIC and Columbia University)
International R&D agreements	Participation in Knowledge and Innovation Communities (EIT), European Universities Association, Fraunhofer Institute (Future of work), bilateral agreements with the USA and BRIC countries, III Director Plan of Spanish Cooperation, Annual Spanish Cooperation Plan in Development Cooperation
Technological platform agreements	NESSI, INES and MORFEO
University agreements	CEU, Francisco de Vitoria, European Universities, Complutense University of Madrid and Rey Juan Carlos I University
Agreement with the Spanish Scientific and Technology Parks (APTE)	

Table 26. CEI Collaborations and Alliances

Activities

ULAB (University Lab)

UPM wants to collaborate with other Excellence Campus. The ULAB project focuses on the design and creation of the Technical University of the Future. ULAB is a joint research project of five leading technology universities: UPM, Politecnico di Torino, TU Munich (Germany CEI), The University of Oxford and Paris Tech (France promising CEI). The project focuses on establishing new policies on research, valuation and entrepreneurship. It was explained in detail previously.



Source : ministère de l'Enseignement supérieur et de la Recherche - mardi 24 février 2009

Fig. 81. Excellence campus: France 2008, Germany 2006, 2007

The ULAB will operate as a university experimental laboratory to implement best practices. It also will demonstrate how the creation of open innovation networks between universities can increase the quality of research and innovation in the pursuit of excellence.

The results will be disseminated to 4000 higher education institutions, of which 1800 are universities with more than 19 million students and 1.5 million personnel assigned. The UPM as project coordinator strongly influences the general direction of the project.



Relevance

Project has 4 phases: Best practices interexchange, experimentation and piloting, valuation and dissemination

ULAB Project

Research Area

Best practices interchange in research, planning, R&D structures and HR management

Knowledge transfer Area

Best practices in entrepreneurship education

Idea generation competition and new company support

Influencing

Initiative oriented towards the diffusion of Science and Technology among the citizens

Fig. 82. ULAB Parts

This is an institutional project awarded to the UPM in the Capabilities Program of VII Framework Program for R & D in the EU. The project is called "Designing Tomorrow's Technology University"

Madrid MIT M + Visium Consortium

Training and integrated research program on advanced biomedical imaging: MIT, UPM and Fundación Madri + d

Mission/vision of the project

This project is part of the Madrid for knowledge Consortium. Goal is to make Madrid a Knowledge Hub for Southern Europe, Latin America and the Middle East, ensuring Madrid's leadership position in the attraction and creation of knowledge.

Its mission is to establish an alliance between partners to develop specific programs and activities to generate scientific-technological elite in Madrid around three strategic areas. This project will allow the creation of competitive R&D teams with American Universities, Universities of Madrid, (UPM among them) and companies, leveraging existing infrastructure.

Areas and strategic partners

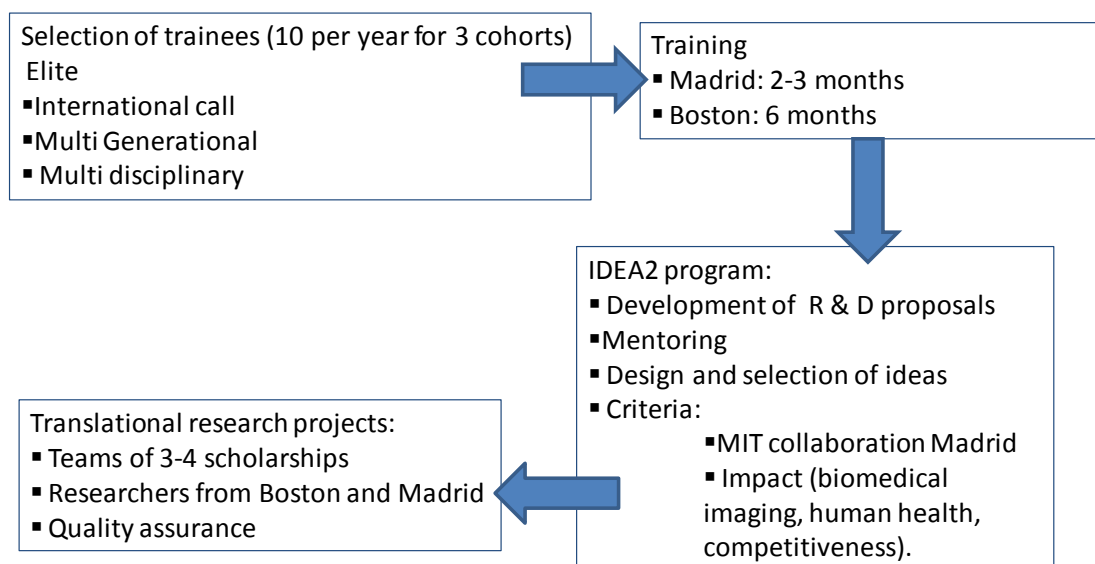
AREA	AMERICAN UNIVERSITY	MADRID UNIVERSITY
MEDICAL IMAGING	MIT	UPM

Project Objectives MIT Medical Imaging

- Promote training, research and transfer of biomedical images
- Increase competitiveness and international profile of universities, research centers and hospitals in Madrid participating in the project.
- Accelerate the potential of Madrid to be an international leader in this area.
- Making education a cornerstone for basic and applied biomedical research in the imaging sector.
- Make teaching and applied research the engine on new discoveries with economic and social benefits.
- Attract health sector investments in Madrid.

Description of activities

- Integrate doctoral training and research in biomedical imaging.
- Emphasis on translational research with hospitals in the Madrid region.
- Create a 5 year scholarship program to establish a scientific elite
- Support awareness activities such as conferences, events, new bonds and evaluations
- Training of 30 doctors (10 doctors cohorts):
 - Training: 3 months in Madrid + 6 months in Boston
 - Project Approach: 3 months in Madrid
 - Research : 1 year in Madrid (with stays in Boston)
- Create an international exploitation office for of R & D results and participation of multinational companies.



Summary

2.8. Summary: Alliances and networks

- 1 Creation of alliances and international networks of excellence.
- 2 Participate in the ULAB project: with international technological universities to create the technological university of the future
- 3 Elitist promotion of excellence through the knowledge consortium created under the Madrid MIT project

ANNEX

Aggregation Card

COUNCIL OF POZUELO



Name:
Council of Pozuelo de Alarcón

Agreement description:
Collaboration with the ICE Montegancedo in innovation, environmental, urbanistic, cultural and educational activities.

Objective:
Strengthen various activities grouped by the different areas of interest.



Complementary factors and specifications:

The UPM will increase its presence and visibility in the council of Pozuelo de Alarcón, through a series of actions, which can be located in buildings outside of the Montegancedo Campus:

1. Facilitate technology-based companies installed in the incubators, managed by the council of Pozuelo. Preferential treatment in the use of ICEs Business Centre's services
2. Participate in scientific-technical cultural events, on offer by the council of Pozuelo, aiming to bring the University closer to the citizens of the municipality.

Activities 2010:
Continuation of 2009 activities.

Calendar:

In September 2009 a collaboration agreement was signed between the Council of Pozuelo de Alarcón and the Technical University of Madrid (UPM), for the transformation of the Montegancedo Campus into an International Campus of Excellence.

ANNEX^{Aggregation card}

ACCENTURE



Name:
Accenture

Agreement Description:
Agreement between the UPM and Accenture in aspects related to teaching and the transfer of knowledge.

Objectives:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Stimulate collaboration between Accenture and the UPM favouring an optimal development of the teaching activities, preferably in the field of:
 - Management and enterprise support for the launch of new high growth potential projects by moving training activities from Accenture to the ICE Montegancedo.
2. Stimulate collaboration between Accenture and the UPM in the knowledge and technology transfer process:
 - Provide support in the setup of technology based companies primarily in the field of Information and Communication Technologies, as well as other technological areas of interest for both institutions, support UPM's existing business creation schemes
 - Provide support in the implementation of technological demonstration zones
 - Provide support in the valuation of research activities and the intellectual property portfolio results

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in November 2009.

ANNEX

Aggregation card

AETIC



Name:

Association for Spanish Electrics, Information Technology and Telecommunications companies (AETIC)

Agreement description:

Agreement between the UPM and AETIC in research, teaching and the transfer of knowledge.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

The R&D&I collaboration objectives between the UPM and AETIC, for the ICE Montegancedo are:

1. Stimulate joint collaboration with AETIC through their Foundation, to optimize teaching activities in Electronics, ICTs and their associated innovation
2. Stimulate the joint cooperation in knowledge and technology transfer processes, with the UPM's associated companies
3. Increase UPM-AETIC collaboration in national and international research activities, through the Spanish Technology Platform (PTE), of which AETIC is the secretary

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in October 2009.

ANNEX

Aggregation Card

ATOS ORIGIN



Name:

Atos Origin S.A.U.

Agreement Description:

Agreement between the UPM and Atos Origin in research, teaching and the transfer of knowledge.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Foster collaboration between Atos Origin and the UPM favouring an optimal development of teaching activities, preferably in the field of:
 - Support postgraduate students by developing training courses, the sharing of best practices and internship offerings in cooperation with various companies.
 - Participation in the ideation and creation of the International Postgraduate School through the creation of joint work groups with the UPM and various companies.
2. Promote collaboration between Atos Origin and the UPM in research activities, through the joint participation in the Aerospace Technology Research Centre.

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Initiated negotiations, pending to formal agreement, around involvement of ATOS in the Concurrent Design Facility. Strategic agreement in the aerospace sector with UPM

Calendar:

A framework agreement was signed in October 2009.

ANNEX

Aggregation card

BICG



Name:

Business Innovation Consulting Group S.L.

Agreement description:

Develop and expand the cooperation framework between the IAO (Fraunhofer Institute), BICG and the UPM, developing mutually beneficial research projects related to “the future of work”. Will be working primarily with the CeDInt.

Objectives:

The objective will be reached through the development of the following actions:

1. Establish relations between IAO, BICG and UPM:
2. Promote joint participation in research activities.
3. Foster the interchange of best practices in the use of virtual reality applied to the New Ways of Working research.

Additional information:

The Memorandum of Understanding will apply to the following areas:

- Area of Virtual Reality: applications based on virtual reality for the simulation of New Ways of Working environments.
- Area of implementation of New Ways of Working linked to ICT (information and communication technologies) in the context of ICE Montegancedo.
- Area of Research Office 21, research platform focused on the future of work created in Germany and to be transferred to Spain.

Improvements to the international position:

Collaboration on International Research Project Office21 on the future of work.

Initiated Best Practices Interchange between BICG.Fraunhofer Institute and UPM

Activities 2010:

Negotiations for the establishment of two Living Labs: In the retail sector (presumably with Corte Inglés as a tractor company) and assisted hospitality.

Calendar:

A Memorandum of Understanding was signed in November 2009 and the definitive agreement in 2010

ANNEX

Aggregation card

BOEING



Name:

Boeing Company

Descripción del acuerdo o convenio:

Agreement between BOEING and the UPM Center of Sustainable Architecture

Objetivo:

1. Development of research projects, development and technological innovation (R&D&i) on issues of common interest. It will focus on the Concentration Photovoltaic Solar Energy, in order to increase the level of science, technology and its applications and improve the business and society competitiveness.
2. The collaboration on design projects, installation, evaluation, monitoring and updating of Concentration Photovoltaic Plant, establishing specific agreements.
3. Promoting the use of renewable energy sources, which contribute to effective development of environmental protection. Reduce dependence on foreign energy and incentive Spanish industry and employment.

Additional information:

- Installation of a center for experimentation in high-performance photovoltaic concentration.
- Projects implementation and research and development programs for the R & D departments and staffs.
- Cooperation in training programs for technical and research staff.
- Advice on issues related to mutual activity of both entities.

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Calendar:

Is negotiating an agreement in July 2010

ANNEX

Aggregation Card

CM&CO



Name:

Clarke, Modet and Company, S.L

Agreement description:

Agreement between UPM-CM&Co in aspects related to teaching.

Objectives:

As part of the ICE Montegancedo launch:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Stimulate collaboration between CM&Co and UPM to favour the optimal development of teaching activity.

- Postgraduate training through definition, class, support collaboration of internships

2. Stimulate cooperation between CM&Co and UPM in knowledge and technology transfer processes.

- Providing support to the technology based new companies with a permanent advisory service in the field of Industrial and Intellectual Property.
- Providing support in industrial and intellectual protection during the creation of a plant DNA centre focused on the validation of vegetal diversity with the UPM centre of Biotechnology and Plant Genome (CBGP).
- Support valuation of research activities results and the IP portfolio. Include related services such as Technological Intelligence and Prospection, protection of intangible assets, valorisation and transfer.

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Created a Chair located in Montegancedo oriented to intellectual and industrial property.

Calendar:

A framework agreement was signed in November 2009.



CEI-CAMPUS MONTEGANCEDO
Universidad Politécnica de Madrid

ANNEX

Aggregation card

COMUNIDAD DE MADRID



Comunidad de Madrid

Name:

Region of Madrid

Agreement description:

Support from the Region of Madrid's Education Ministry, for the Montegancedo Campus.

Objective:

Co financing the development of the Strategic and Viability plan for the conversion into an International Campus of Excellence, in agreement with the included actions from the article 27 of the International Campus of Excellence Open Call, exactly as it was indicated in the PRE/1996/2009 Order from the 20th of July (BOE 23rd July 2009)

Calendar:

In September 2009, a letter of intent, signed by Region of Madrid's Minister of Education, Mrs Lucía Figar de Lacalle, was received

ANNEX

Aggregation Card
CSIC



Name:
Spanish National Research Council

Agreement description:
Memorandum of understanding between UPM and CSIC for the creation of the Information Security Research Centre.

Objectives:
Cooperation and provision of necessary resources for the creation of a research centre in the field of Information Security. Open the participation to other private and public entities.

Additional Information:
Develop the relevant activities for the setup of the Information Security Research Centre, with the participation of researchers from both centres.

Calendar:
Memorandum of understanding was signed in November 2009 for one year, extendable.

ANNEX aggregation card

DEIMOS SPACE



Name:

DEIMOS Space SLU

Agreement description:

Agreement between the UPM and DEIMOS in the area of knowledge transfer

Objective:

- During the ICE development, establish thematic areas and procedures including R&D&I cooperation, postgraduate teaching and advanced services within the ICE Montegancedo scope.
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

The final objectives for the R&D&I collaboration between the UPM and DEIMOS in the ICE Montegancedo are:

Stimulate the collaboration between the UPM and DEIMOS in the process of the transfer of knowledge and technology principally in:

- Support in the start-up of technology demonstration areas and other projects in the areas of:
 - Health (processing of images and medical signs. Telemedicine and tele-aid)
 - Space (GMES-Galileo integration)
 - And various other areas

Improvements to the international position:

Facilitate the attraction of international researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in October 2009.

ANNEX

Aggregation Card

ELEKTA



Name:

Elekta Neuroscience

Agreement description:

Agreement between the CTB UPM and ELEKTA in aspects related joint research

Objectives:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information

1. Foster collaboration between Elekta and the UPM favouring an optimal development of teaching activities, in the field of:

- Advancing the clinical utility and acceptance of magneto encephalography
- Research grants
- Development and validation of diagnostic tests and tools especially for Alzheimer's disease and mild cognitive impairment.
- Further cooperation in areas of mutual interest

Improvements to the international position:

Attracting international students and researchers thanks to MEG.

Activities 2010:

MEG installation and further exploitation.

Calendar:

A framework agreement was signed in November 2009.

ANNEX

Aggregation card

ENERES



Name:

Eneres Technologies S.L.

Agreement description:

Agreement between the UPM and Eneres in teaching, research and knowledge transfer in energy efficiency. Participation in the Bioclimatic Architecture centre.

Objective:

- Establish the strategic guidelines for the implementation of actions for the improvement of the Campus's energy efficiency. Including technological innovation, landscaping, architecture and urbanism. These focus areas will be combined with the incorporation of alternative energies for the Campus.
- Technical assessment for the conservation of the natural habitats, understanding the various options at hand, promoting the image of a sustainable ecological area, in which environmental and innovative values will take preference.
- Collaboration in implementing energy improvements within the Campus, through actions aimed at a reduction in the energy demand and the setup of procedures and mechanisms to collect and reuse renewable energies.

Additional information:

The end objectives for the collaboration in Campus energy improvements between the UPM and ENERES are:

1. Stimulate the collaboration between ENERES and the UPM in order to develop the optimal energy efficiency Campus policy:
 - Participate in the Campus Director Plan for environmental improvements and the installation of renewable energies on Campus.
 - Collaborate in the setup of the EcoCampus project.
2. Stimulate the collaboration between ENERES and the UPM in knowledge and technology transfer processes:
 - Support energy awareness campaigns.
 - Renewable energy and environmental teachings around the Campus
3. Stimulate the collaboration between ENERES and the UPM through joint participation in the new Research Centre (Bioclimatic Architecture)
 - Participation in the ideation and setup
 - Renewable energy and environmental teachings around the Campus
 - Assessment of the environmental criteria for the design of new Campus buildings or installations, as well as the application of bioclimatic architecture techniques and alternative energy solutions
 - Technical collaboration for the reduction of energy consumption, through the progressive installation of energy efficient devices
 - Counselling to promote the creation of alternative energy pilot plants, which facilitate the Campus's energy self-sufficiency.

Improvements to the international position:

Facilitate international talent attraction in sustainable and bioclimatic architecture

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in November 2009.

ANNEX

Aggregation Card

EOI



Name:

EOI Industrial Organization School

Agreement description:

Agreement between the UPM and the EOI in aspects related to teaching

Objectives:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information

1. Foster collaboration between EOI and the UPM favouring an optimal development of teaching activities, preferably in the field of:
 - Support postgraduate teaching and internships in the following disciplines: entrepreneurship, IP management, sustainability, innovation and internationalization
 - EOI will provide support and experience during the ideation and setup of the International Postgraduate School
 - Relocate teaching activities to the ICE Montegancedo
2. Stimulate collaboration between EOI and UPM in the transfer of knowledge and technology:
 - Provide support in the creation of new technology based companies primarily in the field of Information and Communication Technologies, as well as other technologies of interest for both institutions through the support of programmes boosting the creation of companies at the UPM.
 - Provide support in the implementation of technological demonstration areas.
 - Provide support in the valuation of research activities and the intellectual property portfolio results

Improvements to the international position:

Facilitate the attraction of international students and researchers to international postgraduate courses.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in November 2009.

ANNEX Aggregation Card

FDI

FDI FACTORIA DIGITAL
D E I D E A S

Name:

FDI INCUBADORA DE INTERNET S.L.

Convention and Agreement description:

Agreement between UPM and FDI in aspects related to training and transfer of knowledge.

Objectives:

- The establishment of thematic areas and procedures for the cooperation in R&D&i, training of postgraduate and advanced services between both entities in the framework of the development of ICE of Montegancedo.
- The determination of procedures allowing the definition and starting point of agreements as well as the joint participation in official announcements of Public Administration and conventions covered by article 83 of the LOU.

Additional information:

1. Stimulate collaboration between FDI and the UPM to favour an optimal development of teaching activities, preferably in the field of:
2. Support management and entrepreneurship during the launch of high growth potential initiatives by relocating FDI training activities to ICE Montegancedo
3. Stimulate collaboration between FDI and the UPM in knowledge and technology transfer processes:
 - Provide support in the creation of new technology based companies mainly in the field of new ICTs, as well as other technologies of interest for both institutions through the support of new business creation programmes.
 - Provide support in the implementation of technology demonstrators
 - Provide support in the valuation of research activities results and the IP portfolio. Perform competitive viability analysis.

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement has been signed in November 2009.

ANNEX Aggregation Card

EUROPEAN FOUNDATION FOR INFORMATION SOCIETY

Name:

European Foundation for the Information Society (Ministry of Industry)

Convention or Agreement description:

Support the development and implementation of Internet television devices (IPTV)

Objectives:

Jointly promote the development of UPM research platform 3D-HDTV, establishing a laboratory for the areas of acquisition, characterization, compression, distribution and display of 3D audiovisual materials. The distribution of content will be both online (IP3DTV) and as radio diffusion.

Complementary factors and specification:

Promote knowledge transfer of technological demonstrators (Development of 3D TV demonstrator)

Calendar:

Agreement signed in July 2010.

ANNEX Aggregation Card

GENERAL ELECTRIC HEALTHCARE



Name:

General Electric Healthcare (GEHC)

Agreement description:

GE Healthcare (GEHC) is pursuing discussions with the UPM regarding the participation of GEHC in the CTB (Biomedical Technology Centre) Research Centre in Madrid.

Objective:

The technological challenges of healthcare in the future will be related to the integration of several scientific and clinical disciplines. A stable environment of multi-disciplinary research will be required for pre-disposition patient risk identification, earlier detection and more accurate diagnostics. The leadership of the UPM research lines and working groups and its large experience in biomedical technology together with the GEHC expertise and leadership in pharmaceutical solutions, genomics, molecular imaging, diagnostics technology and information systems will provide unique synergies to approach an interdisciplinary research centre of excellence.

Additional information:

The principal lines of health care research in which the UPM and GEHC will interact are:

1. Alzheimer: Investigation of early diagnosis for Alzheimer's disease and more generally Dementia is of strategic importance.
2. Parkinson: Understanding of Parkinson's disease and other neurodegenerative pathologies progression for early detection and personalized health care.
3. Brain Communication Network: Analysis of neural oscillations associated to cognitive functions
4. Diabetes: Biomedical technology Analysis and decision support tools for therapy monitoring, Diabetes type.

Improvements to the international position:

Facilitate activities outside Spain as a multinational company

2010 Activities:

Develop various agreements related to R&D projects started in the CTB.

Calendar:

A memorandum of understanding was signed in November 2009.

ANNEX

Aggregation Card

GMV



Name:

GMV Innovating Solutions S.L.

Convention or Agreement description:

Agreement between UPM and GMV in aspects related to teaching, research and knowledge transfer.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

Stimulate collaboration between GMV and UPM to favour the development of the teaching activity mainly in the following fields:

- Support postgraduate students by developing training courses, best practice sharing and internship offerings in cooperation with various companies.
- Participate in the ideation and creation of the International Postgraduate School
- Support for the ICE Montegancedo during the personnel training activities.
- Stimulate collaboration between GMV and the UPM in the transfer of knowledge and technology:
- Providing support in the creation of technological demonstrator zones in the following fields: Space technology, information technology linked to the informatics security, medical simulators.
- Provide valuation of results in research and intellectual property.
- Promote cooperation between GMV and UPM in research activities through the joint participation in research centres.

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in October 2009.

ANNEX

Aggregation Card

IBM



Name:

International Business Machines S.A (IBM SA) and Spanish Global Services S.A (IBM-GSE)

Agreement description:

Agreement between the UPM and IBM in aspects related to teaching, research and transfer of knowledge.

Objective:

Establish an action framework for the collaboration between the UPM and IBM in the development of activities of mutual interest.

Additional information:

1. Support the development of activities, which promote the use of information technologies.
2. Organize and carry out courses, seminars, meetings and open days, with the aim of strengthening teaching and research, these can be either periodic or once off.
3. Reinforce the collaboration between both parties, in order to strengthen traditional and continuous teaching and in the development of information technology researcher studies and careers, within IBM's product and technology scope.
4. Organize and carryout activities, events and programmes that strengthen R&D&I.
5. Promote and strengthen activities that facilitate the incorporation of students into their professional careers.

Improvements to the international position:

Facilitate activities outside Spain thanks as a multinational company. Attracting international students and researchers worldwide.

Activities 2010:

Extension of the agreement on the supercomputer Magerit and future agreement for the development of Cloud Computing. It has also signed a university-industry chair with IBM Rational.

Calendar:

A collaboration framework agreement was signed in November 2009.

ANNEX

Aggregation card

IEO



Name:

Spanish Oceanographic Institute

Agreement description:

Initiate the collaboration between the UPM and IEO, establishing a collaboration agreement framework for the development of marine research, which will include the creation of joint science-technology centre.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

The objectives for the R&D&I collaboration between the IEO and the ICE Montegancedo are:

1. Stimulate the collaboration between the IEO and the UPM in knowledge and technology transfer processes
2. Foster the collaboration between the IEO and the UPM in research activities through the joint creation of a research centre
3. Stimulate the collaboration between the IEO and the UPM in order to develop optimal teaching activities

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in November 2009.

ANNEX

Aggregation Card

FRAUNHOFER IAO INSTITUTE



Name:

Fraunhofer IAO Institute

Agreement description:

Develop and expand the cooperation framework between BICG, the Fraunhofer IAO and the UPM, developing mutually beneficial research projects related to “the future of work”. Will be working primarily with the CeDInt.

Objectives:

1. Establish relations between IAO, BICG and UPM:
2. Promote joint participation in research activities.
3. Foster the interchange of best practices in the use of VR applied to research on New Ways of Working.

Additional information:

The memorandum of understanding will have main application to the following areas:

- Area of Virtual Reality: applications based on virtual reality for the simulation of new ways of working environments.
- Area of implementation of New Ways of Working linked to ICT (information communication technologies) in the context of CEI Montegancedo.
- Area of Research Office 21, research platform focused on the future of work created in Germany and to be transferred to Spain.

Improvements to the international position:

Collaboration on International Research Project Office21 on the future of work.

Initiated Best Practices interchange between UPM-BICG-Fraunhofer IAO

Activities 2010:

Negotiations for the establishment of two Living Labs: In the retail sector (presumably with Corte Inglés as a tractor company) and assisted hospitality.

Calendar:

The Memorandum of Understanding was signed in November 2009

ANNEX

Aggregation card

IMDEA SOFTWARE



Name:

IMDEA Software Foundation

Agreement description:

Agreement between the UPM and the IMDEA Software Foundation

Objective:

The agreement objective aims to compliment and complete the 2007 IMDEA Software and UPM agreement. In particular the new agreement establishes the Montegancedo Computing Faculty as the provisional home for the IMDEA Software Foundation.

Additional information:

The Computing faculty and IMDEA SW recognize their mutual interest linking both institutions, through agreements and joint activities.

IMDEA and the UPM will promote this agreement and commit themselves to make special efforts to successfully execute previous and new agreements

Improvements to the international position:

Joint participation in international R & D projects

Activities 2010:

Construction of the new IMDEA building in the Campus

Calendar:

A framework agreement between the Computing Faculty and the IMDEA Software Foundation was signed on the 14th of December 2007, complimenting the previously signed agreement between IMDEA SW and the UPM, signed on the 4th of December 2007.

ANNEX

Aggregation card

INDRA



Name:

INDRA

Agreement description:

Agreement between the UPM and INDRA for teaching, research and the transfer of knowledge. Participation in the CTB.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Stimulate the collaboration between INDRA and the UPM for the optimal development of teaching activities:
 - Postgraduate training through the ideation, exchange and collaboration in internships
 - Participation and setup of the International Postgraduate School
 - Relocation of some training activities from INDRA to the ICE Montegancedo
2. Stimulate the collaboration between INDRA and the UPM in knowledge and technology transfer processes:
 - Support in the creation of new technology companies
 - Support in the setup of technology demonstration areas
 - Provide support in the valuation of research activities and the intellectual property portfolio result
3. Stimulate the collaboration between INDRA and the UPM through the joint participation in the Research Centre CTB
 - Participation in the ideation and setup
 - Create joint units in the following areas: analysis, integration and recovery systems and sanitary technologies
 - Exploit the collaboration between INDRA and the UPM in the ICT research of frequency and image processing, through the creation of a joint unit
 - Stimulate future areas of joint research collaboration in mutual areas of interest

Improvements to the international position:

Facilitate the implementation of software activities in India. Attract students and researchers to international postgraduate courses.

Activities 2010:

Continuation of the activities of 2009. Negotiations on possible future collaborations in biomedicine. Relocate to the CTB all joint projects

Calendar:

A collaboration framework agreement was signed in November 2009.

ANNEX

Aggregation Card

INIA



Name:

National Agrarian and Alimentary Research and Technology Institute (INIA)

Agreement description:

Cooperation in joint training and research activities, mainly in the field of postgraduate training with the organization of an international course on “Genomics and bioinformatics in plants improvement”, extend the agreement in place with the Biotechnological and Plants Genomic Centre (CBGP) through the participation of new research groups from INIA. Promote cooperation in information access processes and electronic databases.

Objectives:

Interaction between UPM and INIA in teaching and research in relation with the Biotechnological and Plants Genomic Centre (CBGP).

Additional information:

Promoting joint research between the UPM and INIA in the CBGP through the participation of new researchers from INIA, access to INIA’s database and location of INIA’s programme of international postgraduate courses in the ICE Montegancedo.

Improvements to the international position:

Attracting international students and researchers to postgraduate degree in "Genomics and Bioinformatics in Plant Improvement"

Activities 2010:

Continuation of 2009 activities.

Calendar:

Framework agreement signed in October 2009. Creation of a working group composed by researchers from INIA and UPM for the initiation and monitoring of agreed activities.

ANNEX

Aggregation card

ISFOC



Name:

Concentration Photovoltaic Systems Institute SAU

Agreement or Convention Description:

Agreement between ISFOC and the Bioclimatic Architecture Centre of the UPM

Objectives:

1. Research, development and technological innovation projects in topics of common interest, like solar photovoltaic concentration energy. Improve level of science, technology and applications as well as the competitiveness of companies and the society.
2. Collaborate in designing, installing, evaluating, supervising and up-dating photovoltaic concentration plants, for which concrete agreements will be signed.
3. Promote the use of renewable energies sources. Contribute to the protection of the environment by reducing dependency on traditional energy and serve as a motivating factor for the Spanish Industry and employment.

Additional information:

Modalities of cooperation:

- Installation and monitoring of photovoltaic plants mainly (but not exclusively) of concentration.
- Execution of projects and R&D programmes by R&D&I departments and personnel of both institutions.
- Cooperation in research and technical personnel training programmes.
- Mutual advice in matters related to the activities developed by both entities.

Improvements to the international position:

Facilitate the attraction of international talent in bioclimatic and sustainable architecture.

Activities 2010:

Continuation of 2009 activities.

Calendar:

The collaboration agreement was signed in November 2009.

ANNEX

Aggregation Card

LPI-IIC



Name:

Light Prescriptions Innovators Ilc

Agreement description:

Agreement between Light Prescriptions Innovators Ilc and the UPM's CEDINT Centre (Integral Domotic)

Objectives:

1. Collaborate in specific innovation and science and technology development activities:
 - Sign service provision contracts
 - Participate in national and international R&D projects in the field of optic engineering
 - Support UPM student teaching activities such as thesis, end of career projects, etc
 - Support staff training activities in optic technologies and their applications

Additional information:

The R&D activities of LPI-Ilc and CEDINT-UPM in the field of advanced optics are complementary. This allows for cooperation in the research and development of advanced optic systems for solar photovoltaic concentration applications; image optics for general systems and ultra compact projection; optics for non-guided optic broadband communication applications.

The cooperation projects developed in the framework of this agreement over the past year are:

1. "LED-TV: Study on the technical viability of a backlight system for digital TV displays, based on LED technology" (CAM).
2. "OSV: Advanced optics for the optimization of the panoramic vision sensor resolution used in observatories and surveillance" (MITYC).
3. "F3: New generation of high efficiency photovoltaic concentrators" (IMADE-CAM).
4. "ABL: Technological research of new light bulb designs, based on LEDs" (IMADE-CAM).

Improvements to the international position:

Facilitate activities outside Spain as a multinational company and attract students and researchers to international doctorate and postgraduate courses.

Activities 2010:

Continuation of 2009 activities and create a space for LPI in CEDINT (LL strategic partner along with Boeing)

Calendar:

The Social Council of the UPM approved the agreement in 2007. The duration of the activity is 2 years renewable for an equal period of time, by tacit agreement.

ANNEX Aggregation card

MADRID NETWORK



Madrid Network

Name:
Madrid Network Association

Agreement description:
Agreement between the UPM and the Madrid Network Association in aspects related to teaching and the transfer of knowledge.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Stimulate collaboration between the Madrid Network Association and the UPM favouring an optimal development of teaching activities:
 - Postgraduate training through the ideation, exchange and collaboration in internships and specialized master's courses.
 - Participation and setup of the International Postgraduate School
2. Stimulate the collaboration between the Madrid Network Association and the UPM in knowledge and technology transfer:
 - Support the creation of new technology based companies
 - Support the setup of technology demonstration areas
 - Provide support in the valuation of research activities and the intellectual property portfolio results

Improvements to the international position:

Facilitate the attraction of international students and researchers.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A collaboration framework agreement was signed in November 2009.

ANNEX

Aggregation Card

TRAINING CENTER PADRE PIQUER



Name:

Training Center Padre Piquer (Obra Social Caja Madrid)

Agreement description:

Collaborate with Padre Piquer Training Centre as part of the agreement with secondary schools and vocational institutes.

Objectives:

The action group UPM-Padre Piquer Training Centre will improve mutual educational aspects. Action lines:

1. Creating Educational Innovation activities
2. Workshops and round table to share experiences
3. Preparation of teaching materials in digital media for self-evaluation and self-study, (OpenCourseWare, Starting Point)
4. Intensified cooperation with students and minorities
5. Sharing best practices in collaboration with the productive sector

Complementary factors and specification:

Providing information on educational options and career opportunities, pre-university orientation, the adjustment between supply and demand and the start of professional experience.

Calendar:

Agreement signed in July 2010.

ANNEX

Aggregation card

ROCHE DIAGNOSTICS S.L.



Name:

Roche Diagnostics S.L.

Agreement description:

Collaboration in joint teaching activities within the official master's of agroforestry biotechnology and the international postgraduate courses organised by the UPM and INIA. Development of research projects through the creation of a genomics laboratory in the Biotechnology and Plant Genome Centre with the necessary equipment to implement ultra sequencing, functional genomics, biology systems and development of joint R&D&I projects. Main objective is to develop genotype platforms for species of agroforestry interest and pathogen detection.

Objectives:

Agreements between the UPM and Roche Diagnostics in fields of training and research

Additional information:

Promoting the private sector participation in the training of biotechnology, genomics and applied bioinformatics for vegetal genetics. Creation of a genomics laboratory using state of the art equipment, developed by Roche Diagnostics. Pursue joint R&D&I projects.

Improvements to the international position:

Facilitate activities outside Spain as a multinational company and attract students and researchers to international postgraduate courses.

Activities 2010:

Continuation of 2009 activities.

Calendar:

The Framework agreement was signed in October 2009 creating a work team composed by Roche Diagnostics and the UPM, with the objective to initiate and monitor the agreed actions.

ANNEX aggregation card

SANTANDER

**Name:**

Banco Santander, S.A.

Agreement description:

Agreement between the UPM and Banco Santander in research, teaching and the transfer of knowledge.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

The research fields of interest for the joint collaboration between the UPM and Banco Santander, in the creation of the ICE Montegancedo are:

1. Foster collaboration between Banco Santander and the UPM favouring an optimal development of teaching activities, preferably in the field of:
 - Postgraduate training in the area of financial services information technologies
 - University-business collaboration for IT graduates, providing internship opportunities with the bank, its subsidiaries or its suppliers.
2. Stimulate the UPM- Santander collaboration in technology and knowledge transfer processes, defining scenarios of future technology use:
 - Support the creation of a concept demonstrator “Bank office of the future”
 - Definition of specific ICT operational scenarios
3. Promote collaboration between Banco Santander and the UPM in research, development and technology innovation areas, such as:
 - Collaboration and initiation of R&D&I projects in areas of mutual interest
 - The study of pilot environments

Improvements to the international position:

International Collaboration on Blue Brain Project. Company linked to the new graduate and doctorate school in international UPM Campus Montegancedo.

Activities 2010:

Agreement with Prohuban Santander Group to support supercomputing. The agreements have been extended to two activities areas: creation of the Bank of the Future Living Lab and management training activities.

Calendar:

A framework agreement was signed in November 2009

ANNEX Aggregation card TELEFÓNICA I+D



Name:

Telefónica R&D SA

Agreement description:

Agreement between the UPM and Telefónica R&D in aspects related to teaching, research and transfer of knowledge. Participation with the CeDInt centre.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Stimulate cooperation between Telefónica R&D and the UPM promoting the development of teaching activities in the following fields:
 - Support postgraduate students by developing training courses, best practice sharing and internship offerings in cooperation with various companies.
2. Viability study to evaluate the possibility of partially hosting Telefónica's R&D training activities in the ICE Montegancedo.
3. Stimulate collaboration between Telefónica R&D and the UPM in knowledge and technology transfer processes.
 - Provide support in the creation of new technology-based companies within the ICT field, through collaboration with the f2i institute.
 - Provide support in the creation of technology demonstrators areas related to communications and contents.
4. Promote cooperation between Telefónica R&D and the UPM in research activities through a joint participation in the CeDInt.

Improvements to the international position:

Facilitate activities outside Spain as a multinational company and attract students and researchers to international postgraduate courses.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in November 2009.

ANNEX

Aggregation card

T-SYSTEMS



Name:
T-Sytems

Agreement description:
Agreement between T-Systems and CeDInt-UPM.

Objectives:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- UPM student training activities (end of career projects, master's and doctoral thesis) and T-Systems technical personnel training in the field of virtual reality technology and applications.

Additional information:

T-Systems and the CeDInt-UPM Virtual Reality (VR) team have many complementary R&D activities, which have allowed for the development of several joint research projects in virtual reality applications. The areas of activity are the following:

- Virtual simulation of domotic environments, improving the user interface, for final user applications and also in training applications for professionals.
- Development of network VR web based applications for the digitalization of bones, growth of white tissues and elaboration of digital medical libraries.
- Development of VR applications for remote teaching.
- Development of virtual systems of identification and control for refineries, port environments and security areas.

The ICT projects for the period 2008-2009 are:

1. "DVD: New Systems of Virtual Reality for the Disabled" in cooperation with T-Systems and Eneo (MITYC). This project was awarded the second prize in TREELOGIC innovating spirit competition, 2009.
2. "CRANEO: Design and implementation of software solutions in the field of legal medicine and virtual surgery" with T-Systems, Legal Medicine School of the Complutense University and Perio Clinic (MITYC).

Additionally, T-Systems has partially financed the CAVE facility, a 5 sided, total immersion Virtual Reality device, located within the CeDInt building of the Montegancedo Campus.

Improvements to the international position:

Campus Montegancedo is a pioneer by installing the first five-sided cave in southern Europe.

Activities 2010:

Agreement on joint exploitation of the virtual reality cave to third parties and development of SW systems for processing data in certain domains.

Calendar:

The agreement has been approved by the Social Council of the UPM in 2007. It has a 2-year duration period, extendable for an equal period.

ANNEX

Aggregation Card

ULAB



Name:

ULAB (UPM-Montegancedo, Oxford, Paris Tech, Politécnico de Torino y Universidad Técnica de Múnich)

Agreement description:

ULAB Project (University Lab): network of technical universities aimed at the implementation of pilot programs related to the transfer of knowledge. Institutional project awarded to UPM in the Programme VII Framework for R & D in the EU. The project is called "Designing the Technological University of the Future"

Objective:

1. Participation in **institutional networks** with other European universities to take a proactive role in the implementation of the UPM actions of interest.
2. The project is essentially a network of different entities: UPM, Paris Tech Politecnico di Torino, Oxford University, Technical University of Munich.
3. The actions are focused on defining the strategy of institutional research laboratories, the link with entrepreneurship, commercialization of intellectual property and the science communication area.

Complementary factors and specification:

- Research Area
- Best practices interchange in research, planning, R&D structures and HR management
- Knowledge transfer Area
- Best practices in entrepreneurship education
- Idea generation competition and new company support
- Influencing
- Initiative oriented towards the diffusion of Science and Technology among the citizens

Improvements to the international position:

Participation in **institutional networks** with other European universities to take a proactive role in the implementation of the UPM actions of interest.

Calendar:

It is negotiating an agreement for 2010.

ANNEX

Aggregation card

ZEISS



Name:

Carl Zeiss MicroImaging, S.L.

Agreement description:

Agreement between the UPM and Zeiss in teaching, research and knowledge transfer.

Objective:

- The establishment of thematic areas and procedures for cooperation in R&D&I, postgraduate teaching and advanced services between both entities in connection with the development of the ICE Montegancedo
- Create procedures for the implementation of the established agreements
- Joint participation in the open calls of public administration covered by article 83 of the LOU

Additional information:

1. Stimulate collaboration between CZMISL and the UPM in order to develop optimal teaching environment on Campus:
 - Postgraduate training through the ideation, exchange and collaboration in internships
 - Participation and setup of the International Postgraduate School, through courses in the application of advanced microscopy solutions
 - Relocation of some training activities from CZMISL to the ICE Montegancedo
2. Stimulate collaboration between CZMISL and the UPM in knowledge and technology transfer processes;
 - Support the creation of new technology based companies, specialized in the development of high definition image solutions. Scientific and technology collaboration
 - Support the setup of technology demonstration areas, common use of equipment
 - Provide support in the valuation of research activities and the intellectual property portfolio results
 - Exploit the collaboration between the CZMISL and the UPM through research activities and the joint participation in the Neurosciences Research Centre
 - Participation and setup of the Blue Brain project
 - Create a joint team for high resolution imaging instrumentation
 - Relocate a unit from CZMISL into the Campus, for the future collaboration in the Blue Brain and other joint projects

Improvements to the international position:

Facilitate activities outside Spain as a multinational company

Activities 2010:

Agreement for the develop neural imaging automation and software for microscopy cross-beam systems of dual beam

Calendar:

A framework agreement was signed in October 2009

ANNEX Aggregation Card

ZETA SEEDS S.L.



Name:

Zeta Seeds S.L.

Agreement description:

Collaboration in joint teaching activities in the Agroforestral Biotechnology master's and the various international postgraduate courses organised by UPM and INIA.

Objectives:

Interaction between the UPM and Zeta Seeds in aspects related to teaching.

Additional information:

Promote the participation of companies, which specialize in the production of seeds and vegetal varieties, the teaching of biotechnology, applied genomics bioinformatics, in the development of vegetal genetics.

Improvements to the international position:

Facilitate the attraction of international students and researchers to international postgraduate courses.

Activities 2010:

Continuation of 2009 activities.

Calendar:

A framework agreement was signed in October 2009, overseeing the creation of a working group composed by Zeta Seeds and UPM research personnel, to initiate and follow up the foreseen activities.