Adjunct Enterprise Professors in the European Higher Education Area

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Abstract—**The PAVEs Program (Profesores Asociados Vinculados a Empresa – Adjunct Enterprise Professors) of the University of Valladolid allows enterprises to offer a set of optional subjects dealing with the technological knowledge necessary for their operation. These subjects are not only very attractive for the students, as they are given the chance to get an insight of the world that will host them as employees in the future, but also could be studied to extract lessons about the future European Higher Education Area (EHEA). This work presents the PAVEs program, the lessons learned that could be applied to the plan adaptation to the EHEA, and how the PAVEs subjects could be better integrated with ordinary subjects in the upcoming EHEA.**

Keywords- ECTS; Adjunct Enterprise Professors; Practical Education; Learning Technology; EHEA.

I. INTRODUCTION

The PAVEs Program (Profesores Asociados Vinculados a Empresas – Adjunct Enterprise Professors) is aimed at bridging the gap in the educational plane between the industry and the academia [1]. This program represents a unique collaboration initiative in the Spanish landscape, and has revealed itself as a very efficient tool for the students of technical degrees in the University of Valladolid.

Traditional collaboration among industry and academia has been focused on research activities, either having universities as consultants or partners for research, development and innovation activities. There is an extensive literature describing this, for instance [2] and [3]. However, collaboration in the educational plane has not been typically addressed.

The industry has a very wide spectrum of very specific skills which are necessary for each of the activities carried out in the different areas. Traditional academic programs are limited in time, and priorities have to be assigned so all the basics of the profession can be taught. The idea behind the PAVEs program is to take advantage of some of this industrial knowledge and bring it to the University students, so they can have a first approach to the details of some of the real industrial activities and the necessary skills to perform them) that they will carry out during their professional lives, effectively bridging the transition from student to apprentice. The teacher of a PAVEs subject is an industry professional acting as Adjunct Enterprise Professor, classes could be conducted within that enterprise premises, and although students do not perform any practical industrial work during these classes, they learn the skills, techniques and knowledge to do so.

Therefore, when students obtain their degrees, they have already some contact with the skills, habits and best practices required in the industry, which are not always teachable by professors which have been involved in academic spheres for years.

The PAVEs program has been active since 2001, when the University of Valladolid and the Regional Government (with the aid of the Spanish Ministry of education and the Spanish Ministry of Economy) reached an agreement to integrate Adjunct Professors from the industry sector into de University hierarchy. This agreement, with an initial duration of 2 years, has been renewed several times, and a total of 50 professors coming from the technical and engineering areas are involved.

As the PAVEs program has had an eminently practical approach and has tried to avoid traditional unidirectional learning methods, it can be considered a great information source to extract experimental conclusions about the new orientation of the education system in the European Higher Education Area. This information could be used for instance to drive the design of educational programs on the different subjects for the future convergent European framework.

The PAVEs program could be considered an innovative experience with very similar aims to those of the EHEA (European Higher Education Area), in particular, the practical approach and the compatibility with the ECTS (European Credit Transfer System) credit systems, based on the students' workload required to reach the objectives of the subject instead of just hours attending classes. In this sense, the PAVEs program aims in the right direction to foster the implantation of ECTS credits, focusing directly on the students' efforts to learn the subject and letting the student play the main role in his own education.

II. TELEFÓNICA I+D IN THE ADJUNCT ENTERPRISE PROFFESOR PROGRAM

Telefónica I+D, the Research and Development branch of Telefónica, the Spanish telco operator, is one of the most active companies in the PAVEs program of the University of

Valladolid, through its nearby premises in the Boecillo Technological Area (Parque Tecnológico de Boecillo). It has been offering a wide array of subjects inside the program for years with very good results [4].

For academic year 2009-2010, Telefónica I+D offers a total of seven different subjects, covering several areas like Multimedia, Next-Generation Networks, Web Programming and Service Provision [5].

The subject "Innovación: Servicios" (Innovation: Services) is a transversal course dealing with how the Research – Development – Innovation cycle is implemented in the enterprise. A first, generic block of the subject presents a description of the R+D+i cycle, its implications in the industry, and best practices, including the funnel diagram, typical procedures, publications and patents. The second content block presents the application of these concepts to several specific areas, including communications, mobility, digital home, etc.

The subject "Servicios Avanzados de Apoyo a Aplicaciones Telemáticas" (Advanced Services for Telematic Application Support) presents the innovative low-level services introduced by telco operators to support next-generation converged applications. Specifically, context-aware and location services, support for Mobile Ad-hoc Networks (MANET) and frameworks for Next Generation Network management.

The subject "Desarrollo de Aplicaciones Orientadas a Internet" (Development of Internet-oriented Applications) is aimed at preparing the students with the specific programming skills that the ICT (Information and Communication Technologies) industry is employing in the state of the art trends in the internet, including Web 2.0 and Web 3.0, Web Services, Service Mashups, RIA (Rich Internet Applications) [6]. This subject teaches how to develop a dynamic Web application accessing a database using Java as a programming language. Web servers, Development tools and environments, Web applications architectures, Servlets, JSP, JDBC, iBatis and AJAX are the technologies to be explained during this course.

The subject "Desarrollo de Componentes y Servicios en .NET" (Component and Service Development in .NET) aims at teaching how to create applications for the Windows operating system, ranging from traditional, simple ones like Microsoft Office expansions to more sophisticated ones taking advantage of innovative resources, such as N-layer applications or multi-touch interfaces. Technologies to be investigated within this course include .NET Framework v3.5, SOAP Web Services, ASP .NET, Windows Form, WPF, Silverlight, Windows Azure, Windows Surface and Windows 7.

The subject "Servicios Móviles sobre IP y de Tercera Generación" (IP-based and Third Generation Mobile Services) aims at providing an insight on how service development for mobile environments aimed at end users is carried out using the latest technologies. State of the art technologies in distributed mobile applications are presented, and popular environments such as iPhone and Android are investigated. Additionally, the innovative Scrum development methodology is studied, teaching the studies how to conduct team work and application development following its principles, and how it is employed in real world enterprises.

The subject "Fixed-Mobile Service Convergence on IMS" aims at teaching students how the converged Internet of the future is being shaped, how telco operators' infrastructures are changing to adopt IMS (IP Multimedia Subsystem) [7], and how the Quality of Experience concept is applied to network design. With an eminent practical approach, this subject will train students in several areas related to IMS and convergence, including IMS Testbed Installation and configuration; Femto-cells and convergent technologies; SIP and SIP-SIMPLE practical analysis with network analyzers; multimedia convergent service creation based on SIP (with session transfer); Quality of Experience model definition for messaging, interactive or streaming services; and studies on the technologies enabling the Internet of the future.

The subject "Redes de Cuarta Generación, Interconexión y Gestión de Red" (Fourth Generation Networks, Interconnection and Network Management) aims at introducing the fourth generation of mobile communications to the students, and teach them how implementation and management of fourth generation systems is carried out. The course is focused in the feature of heterogeneous 4G networks and Internet access protocols in high mobility environments, and includes practices on designing a management system for 4G networks.

III. Integration Within Official Degrees in the EHEA

A good integration of the PAVEs subjects into the programs of the official degrees, and together with the ordinary subjects is a key factor for its success. There is a risk that due to the fundamental differences in the matters covered by the PAVEs and the ordinary subjects, students can develop the perception that they account for two completely different, and even competing, realities. It is necessary to counter this risk inducing the idea that they are actually complementary, and that the same knowledge acquired in more theoretical subjects is actually applied in the industry activities shown in the PAVEs.

A very good approach to foster a coherent integration of both worlds is to actually create links among PAVEs and ordinary subjects. As the EHEA promotes a bigger presence of practical activities, ordinary subjects are also increasing the amount of this kind of practical contents. The approach suggested in this work is to take advantage of this fact, and interpret PAVEs as a kind of practical modules that can be optionally "plugged" with ordinary subjects in order to substitute or complement the ordinary practices.

This allows an intimate contact among the ordinary subjects and the PAVEs, and a direct, easy linking of the theoretical concepts with the industrial, practical knowledge. This brings a twofold benefit. First, the theoretical concepts taught give a good basis to understand the fundamentals of the technologies seen in action during the PAVEs. And second, the conceptual knowledge is better understood, as real world applications are presented as an example of the usefulness of the theory.

However, these links have to be carried out in a subtle manner, so as ordinary subjects are not interfered, hijacked or distorted by the industrial contents. University professors have to keep their workload and official study programs have to be fulfilled according to the defined specifications.

There are some options to implement this link among the different subjects, which have been actually tested within real experiences in the University of Valladolid. In the Polytechnic School [8], practical credits of degree modules are taught by PAVEs professors. But in subjects with very large student bases this approach could be difficult to follow, as industrial premises are not always adapted to host a big number of practicing students.

For these cases, another approach is suggested, which has been named "subject association". This approach implies a link between a specific ordinary subject and a specific PAVEs subject. The ordinary subject is a complete subject, including all the necessary theoretical and practical concepts, and the PAVEs subject is an industrial application of the concepts explained in the ordinary subject. Students are then given the chance to optionally take the PAVEs as a substitution of the practical credits of the ordinary subject.

An example of this subject association was carried out in the University of Valladolid [9]. The *Projects* subject, which deals with the project management discipline, is particularly suitable for an industrial approach in the practical credits. As a standalone subject, the teacher usually has to present use cases to illustrate the application of the management tools studied, and the nearer they are to real experiences, the better the subtleties of the problems encountered in the real world are captured. Therefore, through PAVEs subjects it is possible to offer real examples of project management to the students, specifically in this pilot *Voice over IP* and *Development of Internet oriented applications* were the PAVEs subjects which could substitute the practical credits of the ordinary subject.

The experiences carried out within the PAVEs program show that the achievements obtained are in line with the objectives of the EHEA. This means that the novel methodologies fostered by the EHEA are pointing in the right direction, and that the implementation of the PAVEs subjects could be used as a kind of guide to help modifying the study programs and adapt them to the EHEA.

Specifically, the PAVEs program has been monitored yearly since its beginning by conducting a series of surveys among the students implied in order to extract conclusions on the satisfaction level. These surveys have shown that students of PAVEs subjects are very satisfied with the experience, mainly because of the following reasons:

- Interesting and attractive contents, which depart a little from the traditional academic approach followed by ordinary subjects, and are usually focused on state of the art technologies instead of the basics and generalities that often form the core of ordinary study plans.
- Approach to a real world company, opening a whole new world of experiences, methodologies and procedures. The direct contact with this new world induces a bigger motivation and interest in the students.
- For students, the University often becomes a kind of bubble, with its own idiosyncrasy, which prevents them from actually experiencing the real world. This sometimes translates in ignorance about the kind of professional work that they will be performing after leaving the academia, and in the fact that very few students actually have clear ideas about their labor objectives in the long term, and how to orient their careers accordingly. Being in contact with the industry helps them to get an insight on the specificities of enterprises and the real work that they will be performing in the future, also helping in many cases to take personal decisions about the kind of jobs that they will pursue.
- The focus on practical tasks helps diversifying the kind of activities that a student has to ordinarily perform. This results in an increased interest and in fighting some of the student's negative feelings about the University and clarifying doubts about the actual usefulness of the studying activity. This is reflected in the fact that many students recognize PAVEs subjects as one of the most interesting activities within their degree programs and continue taking PAVEs courses during the following years.

The philosophy behind PAVEs subjects is quite in line with the new paradigm driving the EHEA. Specifically [10],

- The contents are mainly practical.
- Reduced student groups foster teacher-student interaction, while at the same time adapt better to the industrial premises which are often not adapted to big groups.
- Student-centric learning, meaning that the teacher acts like a guidance to allow the students "discover" the knowledge by themselves.
- Emphasis in group and collective work, sometimes even mimicking real team structure of the enterprise.
- Focus on industry-specific skills.

However, there is still some work to do in order to achieve a complete integration of the PAVEs program into the EHEA, mainly:

- Study of subject structure according to the formal conventions of the EHEA, namely distinction between on-site and off-site tasks, and a proper workload distribution among those tasks.
- Usage of English language.
- Introduction of transversal activities to foster the acquisition of side personal skills, including document search, organization and development, budget and team management, negotiation, etc.

IV. CONCLUSIONS

The PAVEs program of the University of Valladolid has revealed itself as one of the most attractive and innovative initiatives related to the courses offered to the students. Not only it comprises specialized and practical contents that are not frequently found in ordinary subjects, but also gives the chance to students to get in contact with the enterprises, a world that is mostly unknown for them, that they will have to join one day and that remains strange. Through this contact, students get an insight at the environment and practices in this strange world.

Additionally, some of the main characteristics of the PAVEs program have made it a very interesting experience to get some lessons for the adaptation of courses to the upcoming EHEA. The main driving philosophy, the idea that the practical contents should have a prominence and that the students should be playing the key role in their own education, is shared among the two initiatives. This means that while PAVEs subjects do not still fully conform to the conventions of the EHEA, they are a good value for extracting conclusions about the new orientation of the academic degrees.

Finally, letting the industries permeate somehow the University education may initially raise some concerns related to the influence and control they may exercise. Therefore it is worth mentioning that within the PAVEs program, the independence of the University as an academic institution is always guaranteed. PAVEs subject complete education programs introducing side knowledge into them as optional courses, never substituting the traditional base subjects.

REFERENCES

[1] Bailón Vega, L.A., "El programa PAVEs en la Universidad de Valladolid." (José Manuel Pérez Ríos. Un ejemplo: Johnson Controls: Alberto Fuertes, José Costas. Grupo Tordesillas), Toledo 2003

[2] Loet Leydesdorff, Martin Meyer, "The Triple Helix of university-industry-government relations", pp.191-203, vol. 58, iss. 2, 2003.

[3] Fritsch, M., Schwirten, C., "Enterprise-University Co-operation and the Role of Public Research Institutions in Regional Innovation Systems", Industry and Innovation, vol.6, iss. 1, pp. 69-83, 1999.

[4] Siles, J. (2004) "Profesores Asociados Vinculados a Empresas en la Universidad de Valladolid y su vinculación con Telefónica I+D". Primer Informe Fundación Conocimiento y Desarrollo.

[5] Webpages of PAVEs modules:
http://www.uva.es/cocoon_uva/impe/uva/contenido?pag=/contenidos/Empresa_Empleo/paves&tamLetra=&idMenus= (November 2009)

[6] Marino Linaje, Juan Carlos Preciado, Fernando Sanchez-Figueroa, "Engineering Rich Internet Application User Interfaces over Legacy Web Models," IEEE Internet Computing, pp. 53-59, November/December, 2007

[7] Gonzalo Camarillo, Miguel-Angel García-Martín, "The 3G IP Multimedia Subsystem (IMS): Merging the Internet and the Cellular Worlds," John Wiley and Sons publishers.

[8] Magdaleno, J. (2004), "Profesores Asociados Vinculados a Empresas. Experiencia en la EUP de Valladolid.", Barcelona. XII Congreso Universitario de Innovacion Educativa en las EnseñanzasTecnicas

[9] A. Sánchez, B. Carro, J. M. Aguiar, "PAVEs Programme", Proceedings of the International Technology, Education and Development Conference (INTED 2007), ISBN 978-84-611-4517-1, Valencia (Spain), March 2007

[10] J. M. Aguiar, B. Carro, A. Sánchez, "Aportación del Programa PAVEs (Profesores Asociados Vinculados a Empresa) al Espacio Europeo de Educación Superior", III Jornadas de Intercambio de Experiencias de Innovación Docente, ISBN 978-84-690-7548-7, Valladolid (Spain), September 2007