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## Editorial

### Josep M. Duart

Director of RUSC and vice president for Postgraduate Studies and Lifelong Learning,  
Open University of Catalonia (UOC)

Innovation, technology and university management are the keywords of the Dossier in this number of *RUSC*—Universities and Knowledge Society Journal. The relationship between these three concepts is the core aspect of various good practices and research findings presented in the six articles of the Dossier.

Information and communication technologies (ICTs) have had a considerable impact on university management in recent decades. While that impact was first mentioned in the Dossier of Volume 2, Number 1 of *RUSC* in 2005, it has also been the topic of a number of research articles published in the journal since then. If the use of ICTs in universities is appropriate, that is to say, if it is the outcome of strategic planning, then it undeniably leads to changes in management. In most cases, such changes enhance the efficiency and effectiveness of basic management processes. To illustrate this, some examples are open content repositories (which most universities now have), digital document management policies (which include the management of scholarly documents) and student care systems (which provide services via social networks like Twitter and Facebook).

In the Dossier coordinated by Dr Francisco Rubio, the articles offer several analyses of findings on the relationship between technology, university management and innovation. Professor Rubio has proven experience as a university manager (he was the rector-founder of the University of Las Palmas de Gran Canaria, a post that he occupied for over a decade), and his works on university management and innovation have been published widely. His coordination of the Dossier facilitated the review, assessment and selection of the six articles from the many manuscripts submitted. The outcome is a consistent, rigorous Dossier that provides contrasting examples of the use of technology in university management.

Regarding the journal as a whole, I would firstly like to draw *RUSC* subscribers' attention to fact that every article now published in the journal has a Digital Object Identifier (DOI), which we register with CrossRef. This categorical improvement means that *RUSC* now complies with the ISO standard approved in 2010 and with ISO 26324 published in May 2012, which defines the syntax for a DOI name. A DOI is a unique identifier of an article because it preserves its metadata and citation data. Later on, the DOI system will allow the *RUSC* team to find out exactly how often an article has been cited.

Secondly, in order to expand the international scope of *RUSC* and to enhance its positioning, experts in the thematic areas of the journal continue to be incorporated into its Scientific Editorial Board, which now has 50 members.

Finally, I would like to highlight the improvement that *RUSC* has experienced in the composite index of secondary dissemination (ICDS) of the MIAR database; it is now at 9,403, thus making it the top journal in its field.

I sincerely hope that you find this number of *RUSC* both interesting and enjoyable.

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## ARTICLE

# New Technologies in the University Context: The Use of Blogs for Developing Students' Reading and Writing Skills

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## Abstract

Many studies have emphasised the difficulties that students have when it comes to dealing with typical reading and writing tasks in higher education. With advances in information and communication technologies, and the constant development of interactive and multimedia dynamics on websites and e-learning platforms, new alternatives can be used to overcome reading and writing problems. The use and potential of blogs, for example, has spread to the university context, including subjects and courses that specifically focus on reading and writing skills. While several studies have shown that educational blogs have both advantages and limitations, there is still a need to develop guidelines on how to facilitate learning through the use of this tool. An important step is to analyse the current use of blogs for specific educational purposes. In this respect, the aim of this article is to analyse, on the basis of an integral semiotic proposal (Álvarez & Álvarez Cadavid, 2010, 2011), a series of blogs in Spanish that aim to develop text comprehension and production skills. This study shows that most

of the blogs analysed thus far tend to concentrate on information management and organisation processes, and include materials in which verbal aspects prevail.

### Keywords

technology uses; educational blogs; higher education; reading and writing skills

## *Las nuevas tecnologías en el contexto universitario: sobre el uso de blogs para desarrollar las habilidades de lectoescritura de los estudiantes*

### Resumen

Muchos estudios han destacado las dificultades que los estudiantes tienen al resolver las tareas típicas de lectura y escritura en la universidad. En la actualidad, con los avances de las tecnologías de la información y la comunicación, y el continuo desarrollo de dinámicas multimediales e interactivas en sitios webs y plataformas de e-learning, existen nuevas alternativas que pueden ser aprovechadas para superar los problemas de lectoescritura. El uso del blog y sus potencialidades, por ejemplo, se ha extendido en el contexto universitario, incluidas las materias o cursos que trabajan, específicamente, en las habilidades de lectoescritura. Si bien diversas investigaciones han revelado ventajas y limitaciones de los blogs educativos, sigue habiendo necesidad de orientaciones sobre el modo de facilitar los aprendizajes con dicha herramienta. Un paso importante para lograr el desarrollo de dichas orientaciones es analizar el estado actual sobre el uso de blogs con fines educativos específicos. En este sentido, este trabajo analiza, de acuerdo con un análisis semiótico integral (Álvarez y Álvarez Cadavid, 2010, 2011), una serie de blogs en español que apuntan al desarrollo de las habilidades de comprensión y producción textual. Este estudio muestra que la mayoría de los blogs hasta el momento analizados están centrados en procesos de organización y gestión de la información, e incluyen materiales con un fuerte predominio verbal.

### Palabras clave

uso de tecnología, blogs educativos, educación superior, habilidades de lectura y escritura

## 1. Introduction

Many studies have emphasised the difficulties that Latin-American students have when it comes to dealing with typical reading and writing tasks in higher education (e.g., Lacon de De Lucia & Ortega de Hocevar, 2004; Parodi, 2003, 2005; Carlino, 2005; Piacente & Tittarelli, 2006; García & Álvarez, 2009, 2010). Today, with advances in information and communication technologies (ICTs), and the constant development of interactive and multimedia dynamics on websites and e-learning platforms, new alternatives can be used to overcome students' reading and writing problems (Álvarez, García & Qués, 2010). The use and potential of blogs, for example, has spread to the university context, including subjects and courses that specifically focus on reading and writing skills (Reale, 2007). While several studies have shown that educational blogs have both advantages and limitations, there is still a need to develop guidelines on how to facilitate learning through the use of this tool. Thus, in the framework of a broader research project, which intends to establish the criteria for good ICT-

mediated educational practices for the promotion of university students' reading and writing skills,<sup>1</sup> this study analyses a series of blogs in Spanish that aim to develop such skills. This study is based on an integral semiotic analysis proposal (Álvarez & Álvarez Cadavid, 2010, 2011).

## 2. The use of new technologies in higher education

In the university context, the potential of new technologies and the ways in which they can be used have gradually been recognised. As a result, the uses of digital technology as a teaching and learning support have grown (Litwin, 2001; Duart & Sangrà, 2001; Rodríguez Illera & Escofet Roig, 2004; Laurillard, 2010; Torres & Rama, 2010). Today, two modes of networking can be found in universities (Rodríguez Illera & Escofet Roig, 2006; Laurillard, 2010; Torres & Rama, 2010). First, fully online e-learning proposals, where instruction takes place exclusively via digital media, on virtual learning platforms designed and created for that purpose (Buckingham, 2007). Second, blended learning proposals, which are characterised by a combination of two distinct modes of instruction in order to achieve an optimum educational programme for a given target audience (Bersin, 2004). In proposals of this type, technologies, activities and various typologies of instructional situations are combined: multimedia technology, videos, virtual lectures, e-mail, face-to-face lectures, individual tutorials, etc. (Rodríguez Illera & Escofet, 2006). Rodríguez Illera and Escofet (2006) add a condition to the characterisation of blended learning by pointing out that the use of technology to mediate—rather than an occasional use only—should be included in a plan to integrate it with face-to-face lectures.

In 2005 in Latin America and the Caribbean, 201 university institutions implemented the virtual education process, though only 11% were fully online models. The remaining 89% were blended learning models, combining face-to-face and online elements (Rama, 2007; Torres & Rama, 2010).

Given the growing incorporation of ICTs into the university context, it is important to be aware of the particularities of these technologies, which require teaching to be adapted to suit them (Mayer, 2005; Laurillard, 2010).

With ICTs, education can be freed from spatial constraints, thus becoming independent from distance. It can also be freed from time constraints, thus allowing students to learn at their own pace. Students and lecturers can have flexible timetables and schedules. Moreover, digital media offer multimedia, hypertextual and dynamic potential (Salaverría, 2001; Baldry & Thibault, 2006; Scolari, 2008, 2009; Avgerinou, 2009; Kress, 2004, 2010), as well as a high degree of interactivity, which is evidenced at a variety of levels (e.g., objects, browsing, connections, forums, etc.) (Gros Salvat, 2000). In this respect, it has been claimed that ICTs facilitate individual, group and collaborative learning processes

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1. I am referring to the project "Aprendizaje, multimedialidad y TIC: modelo de análisis de estrategias discursivas, multimediales, hipertextuales e interactivas en comunidades de aprendizaje totalmente en línea o híbridas en la universidad" (Learning, Multimediality and ICTs: A Model of Analysis of Discursive, Multimedia, Hypertextual and Interactive Strategies in Fully Online or Blended Learning Communities in Higher Education", which I am undertaking as an investigator for the National Council for Scientific and Technical Research, Argentina. Regarding the study presented in this article, we would like to thank the Ministry of Education (Argentina) and Fundación Carolina (Spain).

(Gros Salvat, 2004). When talking about mediated collaboration, Gros Salvat and Larra (2007) refer to two fundamental ideas: on the one hand, the possibility of learning alongside other participants, of sharing objectives and of distributing responsibilities; and on the other, the idea that technology is a mediating element that promotes and supports that process. These are the particularities of ICTs that are beginning to transform teaching situations. However, research on the use of new technologies in higher education (Sosa, 2009; Laurillard, 2010; Torres & Rama, 2010) highlights the fact that, even when instruction takes place on a virtual platform, most of the materials are still based on a textual logic determined by a printed-page culture (Laurillard, 2010; Kress, 2010). Besides that, in certain cases there is no planned integration of tools or materials (Rodríguez Illeras & Escofet, 2006). It should also be noted that the design of virtual learning environments does not always make full use of the potential that electronic media offer, such as their multimediality and hypertextuality (Álvarez & Álvarez Cadavid, 2010).

More work therefore needs to be done on the design of virtual environments and learning materials to ensure that they are compatible with the new educational contexts that are emerging with the advent of ICTs. In the light of technological impacts, it is therefore a matter of understanding that the pace of teaching and learning deserves to be interpreted in terms of ephemerality, atemporality and unpredictability, and that such pace needs to be redimensioned in order to promote critical processes of knowledge appropriation (Duart & Sangrà, 2001; Litwin, Maggio & Lipsman, 2004; Lion, 2006). So the challenges are shifted towards the activity itself, to the way in which teaching and learning is conceived, and to the approaches taken to planning, designing and implementing the activities (Litwin, Maggio & Lipsman, 2004; Litwin, 2005; Lion, 2006; Buckingham, 2007).

In this respect, it is worthwhile investigating how new technologies have been used in the university education context. In consequence, this study forms part of a broader project (see Footnote 1) that deals with the urgent need for guidelines on how to facilitate learning in educational programmes that are offered in fully online or blended learning modes. A general objective of this project is to understand how to use ICTs properly in the university context, and in particular in the area of language teaching, and text comprehension and production. Within this framework, this study aims to get an understanding of the characteristic features of the discursive, multimedia and hypertextual configuration of blogs used in subjects dedicated especially to the promotion of university students' text comprehension and production.

### 3. Blogs in the educational context

Blogs are communication websites that are mostly personal, on which users publish content (posts) on their topics of choice (Granieri, 2005). Users, including those with very little technical knowledge, can therefore share their thoughts and opinions (Stefanac, 2006). In general, posts appear in chronological order and comments can be left about them by other users (Piscitelli, 2002; Orihuela, 2003). In this respect, the tool provides an opportunity to interact. Besides content, blogs usually include information about the user, a categorisation of each post and links to other websites. One of the advantages of blogs is that they are easy to update (Piscitelli, 2002).

According to Deng and Yuen (2011) and in the higher education context, the role of blogs in different disciplines has been explored (Stiler & Philleo, 2003; Williams & Jacobs, 2004), and this includes language teaching (Ducate & Lomicka, 2005). In every case, the fundamental benefits of using them have been underscored: reflexive mechanisms on the one hand, and interactive mechanisms on the other. However, some studies have shown that, while blogs would appear to provide opportunities to foster productive exchanges, the evidence did not indicate that this advantage was being fully maximised (Hall & Davison, 2007; Xie, Ke & Sharma, 2008; Deng & Yuen, 2011). Thus, as Deng and Yuen (2011) indicate, while the advantages for socialisation are highly valued in blogs, there are few and limited interactions in such environments.

In the specific case of developing reading and writing skills, Reale (2008) points to a number of particularities of blogs that are advantageous: economy, which requires writers to be succinct in their interventions; archiving system, which allows students to explore how their ideas develop and connect over shorter or longer periods of time; feedback, which encourages participation and collaboration among peers; the use of multimedia resources, which provides the opportunity to develop skills in different languages; the immediate nature of publication, which generates an instant sense of achievement; and active participation, which extends learning opportunities beyond those offered in lecture time. It is in this respect that blogs to some extent allow the discontinuity imposed by the pace of work—as a subject is taken—to be overcome, given that between one lecture and another there is usually a long time gap of at least a week.

In short, research on educational blogs has shown that their use has both advantages and limitations; however, it is still necessary to explore the strengths of these Web 2.0 tools, particularly in the context of university subjects that aim to develop students' reading and writing abilities, and to overcome the difficulties that have been found with skills of this type. This is due to the fact that reading and writing are conceived as communication skills that are essential for proper academic performance; they are skills that can be improved through a process involving a series of frequent, continuous activities. This type of process requires a continuous pace of work, as fostered by the very nature of blogs.

With all of the above in mind, the aim of this article is to analyse educational blogs in accordance with the principles of a proposal for an integral semiotic analysis of virtual learning environments (VLEs) (Álvarez & Álvarez Cadavid, 2010, 2011).

## 4. An integral semiotic analysis proposal for the study of VLEs

The integral semiotic analysis proposal (Álvarez & Álvarez Cadavid, 2010, 2011) is based on Lemke's semiotic analysis (2002) and adapts it to the study of VLEs.<sup>2</sup>

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2. The development of this proposal is motivated by two observations: 1) while there is a wide variety of perspectives and models for studying online education, they all concentrate on the analysis of verbal aspects and do not consider the

Lemke (2002) defines hypermediality as the conjunction of multimediality and hypertextuality.<sup>3</sup> This suggests that links are established not only between textual units, but also between textual, visual and sound units. For Lemke, hypermediality involves the multiplicative combination of organisational, orientational and representational resources of each semiotic mode (language, image and sound). As a result, every semiosis is related with meanings of three types:

- Organisational meanings: they fundamentally allow the association between elements in larger units to be understood by means of functional relationships or by the correspondence between elements that form chains from common aspects.
- Representational meanings: they present a state of affairs. In connection with this state of affairs, attention is paid to what is said about the events, participants and circumstances.
- Orientational meanings: assumed rather more implicitly, they indicate the participants' stance towards them and their content.

In accordance with this approach by Lemke (2002), a three-pronged analysis is proposed for VLEs. First, regarding the organisational function, the way in which the sites, and the resources and tools involved in them, are organised. The guiding questions could be: How is the home page organised? What are the most frequent and the most prominent aspects? How are posts organised? What teaching resources are included and what spaces are they presented in?

Second, regarding the representational function, the content and forms of representation brought into play are recognised. The guiding questions could be: What topics and content are developed? What resources are used to present them? What order are they presented in? What relationships are established among the content developed?

Third and finally, regarding the orientational functional, aspects of interaction among lecturers, tutors and students are studied, that is to say, the identities and social relationships formed among them, and the means by which such relationships are formed. The guiding questions could be: What does the blog offer the student (e.g., information, services, options to take action)? What does the blog demand from the student? What type of student is sought, and what strategies and resources are used to indicate that type of student? What type of teaching is updated on the blog? What strategies and resources are used to indicate that type of teaching?

It should be noted that the three functions are simultaneously projected in the courses and resources involved, and are only presented separately for analytical purposes.

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relationship between such aspects and others of a different kind, such as images and hypertextual elements; 2) various proposals for multimedia semiotic analysis have been observed, but such proposals have not been specially designed for the analysis of VLEs.

3. Lemke clarifies that, in the same way as meaning can be constructed through paragraphs and chapters, it can also be done through hypertext, that is to say, through different web pages and hypertextual lexical items (for example, through 10, 30 or 100 lexical items).

## 5. Methodology

As already mentioned, this study forms part of a broader project (see Footnote 1) of a qualitative nature, which is being carried out in accordance with the principles of the integral semiotic proposal outlined earlier (Álvarez & Álvarez Cadavid, 2010, 2011). In the framework of this project, this study deals with blogs used in subjects dedicated especially to the promotion of university students' text comprehension and production. Presented in this article is an exploratory phase of a descriptive nature, on which more work is intended to be done in subsequent analyses. This phase comprises the following steps:

- Collection and systematisation of the corpus.<sup>4</sup>
- Analysis of the blogs in accordance with the principles of the integral semiotic proposal.
- The identification of frequent and significant features of the blogs in connection with organisational, representational and orientational functions.

The corpus comprises 10 blogs corresponding to face-to-face subjects or courses that, in the university context, seek to promote students' reading and writing skills, generally by means of a workshop methodology. In every case, the blogs operate as a support for such subjects or courses.

## 6. Analysis of the blogs

By performing the analysis, it was found that —beyond the particularities of each blog from which information was gathered— there is a discursive, multimedia and hypertextual pattern common to all of them in organisational, orientational and representational terms, and that only one of the blogs (herein Blog-D) presented some differences with respect to that pattern. In this section, then, we shall present the frequent characteristics that configure the above-mentioned pattern, as well as the distinctive features of Blog-D. Finally, we shall attempt to understand the educational consequences of this discursive, multimedia and hypertextual configuration.

### 6.1. Organisational function aspects

Regarding the organisational function, the blogs present different constituent parts, grouped into three fundamental sectors.

The top section gives the identity of the blog, by including the name, a sentence or a representative description, and the colours or images used to identify it. Below this section, there are two columns in a different colour or with a different background from the top section.

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4. Web scanning with keywords (workshop, text comprehension and production, reading and writing, university) was used to gather information from the blogs. In this article, to respect the confidentiality of the blog producers' identities, we have not included any URLs.

One of the columns —the narrowest— comprises several stable elements, laid out vertically: characteristics of the blog and its creator, archive of posts, links and, in a few cases only, the thematic categories of posts and a calendar.

The widest column is used for presenting the posts, which are usually texts or PPT slides in which verbal aspects prevail. These posts appear in chronological order. In some blogs, the posts are labelled by topic, meaning that an item can be selected from the categories in order to see posts grouped under the same topic.

In relation to the above description, an element that gives cohesion to the top section and the narrow column of the blogs is the persistence of their elements, which contrasts with the posts, which are updated daily or weekly, or can be reorganised by any user.

In Blog-D, there is also a top section that allows the blog to be identified, but both the design and the layout of the remaining elements establish other types of organisational relationships, articulating a distinctive configuration of the blog as a unit, and of the constituent parts of that unit.

So, below the top section, there are different tabs, laid out horizontally and in a brighter colour than the rest of the page. Each tab is associated with a specific section of the blog.

Apart from the 'Home' tab, dedicated to presenting the blog and to explaining its utilities, the other tabs refer to the resources and tools necessary for students to perform well in lectures. In other words, unlike the other blogs analysed, in which order and occasionally a thematic order prevailed, Blog-D categorised the posts by the type of resources and tools. In this respect, the tabs covered: 'Classroom Presentations', 'WebQuest', 'CmapTools', 'Videos', 'Books', 'Notes' and 'Links'. As the name of some of these tabs indicates (WebQuest, for example), there are programs, tools and specific resources for students to approach the content from a multimedia and hypertextual viewpoint. By clicking on each tab, PPT slides and videos are displayed, which also involves a multimedia presentation of content.

It is important to highlight the fact that the posts are stable and, though they may be changed over time, they are not updated daily or weekly.

Thus, the distinctive cohesion of Blog-D's elements is provided not only by the colour, but also by the chosen criteria for establishing the tab categories (i.e., programs/tools/resources), by the prevalence of multimedia and hypertextual elements, and by the stability of the posts.

Finally, it is important to highlight the fact that, in the bottom section, Blog-D presents a toolbar that links to other websites, and in particular to YouTube, Facebook and Twitter, thereby offering students the opportunity to engage online through one of those sites. In this case, it was once again found that specific sites and tools are also displayed to meet some of the educational objectives of the blog, such as communication between lecturers and students, or among students.

Thus, the blog's links to sites offering tools and resources to meet various educational objectives, such as tasks to be done by students or communication among the blog's users, represent a distinctive feature that provides the blog with cohesion and articulates it as a unit.

## 6.2. Representational function aspects

From the representational function viewpoint, all the blogs (apart from Blog-D) distinguished between 'Posts' and 'Links'. Regarding posts, they can be grouped into:

- Alerts: referring to information about subjects taken, exam dates and lecture cancellation or postponement.
- Assignment instructions: referring to instructions for doing activities that will be corrected and/or handed in during face-to-face lectures. In contrast, no instructions are proposed for carrying out exchanges on the blog.
- Reading lists: referring to theory texts about the concepts that will be studied in lectures, or literary bibliography (poems, stories, etc.) that will either be worked on in lectures or will act as the trigger for topics to be covered.
- Other study materials: referring to PPT slides and videos explaining the fundamental concepts of the subject. There is usually a high prevalence of verbal aspects in these materials.
- Student productions: referring to texts written by students according to instructions given by lecturers.

Blog-D differs to some extent from this categorisation because the tabs that we mentioned in the previous section cover what the other blogs refer to as 'Posts' and 'Links'. All of these tabs display PPT slides and videos explaining the fundamental concepts of the subject. In these resources, verbal aspects are combined with multimedia and hypertextual aspects. In fact, there are two tabs specially dedicated to tools (WebQuest and CmapTools) that students should use to do activities in which verbal aspects are combined with multimedia (images and sound) and hypertextual aspects.

In connection with the above, Blog-D, unlike the other blogs, also includes information in PPT and video format about the possibility of using different programs and technological media. Regarding the topics covered, we found a language perspective common to all the blogs, including Blog-D: the topics usually refer to content on a discursive and textual approach to language (Calsamiglia & Tusón, 2008; Van Dijk, 1988, 2000), which suggests studying communication units that go beyond clausal limits. From this approach, the posts cover concepts connected with the macrostructural level (thematic content) or superstructural level (organisational structure of texts). In consequence, many posts work on the concept of gender, either through theoretical presentations or real cases for each gender (opinion articles, for example). The microstructural level (lexicon, for example) is generally included in 'Links', even in the case of Blog-D, which has a tab with that name. So, the blogs are 'linked' to Spanish-language dictionaries or thesauruses, and to punctuation and spelling exercises. This would seem to suggest that resources at the microstructural level are not considered to be priority topics, but rather peripheral ones, in blogs aimed at text comprehension and production with a discursive and textual perspective of language.

### 6.3. Orientational function aspects

Regarding the orientational function, in most of the blogs analysed, posts are supplied by the blog's creator, who is a subject lecturer.

Other than this similarity, we found differences between Blog-D and the other blogs with respect to student participation modes and interaction with lecturers.

In all the blogs (apart from Blog-D), student participation revolved around leaving comments, generally not very common, on lecturers' posts. The posts receiving the highest number of comments are those referring to alerts or assignment instructions. Faced with these, the students usually ask for clarification or recount their individual problems in search of an alternative solution. In some —albeit a few— cases, the students generate a type of post represented by texts produced on the subject. In that instance, lecturers or users leave comment on the texts, expressing positive, complimentary appreciation. In short, interaction is minimal or non-existent and is not usually aimed at doing exercises or activities, which, if done on the blog itself, would promote the acquisition of subject content.

In contrast, Blog-D puts the option to participate in other sites, such as Facebook and Twitter, which are linked from the blog. As a result, it offers students the opportunity to leave comments or engage via any of those channels, which are rightly acknowledged for their interaction potential (Siemens & Weller, 2011).

## 7. Scope and limitations of blogs aimed at developing reading and writing skills in higher education

In this article, the aim has been to study, in accordance with an integral semiotic analysis (Álvarez & Álvarez Cadavid, 2010, 2011), a series of blogs in Spanish that aim to develop students' reading and writing skills in the university context. Several conclusions can be drawn from the study.

First, from the viewpoint of content connected with the area of language teaching, we found a feature common to all the blogs, including Blog-D: that content contained in the various posts responds to a discursive and textual approach to language. In addition, priority is given to the macrostructural and superstructural levels, while the microstructural level is relegated to 'Links' that students can follow independently. This hierarchy of content on the blogs would be compatible with the organisation of content on programmes for the corresponding subjects.

Parallel to this, we noted the existence of several differences between the ways in which content on Blog-D and the other blogs is dealt with.

Second, on the blogs in general, we found that students are only asked to enter the site, browse the documents on it and participate by leaving comments on the posts. In other words, students do not have to use other specific programs or sites to meet the educational objectives of the blog. In contrast, on Blog-D, the use of technological media is not limited to the use of the blog. Rather, it asks students to browse and use a wide range of sites, tools and resources. Thus, it asks for the use of specific tools to work on topics with a multimedia approach (WebQuest, for example); the use of specially designed sites to promote interaction among users was also found (Facebook, for example). This leads to students being taught how to use such tools, and specific materials on the topic are incorporated for that purpose. The above would suggest a strong cohesive feature of Blog-D, in that it presents several links to sites with services and tools that promote the development of the various educational objectives that are intended to be met.

Third, and in connection with what has recently been mentioned, we noted that the materials on most of the blogs present a high prevalence of verbal aspects, whereas on Blog-D, a combination of text, images and sound is frequent (multimedia), as are links to other sites (hypertexts), both for the lecturers' content presentation and for the students' approach to such content.

Lastly, on most of the blogs analysed, there is a prevalence of materials and tools aimed at information management and organisation processes, while others aimed at group management of knowledge processes have yet to be incorporated. In fact, apart from Blog-D, the space is not organised in such a way as to promote interaction. Consequently, very little interaction between lecturers and students, or among students, was found, and such interaction is limited to solving practical and one-off problems arising from the lectures.

In short, on blogs dedicated to promoting university students' reading and writing skills, and as Begoña Gros (2004) notes, tools and materials promoting the cognitive processes required for the collaborative production of new knowledge have yet to be incorporated. Furthermore, it would be necessary to include and demand multimedia and hypertextual materials for the development of subject content, for which, as we can see in Blog-D, it appeared possible to offer training on specific technological media. This means training students to use new technologies for educational purposes.

Finally, this analysis has enabled an initial approach to the analysis of blogs aimed at promoting text comprehension and production. However, we believe that the research needs to be furthered by reviewing and adapting the integral semiotic proposal, and by expanding the corpus, which means not only including more blogs, but also another type of VLE, such as online courses. We believe that this would make it possible to develop good ICT-mediated educational practices in the university context, particularly in the area of written comprehension and production teaching.

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## ARTICLE

# Use of Bibliography and Academic Plagiarism among University Students

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**Abstract**

Given the proliferation of student plagiarism from the Internet, the intention of this study is to understand academic plagiarism among university students and how they cite and reference the information they find on the Internet. The study was carried out at Mondragon University (Basque Country, Spain). Quantitative data was collected using two questionnaires, and qualitative data was collected through five different focus groups. The participants were students and their lecturers. The findings suggest that students do not understand the importance of citing and referencing the information they use in their academic research. While students believe that they do not plagiarise, lecturers consider that plagiarism is a real problem.

**Keywords**

university students; academic plagiarism; use of bibliography; information literacy

*Uso de bibliografía y plagio académico entre los estudiantes universitarios***Resumen**

*Este trabajo pretende comprender mejor el plagio académico entre estudiantes universitarios y cómo hacen referencia a la información que citan. También analiza el uso que hacen de la bibliografía y descri-*

*be cómo buscan la información académica que necesitan. La investigación se realizó en Universidad de Mondragón, donde participaron 140 estudiantes de la licenciatura en Comunicación Audiovisual del curso 2007-2008 y 22 de sus profesores. Los datos cuantitativos fueron recogidos a través de dos cuestionarios, uno para los alumnos y otro para recoger la opinión de los profesores (sobre cómo buscan información sus alumnos). Los datos cualitativos se recogieron a través de cinco grupos de discusión. Los resultados muestran que los estudiantes tienen dificultades para buscar la información académica que necesitan, que buscando información son menos competentes de lo que ellos creen, que solamente utilizan el buscador Google, que no buscan información en inglés y que buscan información de manera no lineal ni planificada.*

### **Palabras clave**

*búsqueda de información, alfabetización en información, alfabetización digital, estudiantes universitarios, internet*

## 1. Introduction

The Internet is the main source of information that students use for their academic assignments (OCLC, 2005; Fuentes Agustí, 2006; Sureda, Comas, 2006; British Library, 2008); publishing information on the Internet is relatively simple, and almost anyone is capable of managing a website. Consequently, the Internet offers a vast amount of information resources that are constantly updated. The combination of these factors means that the majority of the university community's members has the same resources and sources of information at its disposal as the most advanced learning centres. The majority of students, lecturers and researchers is able to access information offered by the most prestigious journals and scientific websites in the same way and at the same time as the most renowned scientists because the conditions for access to the information are the same for everyone in many universities, through digital collections in university libraries.

Just a couple of decades ago, what was only a dream for scientists, pedagogues and social agents (that information should be within everyone's reach) is now a reality. At the same time, however, this means that information copying is now very simple, and it would appear that plagiarism has increased among students. But what do we understand by plagiarism? How can academic plagiarism be defined? According to Comas and Sureda (2007):

Cyber-plagiarism is understood as [...] locating, adopting and presenting others' ideas, theories, hypotheses, results, texts, etc. as one's own, in any piece of academic work.

In addition, the literature distinguishes between two types of plagiarism (Park, 2003; Bugeja, 2001): intentional plagiarism, where others' ideas and texts are directly presented as one's own, and unintentional plagiarism, where quotations and paraphrases are incorrectly made, or simply where the sources are not cited because students do not know how to do so.

According to Sureda and Comas (2008), 61.1% of university students admitted to having used texts from the Internet without mentioning the author, presenting the ideas as their own. In the

same study, 3.3% of students said that they had handed in, as their own, assignments done by other students. The results of studies carried out in other countries are similar (Teixeira & Rocha, 2006; McCabe, Butterfield & Trevino, 2006; Rey-Abella, Blanch & Folch-Soler, 2006; Agnes, 2008).

So what do university lecturers think about all this? According to Sureda, Comas and Morey (2009), university lecturers believe that students plagiarise because the Internet makes it very easy for them to do so; students do not value effort and hard work; they do not manage time properly; they do not know how to do academic assignments; furthermore, lecturers do not properly monitor such assignments. Likewise, it would appear that the teaching-learning methodologies used by lecturers and the characteristics of the assignments that students are asked to do actually encourage plagiarism (Hunt, 2003; Sureda, Comas & Urbina, 2005).

## 2. Methodology

Quantitative and qualitative methodologies were used in the research design. Simultaneous triangulation of methods (questionnaires and focus groups) and triangulation of data (of students and their lecturers) (Rodríguez Ruiz, 2005) were also used to enhance the validity of the results.

### Participants

There were two types of participants: students and their lecturers. While the object of study was the students, their lecturers were also asked about what the students did, for triangulation of data purposes. A total of 115 students and 22 lecturers took part in the study. Of the students, 25 were in the first year, 33 in the second year, 31 in the third year and 26 in the fourth year of the Audiovisual Communication bachelor's degree course in the 2007/2008 academic year, in the Faculty of Humanities and Education at Mondragon University, Eskoriatza (Guipúzcoa, Basque Country, Spain). All the students (apart from the first-year students) had received three hours of training on how to do academic assignments and on the use of bibliography as part of a subject in the first semester of the second year. This is the reason why the lecturers said that they did not usually explain how to cite bibliographic sources in their subjects.

Data collection took place between November 2007 and February 2008.

### Questionnaires

Two types of questionnaires were used. The student questionnaire was the first to be validated. Then, taking it as a reference, the lecturer questionnaire was created and validated. The questionnaires were based on indicators from the Association of College & Research Libraries' Information Literacy Competency Standards for Higher Education (ACRL, 2000). Also taken into account were the questionnaires used in research by Mittermeyer and Quirion (2003), and by Sureda and Comas (2008). They contained five questions, four on a frequency scale and one task question. For the latter, they had to interpret a bibliographic reference.

## Focus groups

Focus groups were held to gather information about the students' and the lecturers' social discourse, feelings, experiences and concerns about academic plagiarism and the use that the students made of bibliography. In total, five focus groups were convened: four with the students and one with the lecturers. The focus groups were designed and analysed in line with the guidance offered by Murillo and Mena (2006), Suárez (2005) and Llopis (2005).

## 3. Results

### 3.1. Questionnaire results

In the tables, data on what the students thought about the use of bibliography and academic plagiarism are compared with data on what their lecturers thought about what the students did. The standard deviation is shown in brackets.

#### 3.1.1. Citing the author when information created by others is used

The students said that they very often cited the authors of information that they used (two thirds), whereas their lecturers thought that they did so less often.

**Table 1.** Citing the author when information created by others is used. Students and their lecturers

<i>Mean for students</i>	<i>Mean for lecturers</i>	<i>Level of significance</i>
1,86 (0,95)	1,05 (0,52)	U=436,5; p<0,01 *

Scale: 0-3

The following table shows that the students said that they cited more often as they progressed through their course. The academic year in which they claimed to cite more bibliographic sources was the third year. In the fourth year, however, the frequency of citations returned to levels approaching those of the first year.

**Table 2.** Citing the author when information created by others is used. Students per year

<i>First year, mean</i>	<i>Second year, mean</i>	<i>Third year, mean</i>	<i>Fourth year, mean</i>	<i>Level of significance</i>
1,58 (0,96)	1,87 (0,94)	2,30 (0,87)	1,62 (0,92)	$\chi^2=9,44$ ; p<0,05 *

Scale: 0-3

### 3.1.2. [Task-item] Ability to interpret a bibliographic reference

In order to find out more about the students' real dynamics with regard to bibliography, a task-item was incorporated into the questionnaire. The result was that more than half of the students were unable to interpret a bibliographic reference properly. It is significant that the lecturers considered that only 6.7% of their students was able to interpret a bibliographic reference.

**Table 3.** [Task-item] Ability to interpret a bibliographic reference. Students and their lecturers

<i>Percentage of students</i>	<i>Percentage of lecturers</i>	<i>Level of significance</i>
45,2%	6,7%	U=428,0; p<0,01 *

Percentage (%)

The students' ability was similar in all years and no progression was observed as the years went by. However, the results for the second year were slightly better than the other years, which may be due to the three hours of training on how to do academic assignments and on the use of bibliography that the students received in the first semester of the second year.

**Table 4.** [Task-item] Ability to interpret a bibliographic reference. Students per year

<i>First year, percentage</i>	<i>Second year, percentage</i>	<i>Third year, percentage</i>	<i>Fourth year, percentage</i>	<i>Level of significance</i>
41%	59%	38%	38%	$\chi^2=3,04$ ; p=0,39

Percentage (%)

### 3.1.3. Use of information created by others as one's own, without making any changes

The students said that they did not present information created by others as their own in their assignments, without making any changes to it or citing the author. However, the lecturers considered that this was usual practice among their students.

**Table 5.** Use of information created by others as one's own, without making any changes. Students and their lecturers

<i>Mean for students</i>	<i>Mean for lecturers</i>	<i>Level of significance</i>
0,68 (0,77)	1,83 (0,62)	U=244,0; p<0,01 *

Scale: 0-3

As the students progressed through their course, they tended to present information created by others as their own more often, without making any changes to it or citing the author, as shown in the following table.

Table 6. Use of information created by others as one's own, without making any changes. Students per year

<i>First year, mean</i>	<i>Second year, mean</i>	<i>Third year, mean</i>	<i>Fourth year, mean</i>	<i>Level of significance</i>
0,47 (0,61)	0,47 (0,78)	0,83 (0,72)	1,00 (0,84)	$\chi^2=9,09$ ; $p<0,05$ *

Scale: 0-3

### 3.1.4. Taking into account that the information's intellectual property always belongs to the author

The students said that they took into account that the information's intellectual property always belonged to the author for half the number of times that they handled information, although their lecturers thought that the frequency was lower.

Table 7. Taking into account that the information's intellectual property always belongs to the author. Students and their lecturers

<i>Mean for students</i>	<i>Mean for lecturers</i>	<i>Level of significance</i>
1,60 (0,92)	0,95 (0,70)	$U=544,5$ ; $p<0,05$ *

Scale: 0-3

When comparing the student data by year, no differences were found.

Table 8. Taking into account that the information's intellectual property always belongs to the author. Students per year

<i>First year, mean</i>	<i>Second year, mean</i>	<i>Third year, mean</i>	<i>Fourth year, mean</i>	<i>Level of significance</i>
1,63 (0,95)	1,70 (0,91)	1,48 (0,99)	1,57 (0,87)	$\chi^2=0,73$ ; $p=0,87$

## 3.2. Focus group results

### 3.2.1. First-year focus group analysis

The first-year students considered that copying information created by others in an academic environment was an issue of personal ethics, and they did not express any value judgment on this conduct. They thought that it was easy to detect who had copied, and they all said that they did not usually do so: "I prefer doing an assignment my own way, even if it's wrong, rather than doing a perfect assignment using other people's words."<sup>1</sup>

This group considered that, to use information created by others, it was essential to feel identified with what they had said. If they did not identify themselves with a text, then they did not use it in their assignments.

1. Translator's note: The source language of this and all subsequent student comments was Spanish.

When they used information created by others, they did not usually make any bibliographic citations, although they claimed that they knew how to make such citations if necessary. They only made bibliographic citations when it was strictly necessary, that is to say, when the lecturer explicitly asked them to do so.

### 3.2.2. Second-year focus group analysis

This group's thoughts on the issue were quite confused. They considered that it was never acceptable to use information created by others, whether paraphrased, translated or quoted; they considered this to be copying, that the quality of their assignments would be lower, and that the lecturer would penalise them for doing so: "it happens a lot... if you haven't got a clue about a topic and you manage to find a good article and copy it in one way or another, and then, on top of that, you go and put the bibliographic citation, well he's going to say: 'you're good at copying, aren't you?' So it's often better to sign it yourself without saying a word, and that's that." They considered that it was a better strategy not to offer the reader any bibliography and to present the assignment as if they had not used information created by others: "if you give the bibliography and stuff, he'll soon realise where you got the information from, because you're giving him all the clues. It's often better to keep quiet and not cite anything." However, they were not sure whether their conduct was right or wrong: "hey, if you find something you were looking for, well that's what you're going to write, isn't it? The lecturers are very quick to tell us that we're copying when we use other people's information, but if there's no choice, what are we supposed to do about it?"

They were very sure about the procedure they needed to follow when using sources of information in their assignments: "copying everything no, but taking some text in Spanish and translating it into Basque and adding a couple of things, well yes."

In general, they thought that they could use information from the Internet as they saw fit; they did not have any ethical qualms in this respect: "if it can't be used, well why do they post it on the Internet?"

They considered that they did not have much need to make bibliographic references in the course of their work, and when they did so, it was generally in extended assignments. However, their lecturers did not normally ask them to make any bibliographic references and citations.

### 3.2.3. Third-year focus group analysis

Third-year students thought that using information created by others as if it were their own was a little cheeky, but they did not consider the conduct to be inappropriate. They made bibliographic references and citations only when they were asked to do so, and that did not happen very often: "when the assignments are big, then yes, but if we're asked to read a text, we search for a bit of information and create our own text, and then you don't put the bibliography."

Some members of the group said that they used direct quotations in their texts, especially when they wanted to insert an author's words literally. However, these students did not relate this practice to bibliographic citations, and it was not clear what procedure they followed. The discourse on direct

quotations was contradictory. On the one hand, they said that they had been taught how to make citations and references, and on the other, that they would find it hard to make them properly: "they've taught us how to do it, but I can't remember how to."

When they had to do academic assignments, the procedure that they normally followed was to search for a variety of information and then draft a new text, making particular use of paraphrasing: "we underline the main ideas, we use other channels, we go to other sources to search for information, but always for information that's somehow related to the topic, and then we put it all together, a sort of potpourri or collage." A Bakhtinian air and a connection with the berrypicking theory (Bates, 1989) can be observed in this explanation.

### 3.2.4. Fourth-year focus group analysis

The fourth-year group did not show any interest in the issue. In their opinion, they were not used to making any bibliographic citations because the lecturers did not ask them to do so: "we don't generally cite the authors because we're not asked to do so and because many of the assignments are practical." However, they did consider it positive to provide citations and produce bibliographic references in academic assignments.

### 3.2.5. Lecturer focus group analysis

During the conversation, it became clear that the lecturers believed that their students did not usually make any citations or references: "fourth-year students don't know how to cite, and that's a pretty basic thing. They'll leave university without knowing how to insert other author's texts in their assignments"<sup>2</sup> or "I believe that the problem [of not citing or using bibliography] has arisen in every final-year project I've seen since I've been a tutor." They considered that the teaching staff was largely responsible, that is to say, that the lecturers did not get their students used to working with bibliographic references and citations, and that they did not teach the students how to use information they found on the Internet properly: "it may be something that we've overlooked, because we don't help them with the bibliography" or "we don't usually do any work on bibliographic citations, or on how to present direct, in-text quotations, and it's crucial for them to learn how to manage the direct- and indirect-speech issue." The lecturers also thought that all of this was reflected in the quality of the students' assignments: "the students don't handle much information when doing their assignments, and they lack attention to detail and accuracy; they refer to things generally and don't mention anything specific."

The focus group lecturers expressed great concern about academic plagiarism among students: "right now, plagiarism is a major problem in this faculty, especially for subjects given in Spanish. Because it's one thing to build on information, and quite another to copy it directly. As a faculty, I believe that the message we put out should be much stricter, that plagiarising is equivalent to a fail."

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2. Translator's note: The source language of this and all subsequent lecturer comments was Spanish.

Not having an anti-plagiarism policy in the faculty was considered to be a negative aspect: "as an academic institution, we've yet to realise the gravity of this situation and actually convey that to the students. But it shouldn't be that way, and the message we ought to convey is that plagiarism has its consequences." They also realised the difficulties that this involved: "yes, but to do that we have to be very tough and very specific."

Likewise, it was also considered that intentional copying or using other people's ideas without citing them was not the same as doing so unintentionally, simply because the students did not know how to make the bibliographic references or citations. The lecturers felt that the fact of living in a culture where originality is especially rewarded had an influence: "everything has to be original, created by me, it has to be mine; if not, it is considered to be plagiarism." That is why they felt that many students thought that it would not be a good idea for them to cite the ideas that they were using because, if they did, it would be obvious that their work was not original, and the that lecturer would penalise them for it. With this in mind, it was considered expedient to train students on creativity and originality too: "working on the issue of originality and creativity with the students, on what it means to drink from universal fountains of knowledge, etc."

## 4. Conclusions and discussion

### 4.1. The students do not often cite the sources of information that they use because the lecturers do not ask them to do so

Based on the information gained from all the focus groups and the questionnaire, it is clear to conclude that the students did not usually cite the sources of information that they used in their academic assignments. Over half of all the students did not know how to interpret a citation (this result is slightly higher than the one obtained by Mittermeyer and Quirion (2003) for Canadian students). However, almost two-thirds of the students said that they cited the sources of information used. It would seem, therefore, that there is some contradiction between what they did and what they said they did. The explanation for this may be that the students knew what the good practices were (citing the sources of information used) and ticked them in the opinion items on the questionnaire, but, through the task-item and the focus groups, it was possible to elucidate what the real practice actually was (they did not cite the sources).

The students in all years and the lecturers stated that the main reason for the students not citing the sources of information was that the lecturers did not ask them to do so, with the law of minimal effort thus prevailing. The attitude of the teaching staff in this respect was ambiguous; on the one hand, they considered it essential for the students to learn how to construct knowledge by basing their ideas on information created by others, but on the other, they did not encourage this in their lectures or in their teaching practice. They considered themselves and the academic institution to be the main culprits for this worrisome situation.

#### **4.2. A lot of students consider citing the sources of information used to be a dangerous because they believe that the lecturer will penalise them if he realises that they have used ideas and information created by another person**

The evidence was not categorical in this respect, though this idea did arise in three of the four groups. They considered that citing the sources of information gave the lecturer too many clues, which would then lead to him penalising them. They believed that it was better not to offer bibliography or make citations, and to present the work as if it were totally original. In the literature, nothing like this has been found, and it is clear that further research is required to better understand and change this mechanism.

#### **4.3. The students consider that they do not often plagiarise, but their lecturers feel that plagiarism has become a problem**

It is clear that the students felt that they did not plagiarise. They considered plagiarism to be an issue connected with each individual's personal ethics, without judging it.

The students' actions differed depending on the format of the information; when working with texts, they did not act in the same way as with music or videos. The same conclusion was reached in a study of the behaviour of young British people undertaken by the British Library and JICS (2008a). However, both Frand (2000) and Shih and Allen (2006) concluded that the attitudes of young people did not vary with the format.

In keeping with other studies (Luckin et al., 2008; Stock, 2008; British Library & JICS, 2008b), the lecturers felt that plagiarism had become a problem, though with the particular feature that plagiarism happened mainly in subjects taught in Spanish, probably due to the fact that much more information is available in Spanish than in Basque. In order to solve this problem, the lecturers considered that educational organisations should create more specific, tougher policies. The lecturers believed that one of the reasons for the propagation of plagiarism was the fact that we live in a culture where originality is rewarded, and that this might confound the students when it comes to understanding how knowledge is created. It is clear that this is a complex issue, and it would appear that incorporating content related to the creation and construction of knowledge into the curriculum could be effective, in such a way that students are able to understand that, in order to create knowledge, it is necessary to draw on prior knowledge, and that one of the main ways of achieving that is to use information created by others. By doing so, they would understand the dynamics of the 'wheel of knowledge', which they could become part of.

In-depth research also needs to be done on students' real information-handling practices to find out about what they really do, since this study has made it clear that there may not always be a match between what students say they do and what they actually do.

Finally, in order to be able to work with students on topics connected with originality and knowledge creation, tradition, copying, plagiarism, and the importance of using and acknowledging prior knowledge, etc., it is worth investigating further into the most appropriate didactic transposition.

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## ARTICLE

# The Impact of ICTs on Lecturer and Student Interaction in University Education Processes

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## Abstract

Interaction is a basic element in any educational process, and it is something that needs to be reconsidered in the light of technology. In order to examine the methodological changes that ICTs bring to teaching from an interaction perspective, a study was carried out at the University of Lleida to observe interaction processes in various face-to-face, blended learning and e-learning subjects. The methodological design was based on three data collection techniques: documentary analysis of subject curricula, lecturer and student questionnaires, and lecturer interviews. The data showed that, as the online component of subjects increased, the lecturers and students used more technological tools to communicate (e-mail, forums, chats, social networks, etc.). Furthermore, we found that the lecturers and students basically communicated for academic purposes. While they hardly ever communicated for personal reasons (guidance, support, etc.), they claimed that closer

contact with a non-academic focus would be preferable. We also observed that the students' work was more individual in e-learning subjects. Although there is still a considerable way to go in ICT-mediated lecturer-student interaction, both the lecturers and students recognise the potential of such technologies, even though they still do not use them as they feel they should.

### Keywords

higher education; e-learning; interaction; information and communication technologies

## *La influencia de las TIC en la interacción docente y discente en los procesos formativos universitarios*

### *Resumen*

*La interacción, un elemento básico en cualquier proceso formativo, debe replantearse con la irrupción de la tecnología. Con la intención de abordar los cambios metodológicos que las TIC implican en la docencia desde la perspectiva de la interacción que generan, se planteó un estudio en la Universidad de Lérida para observar los procesos que interactúan en diferentes asignaturas en función de si éstas se desarrollaban bajo la modalidad presencial, semipresencial o no presencial. El diseño metodológico se articuló alrededor de tres técnicas de recogida de datos: análisis documental de programas de asignaturas, cuestionarios a profesores y estudiantes y entrevistas a profesores. Los datos mostraron que, conforme aumenta la no presencialidad de las asignaturas, profesorado y estudiantado utilizaban más herramientas tecnológicas (correo electrónico, foro, chat, redes sociales...) para comunicarse. Además, el tipo de comunicación imperante tenía finalidades académicas, mientras que se producía una escasa interacción para aspectos más personales (de orientación, apoyo...); en este sentido, tanto profesorado como estudiantado preferirían un contacto más cercano no tan centrado en los elementos académicos del proceso. También observamos que en las asignaturas en línea se desarrolla un trabajo más individual por parte del estudiantado. Aunque todavía queda camino por recorrer en la interacción docente-discente a través de las TIC, los agentes implicados en el proceso reconocen sus potencialidades, pero aún no las utilizan como consideran que convendría hacerse.*

### *Palabras clave*

*educación superior, formación en línea, interacción, tecnologías de la información y la comunicación*

## 1. Introduction

ICTs facilitate personal communication and provide access to all kinds of information, implying a methodological change to teaching and a need for both lecturers and students to adapt to the use of such tools (Surià, 2010).

Interaction is a basic element in any educational process. Such interaction, which is always explicit in classrooms due to the face-to-face relationship established between lecturers and students, and among students, is an element that various authors have reconsidered in the light of technology in education.

Dorado (2006) analyses networking as a source of learning, with the idea of going beyond models that centre on technological factors (those focusing attention on the use of tools) and on content

factors (those placing importance on content factors rather than methodological factors), and proposes what he describes as 'quality' models. According to this author, such models are centred on users and on the management of the networks in which they participate, and therefore on the methodologies and potential mediations and relationships that develop between the different people forming part of the environment, who represent the veritable added value of any educational and knowledge management system.

From this perspective, with technology and content relegated to a secondary position, it is in human capital that investment should be made. Indeed, Dorado (2006) states that such human capital is the true driver of knowledge creation in any community because it integrates intellectual, social and organisational capital as a whole.

In online learning, it is worth highlighting Dorado's idea of going beyond the need to centre on technology or content to take the leap of only and exclusively being concerned with the users, with the students who achieve learning by doing a series of tasks and by putting various skills into practice. This idea is also underscored by Fuentes (2009), who suggests that the use of ICTs in educational processes should not make us underestimate the importance of interaction between and among the students and, above all, between students and lecturers, which should always be the basis for every educational action.

Interaction should be a basic element in an educational process. If, in the planning of that process, the face-to-face element is reduced, then we have to place greater emphasis on being able to compensate for the lecturers' non-presence so that students feel accompanied and supported at all times. Avoiding isolation should be a fundamental objective to ensure that students get involved and learn throughout the process. Sher (2009) demonstrated this approach and found that, in e-learning, the students' satisfaction with and perception of learning were directly related to the level of student-lecturer interaction.

Indeed, through studies like the one carried out by Davidson-Shivers (2009), we find that, in online educational processes, what predominates is the development of lecturer-group communication on academic topics (information about the course, content, activities, etc.), mainly by using e-mail or notice board tools. Furthermore, according to Wang (2008), it would seem that technological tools are still incapable of establishing a sense of belonging to a strong community in the way that face-to-face processes do.

Authors such as Moore (1989) and Salinas (2004) emphasise the need to approach the methodological changes that ICTs bring to teaching from the perspective of the interaction that they generate. It is a matter of evaluating the extent to which the interaction between and among the various agents of the educational process also has a place in the e-learning model. Of the various types of interaction, these authors highlight three:

- Student-content interaction. In the design of an ICT-mediated educational process, the way in which educational content is prepared is very important for fostering student motivation. Lecturers may consider replacing the 'paper' format so as to offer students interlinked materials containing images, videos, audios, animations, charts, diagrams, etc.

- Student-lecturer interaction. Online teaching should not imply a replacement of lecturers, but rather a review of their tasks. Besides transmitting knowledge and monitoring the students' progress, lecturers should have the capacity to guide and facilitate learning, to channel individual and group efforts, to solve technological problems, etc.
- Student-student interaction. This is another dimension that we should not overlook; in online teaching too, it needs to be strengthened and honed. With ICT tools, face-to-face communication models can be replicated, thus fostering the learning opportunities that are generated when students interact with each other.

On the issue of the student-lecturer communication process, Área (2010) suggests that, in the development of a teaching-learning process that alternates between face-to-face classrooms and the use of virtual spaces, we could combine two modes of communication between these agents.

- First, tutoring through the virtual classroom, which may have a number of formats: personal communication between students and lecturers via e-mail, public communication between students and lecturers via forums, tutoring and inter-student support (also via forums), unidirectional tutoring from lecturers to students via a 'notice board' type of tool for the virtual classroom, etc.
- Second, tutoring in the lecturer's office, mainly consisting in monitoring the students' work and in solving particular queries or problems that each student might have.

Finally, and to conclude this introductory section that allows us to frame the study carried out, we should not forget that interaction facilitates the development of collaborative working. In this respect, the advent of Web 2.0 tools (wikis, blogs, social networks, file-sharing tools, etc.) needs to be taken into account because they allow collaborative learning to take place, and this implies a change to the way in which teaching and learning processes have been conceived and understood to date. According to Dillenbourg (1999), collaborative working develops when students take on an active role in their learning processes and are able to communicate with each other and participate, on an equal standing, in shared tasks. This collaborative exchange of information encourages students to develop more elaborate cognitive strategies, thus enriching the communication between and among group members, and also the acquisition of knowledge from group and individual perspectives (Salovaara & Järvela, 2003). Recently, Jorczak and Bart (2009) observed that collaborative learning takes place when students get involved in the group and communicate with fellow students to solve problems and to construct knowledge jointly. A number of studies on experiences of using tools of this type in teaching (Hugues & Narayan, 2009; Reinoso, 2009; Levis, 2011) highlight the potential and effectiveness of such tools in student learning and the development of teamwork for knowledge construction.

It was from this perspective —connected with the need to reconsider the educational process when technology forms part of it— that a study was carried out at the University of Lleida to analyse the use of ICTs in the development of teaching and learning processes. The study, carried out in the 2007/2008, 2008/2009 and 2009/2010 academic years, focused on observing interaction processes

in various subjects at the university, depending on whether they were offered in face-to-face mode, blended learning mode or e-learning mode. To that end, three variables were considered:

- Lecturer-student interaction (account was taken of elements such as interaction situations, tools used and interaction motives).
- Student-student interaction (how often the students interacted with each other to do various tasks).
- How students were organised to work on the subjects (individually, in pairs, in small groups or whole-class groups).

For the study, data were collected from both lecturers and students.

## 2. Methodology

The methodological design was based on three data collection techniques. First, an analysis was performed of the course plans for the subjects that were the object of study. This allowed us to get an insight into the educational process before its implementation, and to examine how the use of ICTs affects the various aspects planned by the lecturers. As a guide for elaborating a homogenous record, we used a tool that the University of Lleida had designed for lecturers to plan subjects according to a series of established rules.

Besides the documentary analysis, we considered that it was necessary to develop a technique to allow us to reach a high number of student and lecturer informants. We used a questionnaire common to both groups of informants, designed specifically for this study, which would allow us to compare their respective responses. To create the questionnaire, the first step was to group together the elements on which we wanted to collect data and to elaborate the items for each section.

After it had been designed, the first version was then validated. To do that, there were three different profiles for the validation panel: experts in the use of ICTs in teaching-learning processes, university lecturers and students. The elements that needed to be assessed were the unambiguity and suitability of the items. Quantitative and qualitative analyses of the panel members' contributions allowed us to produce the final version of the questionnaire.

Finally, interviews were used to gather the informants' perceptions and feelings about the educational process, once the process had ended. In this case, individual, unstructured, undirected and open-question interviews were formulated. For the design, a protocol was created, which was validated with the help of experts in qualitative research.

### 2.1. Sources of information

The main criterion for accessing sources of information was to locate face-to-face subjects, blending learning subjects and e-learning subjects at the University of Lleida. To do that, we used data available

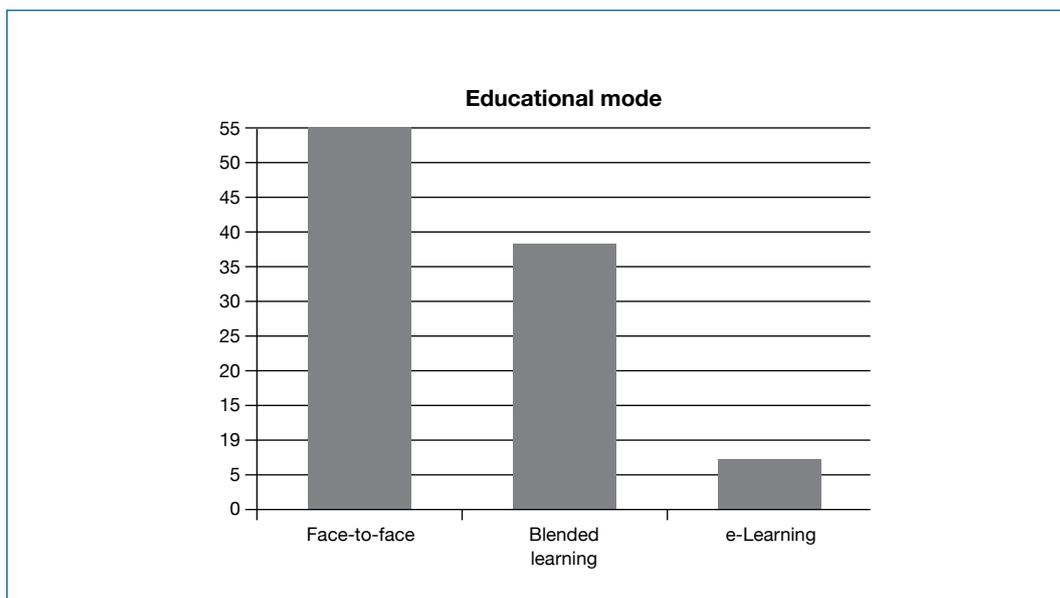
in the Support for Teaching Innovation and e-Learning Area, a unit of the Education Sciences Institute – Continuing Education Centre dedicated to providing pedagogical and information technology support to lecturers for the incorporation of ICTs into teaching. Twenty-nine subjects were selected: nine face-to-face, 10 blended learning and 10 e-learning.

After being chosen, the process to get hold of their plans was initiated so that the documentary analysis could be performed. Some were found on the university's website, and others on the Virtual Campus.

The 29 subjects were taken as the basis for collecting data from the lecturers via the questionnaire. Then a process began to seek out other lecturers at different faculties and schools. The criterion continued to be that of locating face-to-face, blended learning and e-learning educational processes.

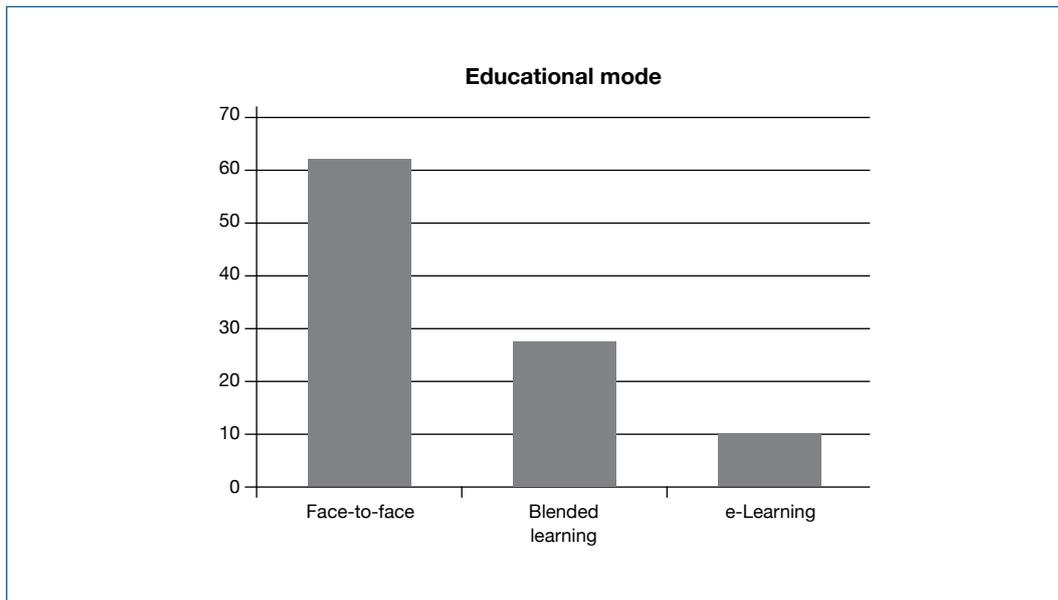
Through the centres' web directories, a decision was taken to select the lecturers randomly (choosing one out of every five by going down the directory list), without knowing which educational mode they used for their subjects. We knew that a number of lecturers implemented ICT-mediated educational processes, some of whom were also chosen.

We sent the questionnaire to a total of 212 individuals and received responses from 71: 43 men and 28 women (60.6% and 39.4%, respectively). Regarding the educational mode used for the subjects, 39 of the 71 respondents (54.9%) stated that it was face-to-face, 27 (38.7%) that it was blended learning and 5 (7%) that it was e-learning (Chart 1).



**Chart 1.** Percentage of subjects, by educational mode (lecturers)

The 29 initial subjects were also taken as the basis for collecting data from the students via the questionnaire. The research team contacted the lecturers in charge and sought their permission to go into the classroom to collect data. A total of 658 responses were received, 163 (24.8%) from men and 478 (72.6%) from women (17 did not respond). Regarding the educational mode used for the subjects, 405 of the 658 respondents (61.6%) stated that it was face-to-face, 181 (27.5%) that it was blended learning and 67 (10.2%) that it was e-learning (five individuals did not answer this item) (Chart 2).



**Chart 2.** Percentage of subjects, by educational mode (students)

For the 29 subjects, the results obtained from the 71 lecturers and the 658 students were compared.

The 29 initial subjects were taken as the basis for the interviews, though the list of lecturers compiled for data collection via the questionnaire was also used. Finally, 12 lecturers across different centres were contacted. Of these 12, four taught subjects in face-to-face mode, four in blended learning mode and four in e-learning mode. The analysis of the interviews was performed by grouping together the responses from the lecturers in accordance with the variables of our study. In consequence, a comparison could be made between the various techniques used.

## 3. Results

### 3.1 Analysis of plans

In the face-to-face subject plans, the lecturers tended to propose assignment tasks in small groups (this option was specified in seven curricula), whereas two of them did not contain any reference to the way in which students should interact with each other.

The blended learning subject plans tended to propose that students should do certain tasks, which they had to solve either individually or in small groups (this interaction formula was specified in seven curricula). Only one plan specified that the assignment should be done individually, and another specified that work should be done by the whole-class group in lectures, and in small groups for other activities. Finally, it is worth mentioning that one plan made no reference to any type of interaction.

Of the 10 e-learning subject plans, two of them made no reference as to whether students should

work individually, in small groups or as a whole-class group. One plan specified that the assignment should be done individually, and another specified that work should be done both individually and in small groups. The remaining plans (six) mentioned that the students should do the tasks both individually and as a whole-class group, using ICT tools such as chats, discussion boards or, in some cases, planned face-to-face meetings.

## 3.2 Questionnaires

As indicated in the methodology section, the questionnaire designed for this study was subjected to a process of quantitative and qualitative validation by a validation panel. Regarding the quantitative assessments, we obtained high scores for the unambiguity and suitability of the items. More than 90% of the validation panel members stated that they were unambiguous and suited to the study, though the percentage dropped to 75% in some cases. In others, the percentage of positive responses was around 80%.

In many cases, the validation panel members expanded their quantitative responses by adding qualitative comments. The interpretation we made of this (high quantitative score, but also qualitative suggestions) was that, generally speaking, the first version of the questionnaire was more or less clear in terms of the information it aimed to collect, though more work needed to be done on the items to make them more precise.

The comments received from the validation panel members helped us greatly to modify items and elaborate the final version of the questionnaire, which asked the lecturers and students about three types of interaction:

- Lecturer-student interaction.
- Student-student interaction.
- How students were usually organised to work on the subjects.

### 3.2.1. Lecturer-student interaction

A question was asked about how much time that, while a subject was being taken, the lecturer spent on: transmitting subject content, monitoring the students' progress, solving academic queries, helping the students to do their assignments and solving queries about various non-academic aspects (guidance, solving technical problems, etc.).

The lecturers responded (Table 1) by stating that, while a subject was being taken, transmitting content, monitoring progress, solving queries and advising students on assignments were the items that took up most of their time, though the order varied slightly depending on the educational mode used. Monitoring progress took up much more time in e-learning subjects, in which interaction in non-academic queries decreases

Table 2. Frequency of time spent on the various sections (lecturers' responses, by percentage).

	Transmission			Monitoring			Academic queries			Advice			Non-academic queries		
	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL
<b>Always</b>	43.6	25.9	20	10.3	29.6	40	23.1	25.9	60	15.4	29.6	60	12.8	14.8	40
<b>Often</b>	53.8	55.6	40	35.9	29.6	60	46.2	55.6	40	48.7	37	40	25.6	29.6	20
<b>Sometimes</b>	0	11.1	20	33.3	14.8	0	23.1	7.4	0	17.9	25.9	0	25.6	25.9	40
<b>Not often</b>	2.6	7.4	20	15.4	25.9	0	5.1	11.1	0	12.8	7.4	0	25.6	29.6	0
<b>Never</b>	0	0	0	2.6	0	0	0	0	0	5.1	00	0	10.3	0	0

FTF: Face-to-face subjects; BL: Blended learning; EL: e-Learning

For the students (Table 2), the options 'always' and 'often' also prevailed in their responses, though two rather odd aspects were observed. First, for monitoring progress, in the face-to-face and blended learning subjects, 'sometimes' and 'not often' appeared more often than in the lecturers' responses; this did not happen in the e-learning subjects. Second, the students gave higher responses in the 'always' and 'often' options for time spent on solving non-academic queries, particularly in the face-to-face and blended learning subjects.

Table 2. Frequency of time spent on the various sections (students' responses, by percentage)

	Transmission			Monitoring			Academic queries			Advice			Non-academic queries		
	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL
<b>Always</b>	46.4	38.1	26.9	4.9	14.4	37.3	26.7	36.5	41.8	17.8	29.3	32.8	19.8	23.8	31.3
<b>Often</b>	38.8	37.6	28.4	18	24.3	28.4	39.5	35.9	26.9	36	24.3	22.4	27.7	27.6	22.4
<b>Sometimes</b>	9.1	13.8	26.9	29.9	26	14.9	22.7	17.1	14.9	25.9	23.8	22.4	23.5	23.2	22.4
<b>Not often</b>	4.7	9.4	11.9	32.1	25.4	13.4	8.4	8.8	11.9	14.6	17.7	16.4	20.2	16.6	16.4
<b>Never</b>	0.5	0.6	4.5	15.1	8.8	3	1.2	0.6	3	5.2	4.4	3	8.4	8.3	4.5

FTF: Face-to-face subjects; BL: Blended learning; EL: e-Learning

### 3.2.2. Student-student interaction

A question was asked about how often the students interacted with each other to: share materials, work on content, do assignments, develop projects or solve problems as a group, solve queries and correct their own assignments or activities.

For the lecturers (Table 3), there was basic student-student interaction in the face-to-face and blended learning subjects to do assignments or practicals (to this question, 69.2% of the face-to-face subject lecturers responded 'often' while 37% of the blended learning subject lecturers responded

'always', so both data are significantly higher than the mean). In the e-learning subjects, interaction for working on content and solving queries stands out. In the remaining sections, the lecturers did not indicate that there was a high level of student-student interaction.

Table 3. Frequency of student-student interaction (lecturers' responses, by percentage)

	Sharing materials			Working on content			Doing assignments			Group projects			Solving queries			Correcting		
	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL
<b>Always</b>	7.7	3.7	0	5.1	22.2	0	7.7	37	20	7.7	29.6	0	7.7	25.9	0	5.1	7.4	0
<b>Often</b>	25.6	37	20	38.5	40.7	40	69.2	48.1	20	23.1	33.3	20	15.4	22.2	40	15.4	25.9	20
<b>Sometimes</b>	33.3	29.6	20	23.1	25.9	20	10.3	11.1	40	23.1	22.2	20	46.2	29.6	0	17.9	25.9	00
<b>Not often</b>	15.4	22.2	20	15.4	7.4	20	2.6	0	0	25.6	11.1	40	15.4	18.5	40	30.8	18.5	20
<b>Never</b>	5.1	3.7	40	5.1	3.7	20	5.1	3.7	20	7.7	3.7	20	7.7	3.7	20	25.6	22.2	60

FTF: Face-to-face subjects; BL: Blended learning; EL: e-Learning

The students' responses differed from the lecturers' in two response blocks (Table 4).

First, in the face-to-face and blended learning subjects, the options 'always' and 'often' were the most frequent responses in all sections apart from time spent on correcting their own assignments or activities, where the number of 'sometimes', 'not often' and 'never' responses increased. The highest data were obtained for time spent on doing assignments: 68.7% of the face-to-face subject students and 76.8% of the blended learning subject students indicated that they 'always' or 'often' interacted in this respect.

Second, in the e-learning subjects, the options 'not often' and 'never' appeared more often, with significant data such as the fact that 49.3% of the students responded that they never interacted to do assignments, 41.8% never interacted to develop projects, 26.9% never interacted to solve queries and 56.7% never interacted to correct their own assignments or activities.

Table 4. Frequency of student-student interaction (students' responses, by percentage)

	Sharing materials			Working on content			Doing assignments			Group projects			Solving queries			Correcting		
	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL	FTF	BL	EL
<b>Always</b>	21.5	32	16.4	16.5	27.1	19.4	27.7	45.9	6	18.5	29.8	10.4	17.5	24.9	10.4	7.2	15.5	4.5
<b>Often</b>	36.3	29.8	10.4	37.8	38.1	10.4	41	30.9	10.4	29.1	36.5	19.4	30.6	34.8	23.9	17.8	21	4.5
<b>Sometimes</b>	25.7	24.3	19.4	28.4	20.4	22.4	24.2	12.7	11.9	28.1	17.7	11.9	28.9	26	20.9	24.4	24.9	11.9
<b>Not often</b>	13.3	8.3	14.9	12.3	11.6	14.9	5.7	5.5	20.9	14.6	8.8	14.9	15.6	9.4	16.4	28.1	18.8	19.4
<b>Never</b>	2.7	3.9	37.3	4.4	1.1	31.3	0.7	3.3	49.3	8.4	5	41.8	6.7	2.8	26.9	21	17.1	56.7

FTF: Face-to-face subjects; BL: Blended learning; EL: e-Learning

### 3.2.3. How students were organised

The lecturers and students were asked to indicate how they usually worked on the subjects: individually, in pairs or threes, in small groups or whole-class groups.

The lecturers indicated (Table 5) that, in the e-learning subjects, that working individually was the most common form. In the other two modes, there was greater variety in this respect.

Table 5. How students were organised (lecturers' responses, by percentage)

	<i>Individually</i>			<i>Pairs, threes</i>			<i>Small group</i>			<i>Whole-class group</i>		
	<i>FTF</i>	<i>BL</i>	<i>EL</i>	<i>FTF</i>	<i>BL</i>	<i>EL</i>	<i>FTF</i>	<i>BL</i>	<i>EL</i>	<i>FTF</i>	<i>BL</i>	<i>EL</i>
<b><i>Always</i></b>	12.8	18.5	20	5.1	7.4	0	5.1	14.8	0	7.7	0	0
<b><i>Often</i></b>	51.3	44.4	80	25.6	48.1	20	38.5	48.1	20	20.5	29.6	20
<b><i>Sometimes</i></b>	12.8	14.8	0	41	29.6	0	10.3	7.4	20	17.9	25.9	0
<b><i>Not often</i></b>	12.8	18.5	0	7.7	7.4	60	15.4	11.1	0	17.9	22.2	20
<b><i>Never</i></b>	2.6	0	0	7.7	3.7	20	23.1	11.1	60	25.6	14.8	60

FTF: Face-to-face subjects; BL: Blended learning; EL: e-Learning

The students agreed that, in the e-learning subjects, they worked individually (83.6% responded by saying that they always did so). In the face-to-face and blended learning subjects, the students agreed that few strategies were used to work with the whole-class group (Table 6).

Table 6. How students were organised (students' responses, by percentage).

	<i>Individually</i>			<i>Pairs, threes</i>			<i>Small group</i>			<i>Whole-class group</i>		
	<i>FTF</i>	<i>BL</i>	<i>EL</i>	<i>FTF</i>	<i>BL</i>	<i>EL</i>	<i>FTF</i>	<i>BL</i>	<i>EL</i>	<i>FTF</i>	<i>BL</i>	<i>EL</i>
<b><i>Always</i></b>	24.2	14.4	83.6	3.5	7.7	0	16	33.1	3	8.1	6.1	16.4
<b><i>Often</i></b>	31.4	24.9	13.4	32.1	34.8	3	32.1	38.7	1.5	10.6	11.6	6
<b><i>Sometimes</i></b>	16.5	33.1	0	28.6	23.8	4.5	26.4	15.5	3	12.1	24.9	3
<b><i>Not often</i></b>	20	17.7	0	18.5	17.1	7.5	14.6	7.2	4.5	22.5	24.3	6
<b><i>Never</i></b>	7.2	8.3	1.5	16	13.8	82.1	10.6	4.4	85.1	44.2	29.8	64.2

FTF: Face-to-face subjects; BL: Blended learning; EL: e-Learning

## 3.3. Interviews

In the face-to-face and blended learning subjects, e-mail was used to receive queries from the students, to solve queries and to arrange appointments with lecturers. Face-to-face tutorials were a strategy that was not often used by the students, either in the face-to-face or blended learning subjects. The strategy of working in small groups was quite often used in the face-to-face subjects.

The lecturers of the blended learning subjects had adverse opinions on a certain kind of e-mail use. For example, one lecturer pointed out that online queries were of no use when it came to solving complicated questions: *"On an electronic level, of forums and so on... I believe that there are certain types of questions that no longer... they no longer bother to ask them, and I guess that's why they think: 'For heaven's sake, it's going to take me forever to explain what..., the query I've got, it'd be easier for me to go and see him."*

In the blended learning subjects too, other communication tools were mentioned, which were not referred to in the face-to-face interviews, such as the Virtual Campus forum tool.

In the e-learning subjects, an idea present in the lecturers' explanation was they were very satisfied with the students' participation: *"What I like is that people get involved. This allows people to become integrated more quickly, allows an exchange of opinions between..., whether technology buffs or not, allows two groups to participate at the same level: the technology buffs don't get bored and they do participate, and those who aren't don't feel excluded by a strange vocabulary and things they don't understand."* *"The truth is that I don't need to encourage them, I've never needed to with this group: there's always someone writing to you to ask questions. I can be found on the chat every single day."*

E-mail was also a highly used resource in the e-learning subjects, particularly for solving queries. Likewise, as mentioned by this lecturer, it was found that the students tended to separate forum and e-mail use very clearly: *"It would seem that they make a quite an odd distinction between the queries they have, that they send me as the lecturer —that they put to me by e-mail or the Virtual Campus mail, individual— and discussion, which they do in the forums. That said, within the forums there is a section for queries they might have on assessment... They don't use it; they'd rather do assessment individually."* Some lecturers said that when they received a query by e-mail that they considered to be of interest to the whole group, then they would forward it to the class.

In the e-learning subjects, the chat tool appeared as an alternative for communicating with the students, generally for less formal communications.

## 4. Discussion

The study has shown that lecturers are concerned with aspects such as transmitting knowledge, monitoring learning progress and solving academic queries (Tables 1 and 2). The data coincide with those obtained by Davidson-Shivers (2009), in that interaction takes place more individually between lecturers and students, or more generically, and less so to address small groups. We found that face-to-face tutoring is underused, although tools such as e-mail have enabled greater lecturer-student contact, irrespective of the educational mode.

As the online component increases, so too do the communication strategies used by the lecturers, such as online forum and chat tools, and even social tools such as Facebook. In this respect, we concur with the results obtained in other studies (e.g., Hugues & Narayan, 2009; Reinoso, 2009), which demonstrate that Web 2.0 tools can be useful for communicating during an educational process, and that their use is highly valued by the agents involved in the process.

In e-learning subjects, students tend to work more individually. This aspect was not observed quite as clearly in face-to-face and blended learning subjects, where working in small groups is a fairly common strategy (Table 3 and 4). In today's society, it is important to foster teamwork among students to develop competencies in that regard, which will allow them to cope better in a working environment in the future. It is for this reason that we consider—in line with the ideas posited by Dorado (2006) and Fuentes (2009)—that an effort needs to be made to strengthen interaction in online learning processes, and to try and ensure that at least as much importance is placed on this part of the process as it is on other elements, like technology or subject content for example. In addition, as Sher (2009) indicates, interaction is an important element for learning and for course assessment. Ensuring that interaction in online educational processes is given the weight that it deserves is the only way of effecting the change that the studies indicate: that a face-to-face approach creates a greater sense of belonging than an online approach (Wang, 2008).

Our study has allowed us to observe how lecturer-student interaction decreases as the online component of subjects increases. The same thing happens with interaction between and among students: the use of ICTs and a decrease in the face-to-face component leads the students' work to become more individual. Therefore, we can conclude that ICTs are currently having a negative impact on interaction processes in university teaching.

In short, we believe that there is still a considerable way to go on the issue of interaction in educational processes, and particularly in ICT-mediated e-learning processes. It will be necessary to conduct further research into social tools and their potential in teaching-learning processes. As we have observed, this field remains relatively unexplored, and investigators of this topic must take this into account. Another future proposal arising from the results obtained is to analyse why online education tends towards individualisation, and to attempt to find possible proposals to solve this issue.

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## ARTICLE

# An Answering System for Questions Asked by Students in an e-Learning Context

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**Abstract**

In this article, we present a system that helps tutors to answer questions asked by their students at an online university: the Open University of Catalonia (UOC). Communication between UOC students and their tutors is fully online; students ask questions and tutors answer them by e-mail. The system, which is currently being developed at the UOC's Office of Learning Technologies (OLT), aims to find multilingual contexts with useful information to enable tutors to give fast, appropriate answers to students. These contexts are extracted from course learning materials, from previous messages posted on subject discussion boards, and also from articles and other sources of information available on

the Internet. Apart from helping tutors to find better answers, the system is also useful for updating their knowledge and contributing to their lifelong learning.

### Keywords

question-answering systems; e-learning; speech acts; tutor

## *Un sistema de respuestas a consultas formuladas por alumnos en un contexto de aprendizaje virtual*

### *Resumen*

*En este artículo presentamos un sistema que ayuda a los docentes a responder las preguntas de sus alumnos en una universidad virtual, concretamente la Universitat Oberta de Catalunya (UOC). La comunicación entre alumno y docente se realiza de forma totalmente virtual: las preguntas y las respuestas se formulan y contestan mediante correo electrónico. El sistema, que se está desarrollando en el Área de Tecnología Educativa de la UOC, tiene como principal objetivo encontrar contextos multilingües con información útil para responder al estudiante de forma rápida y adecuada. Los contextos se extraen de los materiales del curso, los foros de participación de la asignatura, artículos y otras fuentes de información disponibles en internet. Además de ayudar a los docentes a encontrar mejores respuestas, el sistema también es útil para actualizar sus conocimientos y desarrollar su aprendizaje permanente.*

### *Palabras clave*

*sistemas de pregunta-respuesta, aprendizaje virtual, actos de habla, tutor*

## 1. Introduction

At an online university, tutors are faced with the arduous task of writing answers —containing detailed, useful information— to every query and question they receive daily from their students. The task can take up a considerable amount of the time they spend each day on teaching if the number of students is high and the tutors have a narrow timeframe in which to reply to them all.

In most question-answering systems for e-learning tutors (Hung et al., 2005; Feng et al., 2006; Wang et al., 2006; Yang, 2009), questions are answered automatically, but this approach has to overcome a number of problems. This includes the automatic recognition of a question when a student asks it implicitly rather than explicitly, with deviations from formal, normative expression. For example, spelling mistakes or typographical errors are commonplace in e-mails, as are unstable syntax and other phenomena, thus making the question more difficult to identify. Another problem is searching for an answer to a question that, despite being thematically related to the subject, does not refer to an aspect covered by course learning materials. In this case, traditional solutions based on information contained in learning materials are of no use, since such solutions rely on the extraction of information from a database with question-answer pairs, or from an annotated corpus (Feng et al., 2006; Wang et al., 2006; Yang, 2009). A solution that aims to extend beyond learning materials is the retrieval of an answer to a question asked by a student in an open online community (Bernhard

& Gurevych, 2008). The problem with this, however, is that the answers returned may be absurd and very unreliable. Consequently, the system would have to learn to discriminate between good and bad answers, and this is simply too demanding for current systems.

Besides such problems, which partially account for a tutor's lack of trust in automatic question-answering engines, these systems do not contemplate an important aspect that we identified in the UOC tutors' messaging. Questions often prompt tutors to search for the latest information; by doing so, they update their knowledge. Many questions arise from a student's reflections on an exercise or on recommended reading and, as a result, tutors have to find an answer on an aspect that they had not considered or, quite simply, that they were unaware of. Students thus foster their tutors' lifelong learning.

In this article, we present a help tool for tutors, the aim of which is not to get an exact answer to a question, but rather to find contexts with useful information to enable them to give a fast, appropriate answer to students. This aim allows for the development of a method that is more flexible than the traditional one for answer search systems. The best result is obtained when there is a good direct question among the contexts that the system has found. The system cuts down on information search times, allows tutors to update their knowledge and is useful for assessing students' contribution to the acquisition of information by their fellow students and also their tutors.

This article is structured in the following manner. Section two presents the methodology, which is based on a pragmatic theory. Sections three and four describe the prototype that we have developed thus far and present an evaluation of it. The final section contains the conclusions and future work.

## 2. Methodology

Our system's users are the virtual classroom tutors for all of the UOC's bachelor's degrees and programmes. Accordingly, we have developed a methodology that is independent from specific thematic domains. We decided to approach the problem by positioning it within a theoretical framework, in this instance Searle's theory of speech acts (1969), which describes the bases of communication between a speaker and a hearer.

In a communicative situation where tutors and students interact by e-mail, students have objectives that they expect to be met with the tutors' help. It is therefore crucial for students to formulate speech acts whose linguistic traits clearly indicate their expectations to tutors. Conversely, speech acts that tutors formulate in their answers must contain linguistic traits confirming that they meet students' expectations.

A speech act consists of two elements. The first is the speech act expression (SAE); it is the expression by which the hearer identifies the speaker's expectations.

"I don't understand" is an example of the way in which a student expresses an expectation that someone will clarify a concept.

The second element is a speech act object (SAO); it is the key term (or terms) of the speaker's speech act. For example, if a student says "I don't understand the notion of hyponymy," then *hyponymy* is the SAO.

Our hypothesis is that document segments that are useful to tutors are those containing the SAOs of a message. The question we therefore asked ourselves was this: to what extent do the SAOs of a message found in a document contribute to our system's usefulness? With this in mind, the prototype that we have developed searches for contexts in reliable sources of information in which SAOs co-occur. SAO candidates are identified automatically. However, it is up to the tutors to select the most relevant ones, since they are capable of working out students' intentions despite the fuzzy discourse relationships that are characteristic of informal e-mails.

### 3. Prototype

Thus far, we have developed a prototype that searches for contexts in which relevant terms contained in a student's message co-occur. In this section, we shall present the prototype procedure and the sources of information that it consults.

The prototype procedure has four stages, as shown below:

1. *Extraction of the subject of the message*

The subject of the message is extracted in order to retrieve other messages from discussion boards with the same or a similar subject.

2. *Automatic morphological analysis of the body text of the message*

The system morphologically analyses the body text of the message using the Freeling parser (Atserias et al., 2006). Most of the messages are written in Catalan, so it is set as the default source language.

3. *Tag cloud generation*

The system presents a tag cloud with the relevant concepts found in a student's message so that tutors can select the SAOs, that is to say, the concepts that they want to focus on in order to find useful contexts and thus be able to give a good answer. The tag cloud is generated by an automatic terminology extractor. Expressions between quotation marks, verbs and nouns are extracted. Terms probably belonging to the conceptual domain of the subject of the message are highlighted. However, in order to identify these terms, a system that is independent from conceptual content has been used. The system consults the open-source Catalan-English DACCO dictionary (<http://sourceforge.net/projects/dacco/>), which includes information about the frequency of its entries in terms of the number of results returned by Google. If we start from the hypothesis that terms related to a specific conceptual domain return fewer results than general-vocabulary terms, then the highlighted terms are those that fall below a numeric threshold of results.

4. *Useful contexts search*

After selecting the SAOs from the tag cloud, the system searches for contexts in Catalan and English in which the denominations of the selected objects co-appear in both languages. We refer to these contexts as *useful context candidates* (UCCs). The sources of information consulted for the extraction of UCCs are the following:

- Messages on subject discussion boards, written in previous semesters: the same question may have been asked in a previous semester, to which a tutor or a student may have given a good answer.
- Subject learning materials: the system uses a learning materials search engine developed by the UOC to find learning materials contexts in which the selected concepts co-appear.
- Wikipedia: links to Wikipedia in Catalan and English, where the terms selected by a tutor are explained.
- Online scholarly articles: for the prototype, the system used the Delicious (<http://www.delicious.com>) search engine to find articles in Catalan and English whose tags matched the concepts selected by a tutor. The system also used the search engine of CiteULike (<http://www.citeulike.org/>), which is a free online service that classifies scholarly publications and retrieves articles by the same method. So, the prototype showed the results pages from Delicious and CiteULike, with links to articles covering topics related to the selected terms.

Other free scholarly services can be added if tutors consider that to be necessary to obtain good answering contexts.

## 4. Evaluation

The prototype was evaluated to obtain two types of information: first, the prototype's usefulness in terms of enabling tutors to find and give appropriate, fast answers to students, and second, the contribution of each source of information to the prototype's usefulness. A number of elements that could be improved were also identified.

### 4.1. Evaluation procedure

For the evaluation, the subject General Linguistics II was chosen and two groups of evaluators were formed. The first group, called *experts*, comprised three subject consultants. The second group, called *novices*, comprised three subject specialists that had not had any experience as UOC consultants. Consequently, we were able to evaluate whether the prototype was more useful for novices than for experts, and vice versa.

Forty messages were selected for the evaluation. There are two explanations for the number of messages and the semesters they cover: first, the discussion board database only included the last two semesters, and second, we ruled out any messages that, in the opinion of at least three evaluators, were too decontextualised or unspecific to draw any useful contexts from.

A web environment was used, which was organised as follows:

- A space set aside for selecting the message that an evaluator wanted to view. This space contained a list of numbers from 1 to 40, each of them being a message reference number.
- A space set aside for displaying the message.

- A space set aside for selecting the SAOs from a tag cloud of terms in the message. After selecting the SAOs, the evaluators clicked a button to start the prototype's search for relevant contexts in order to give an answer.

The prototype displayed the UCCs found in each source of information, in accordance with the terms selected from the tag cloud. The task for both expert and novice evaluators was to score the usefulness of the source of information according to the UCCs displayed. The evaluators recorded their scores on a spreadsheet organised by the message-source of information relationship. If, on a subject discussion board for example, an evaluator found that an answer given by a student to the same question was very useful, then that evaluator gave the highest score to the 'subject discussion board' source.

The usefulness of the contexts had two dimensions. The first was the usefulness of a source of information in terms of giving a good answer (UGA). The second was the usefulness of a source of information in terms of giving a fast answer (UFA). The items were scored on a scale of five values: 0 (Not useful), 1 (Not very useful), 2 (Useful), 3 (Very useful) and NC (no context). The latter was used when the system was unable to retrieve any UCCs from the sources of information. In addition, the evaluators were encouraged to write comments on the effort and difficulty involved in obtaining useful contexts. These comments provided us with very useful pointers as to how we could improve the system.

The analysis evaluation procedure was divided into two stages; a macroevaluation and a microevaluation. The macroevaluation was an analysis of the results related to the system's usefulness, that is to say, its usefulness in terms of giving a good answer and a fast answer. The purpose of the microevaluation was to determine the contribution of each source of information to the system's usefulness, thus allowing any aspect that could be improved to be identified.

## 4.2. Macroevaluation

We wanted to compare the experts' and novices' perceptions of usefulness in terms of giving a good answer. First of all, we calculated each group member's perception. For each message, we collected the score of the most highly valued source of information. Then we calculated the evaluator's mean score (EMS), which was the mean of the highest scores. The group members' perception of usefulness was the mean of the EMSs of the three evaluators. This was how we compared the mean of the experts' EMSs and the mean of the novices' EMSs.

We also wanted to compare the experts' and novices' perceptions of usefulness in terms of giving a good answer quickly. The EMSs of each group were calculated as explained above, but on this occasion on the scores for the system's speed.

## 4.3. Microevaluation

We also wanted to compare the experts' and novices' perceptions of the most useful sources of information. As was the case for the macroevaluation, we first of all calculated each group member's perception. We calculated the mean of the scores given by an evaluator for each source of information

for all the messages. The result was the mean score of the usefulness (MSU) of each source according to each evaluator. By calculating the mean of the MSUs for the three evaluators of each group, we obtained the group's perception of the sources' contribution to the system's usefulness. Thus, we were able to compare the experts' and novices' perceptions. The evaluators' comments were also used for the microevaluation.

#### 4.4. Results

The system's usefulness in terms of finding information was scored slightly higher by the experts (1.77 on a scale of 0 to 3) than by the novices (1.51). However, the experts gave lower scores for usefulness in terms of giving a fast answer (1.47) than the novices (1.75).

The group of experts considered that snippets from web pages made a better contribution to giving a good answer, a long way ahead of other sources of information. For the group of novices, snippets from web pages and Wikipedia articles scored higher, though the distance between them and other sources of information was much shorter.

According to the experts' comments, web pages were useful for giving an answer, though it meant that they had to spend a lot of time finding the most suitable context. In addition, they said that they found useful contexts after performing more than one test. In other words, they had to select different terms from the tag cloud. To some extent, this explains why the group of experts gave low scores when evaluating the system's usefulness in terms of giving a fast answer.

The contexts displayed by the learning materials search engine were the second most highly valued source of information by the group of experts, whereas the novices gave a higher score to Wikipedia. It would therefore seem that the ranking differences are due to the group of experts' greater experience of searching for information related to the subject by using search engines and to their ability to combine keywords to obtain useful results.

Articles were at the bottom of the ranking; these were scored lower than 1.5 by the experts and novices alike. According to a comment by an evaluator, this could be due to the fact that the articles found in Delicious and CiteULike deal with very specialist topics, and their target audience basically consists of lecturers and graduate students. Conversely, the topics covered in Wikipedia are better suited to the questions and reflections of undergraduate students.

Another issue we identified was the relationship between the types of student expectation and the sources of information. For example, course learning materials are useful for clarifying a concept, though students generally ask about information that is not included in the materials. Moreover, Wikipedia references and links to external online resources are useful for finding a solution to a problem or for suggesting additional reading. Wikipedia articles and web pages also provide extra information that complements learning materials and helps students to confirm that their reflections—and even their digressions—are on the right track. In addition, such sources of information are useful for updating a tutor's knowledge. If they cover topics included in subject learning materials, even scholarly articles can contribute to a tutor's lifelong learning.

Previous messages on subject discussion boards match messages posted by students asking for help. However, their usefulness depends on how recurrent the problem has been throughout

the history of a subject. In addition, previous messages cannot be retrieved if, when writing them, students use under-specified references that only make sense at the time of writing.

## 5. Conclusions

In this article, we have presented a tutor assistant whose methodology distinguishes it from traditional approaches: the system is flexible enough to be able to deal with communicative objectives that go beyond answering students' questions. When messages contain digressions or reflections evoked by reading learning materials, the system promotes a 'learn from your students' learning process. Such a process becomes evident when a tutor finds that a student has given a good answer on a previous discussion board.

The results of the prototype evaluation are promising, bearing in mind not only the short period of time covered by the corpus evaluated, but also the fact that much depends on how recurrent a question, digression or reflection is. However, the methodology that we have developed thus far requires a lot of time to be spent on searching for information and is therefore slightly more beneficial for the group of expert tutors. For that reason, our aim is to improve the system's usefulness in terms of giving a fast answer on the one hand, and of giving a good answer without any distinguishable difference between experts and novices on the other.

We intend to improve its usefulness in terms of giving a fast answer by broadening the pragmatic approach and taking advantage of the relationship between students' expectations and sources of information. In addition, account will be taken of the relationship between a student's speech act expression and the snippet of text that best matches that student's expectation. Moreover, we intend to make the search for useful contexts easier, without any distinguishable difference between experts and novices, by expanding keywords. What we mean by this is that the terms selected by a user will activate semantically related terms, even if they are not visible in the tag cloud. Finally, we plan to integrate a search engine for scholarly articles with useful content for undergraduate students and tutors alike. Doctoral theses, and their state-of-the-art sections in particular, are interesting candidates.

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## ARTICLE

# A Proposal for Formative Assessment with Automatic Feedback on an Online Mathematics Subject

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## Abstract

This article presents a new teaching methodology implemented on a basic mathematics course for Engineering students at the Open University of Catalonia (UOC). The experience of its implementation in the 2010/11 academic year is described and the results are discussed. This methodology is based on formative assessment. As well as doing the activities contained in the course materials, students take weekly practice and assessment quizzes and receive automatic feedback. Not only are they told whether their answers are correct, but they also receive suggestions and comments on the possible sources of their errors. The results suggest that this teaching methodology gives students the opportunity to regulate their own learning processes while allowing lecturers to identify and react to problems in a responsive, timely manner. They also suggest that it fosters interaction among students

and between students and lecturers. Moreover, since the teaching methodology was introduced, the number of students dropping out of the subject has fallen considerably.

### Keywords

activity-based learning; online formative assessment; automatic feedback; immediate feedback; teaching methodology

## *¿Por qué una propuesta de evaluación formativa con feedback automático en una asignatura de matemáticas en línea?*

### Resumen

*En este artículo se presenta una nueva estrategia docente en un curso básico de matemáticas para estudiantes de ingeniería de la Universitat Oberta de Catalunya; se describe la experiencia de su implementación en el curso 2010-2011 y se discuten los resultados obtenidos. Esta metodología, basada en la evaluación formativa, se concreta en la realización semanal de cuestionarios de práctica y de evaluación con feedback automático, además de la realización de actividades propias del material del curso. En la retroalimentación del sistema, no solamente se informa de la validez de la respuesta, sino que se proporcionan sugerencias y comentarios del posible origen de su error. Por un lado, los resultados obtenidos sugieren que la metodología docente implementada da a los estudiantes la oportunidad de regular su propio proceso de aprendizaje y al profesorado, la posibilidad de detectar problemáticas y reaccionar con agilidad; por otro lado, fomenta las interacciones con contenido matemático tanto entre estudiantes como entre estudiante y profesor. Además, con esta estrategia docente, el número de estudiantes que abandonan la asignatura se ha reducido notablemente.*

### Palabras clave

*aprendizaje basado en la actividad, evaluación formativa en línea, feedback automático, feedback inmediato, estrategia docente*

## 1. Introduction

The inclusion of mathematical content in Engineering courses has traditionally given rise to much debate and controversy. While the arguments about why, how and the extent to which they should be introduced have traditionally been disputed, the Spanish Ministry of Education and Science's directives for elaborating Science and Technology bachelor's degree curricula have been very clear (BOE [Spanish Official State Gazette] No 260 of 30/10/2007, 18770). On the one hand, they underscore the expediency of designing bachelor's degree courses to include basic competencies in each branch of knowledge. On the other, they make it compulsory to include the fundamentals of calculus, linear algebra and descriptive statistics in most of them. Indeed, any future Engineering graduate should be able to manage mathematical objects and process numerical data using basic statistical techniques. However, the reality of the situation shows that there are serious problems in this regard.

The poor academic performance of students in their initial years and evidence of a lack of mastery of basic mathematical concepts —as well as their application to specific problems— create a general

sense of unease (López-Gay, 2001). In many cases, such a sense of unease leads to a questioning of educational practice, of the appropriateness of teaching methodologies and assessment systems, and of the incorporation of information and communication technologies (ICTs) into learning. In e-learning, technology is part of the educational context, and the learning methodology is radically different.

This article presents a new teaching methodology implemented on an online basic mathematics subject. Based on a student activity-based learning model, the new methodology uses an automatic assessment and feedback tool. The impact of this methodology on subject-taking is analysed, as is the degree of student engagement and the drop-out rate.

## 2. Immediate feedback, a key factor for formative assessment

Situated within the framework of online education, the proposed assessment model incorporates summative assessment tools to promote formative assessment. In order to define formative assessment, the authors have drawn on Black and Wiliam's (2009) definition and have adapted it to the context of e-learning. They therefore consider that an activity is formative if students obtain evidence of their performance and then interpret and use it to decide which steps they need to take in the teaching-learning process.

A review of the literature on research into formative assessment in online higher education allowed Gikandi et al. (2011) to assert that if the viability, reliability and absence of fraud in an assessment model can be validated, then online formative assessment can function as a new teaching methodology. To that end, such assessment must facilitate: an engagement with critical learning processes, the promotion of a fair education, and immediate, formative feedback. According to the same authors, online formative assessment helps to create attractive learning environments and promotes not only significant interaction between a student and other participants, but also student self-interaction by means of self-corrected quizzes for example.

As mentioned earlier, one of the factors required to make formative assessment work is the existence of immediate, formative feedback. To assess whether feedback is formative or not, Nicol and Macfarlane-Dick's (2006) conceptual model of processes of self-regulation has been taken as the reference. It is a model that takes account of both internal feedback (generated by a student) and external feedback. This article focuses on external feedback. Nicol and Macfarlane-Dick describe good feedback practice as "anything that might strengthen the students' capacity to self-regulate their own performance" and propose seven principles, asserting, in their words, that good practice:

1. helps clarify what good performance is
2. facilitates the development of self-assessment in learning
3. delivers high quality information to students about their learning
4. encourages teacher and peer dialogue around learning

5. encourages positive motivational beliefs and self-esteem
6. provides opportunities to close the gap between current and desired performance
7. provides information to teachers that can be used to help shape the teaching

Regarding formative feedback, another aspect of interest is the impact it can have on student engagement. Indeed, drop-out rates among adult students is a characteristic problem in online higher education, and particularly so in mathematics and physics subjects on Engineering courses, where the drop-out rate is high (Smith & Ferguson, 2005). While many different factors might have an impact on a student's persistence (Castles, 2004), formative feedback can foster students' engagement and enhance their motivation to learn (Crisp & Ward, 2008).

### 3. Teaching proposal for the Introduction to Mathematics for Engineering subject

The teaching methodology proposed here was developed for a basic mathematics subject for undergraduates on Computer Engineering and Telecommunications courses at the Open University of Catalonia (UOC): Introduction to Mathematics for Engineering. The subject has two basic objectives: a) to acquire the terminology, techniques and fundamental concepts of algebra and mathematical analysis; and b) to apply the mathematical concepts studied properly.

The need to improve teaching quality for mathematics subjects on Engineering courses and the authors' experience over the past 10 years of these types of environment have led them to consider a student activity-based design. Activities are followed up and regulated by means of a (semi-) automatic assessment and (semi-) automatic feedback tool. This design was developed within the framework of a teaching innovation project that enabled the course design to be specified, quizzes to be elaborated (using WIRIS Quizzes, [www.wiris.com](http://www.wiris.com)) and a pilot test to be carried out. Bearing in mind that doing things, verbalising things and making mistakes is, as many studies have shown, the best way to develop basic mathematics competencies (Prince, 2004), a learning methodology based on studying each topic by doing activities and taking practice and assessment quizzes was designed. Such quizzes, whose statements are parameterised, constitute an infinite bank of exercises for each topic, all of which have their respective automatic correction.

To be precise, the subject is divided into two blocks: Algebra and Analysis. In the first, there are five topics: Numbers, Equations, Systems, Polynomials and Matrices. In the second, there are six topics: Polynomial Functions, Trigonometric Functions, Exponential Functions and Logarithms, Continuous Functions, Derivation and Integration. For each topic, there is a practice quiz and assessment quiz and, at the end of each block, a summary quiz. This amounts to a total of 26 quizzes. Students can take the practice quizzes at any time, as many times they want; the assessment quizzes have start and end dates and, once that period has been opened, students have two days to submit them. The question types are varied: multiple choice, true/false and short answer. A particular feature of the assessment quizzes is that they include an open question to which students need to provide a

reasoned answer; the answer is then corrected by their lecturer (this is the reason why feedback or semi-automatic correction is often mentioned). Students not only receive a grade with an indication of the validity of their answers, but also suggestions and comments on the possible sources of their errors. The grade obtained in each assessment quiz is recorded, and the final grade for each block is the mean of all of them (excluding the one with lowest grade), with one condition: the mean of the questions to which a reasoned answer has to be given (excluding the one with the lowest grade) must at least be a pass.

The proposed methodology was implemented over the two semesters of the 2010/2011 academic year. There was a class of 49 students in the first semester and of 41 in the second.

## 4. Results of the experience

Presented below are the results for taking practice and assessment quizzes, for interaction among students and between students and lecturers, and for the subject drop-out rate. While the main results are for the 2010/2011 academic year, the results for the semesters prior to the implementation of the proposed model are also shown.

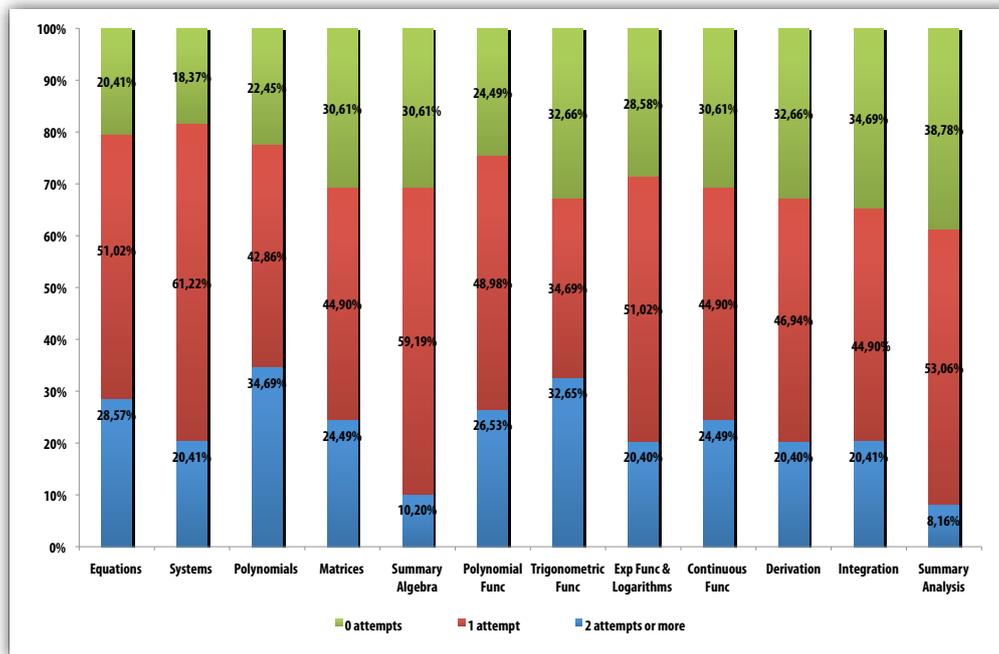
### 4.1. Taking quizzes

Before the results are presented, it is necessary to highlight several elements that may have been responsible for some of the differences between the two semesters in which the new methodology was implemented. In the first semester of the 2010/2011 academic year, there were a number of technical problems. These problems prevented the students from taking the quizzes for the first topic (Numbers). In the second semester, however, they were able to take them correctly. In the second semester, there were two additional tests in the Analysis block; owing to the difficulties observed for the Derivation and Integration topics, the authors decided to devote two weeks and two quizzes to studying each of them (instead of devoting one week, which would normally have been the case).

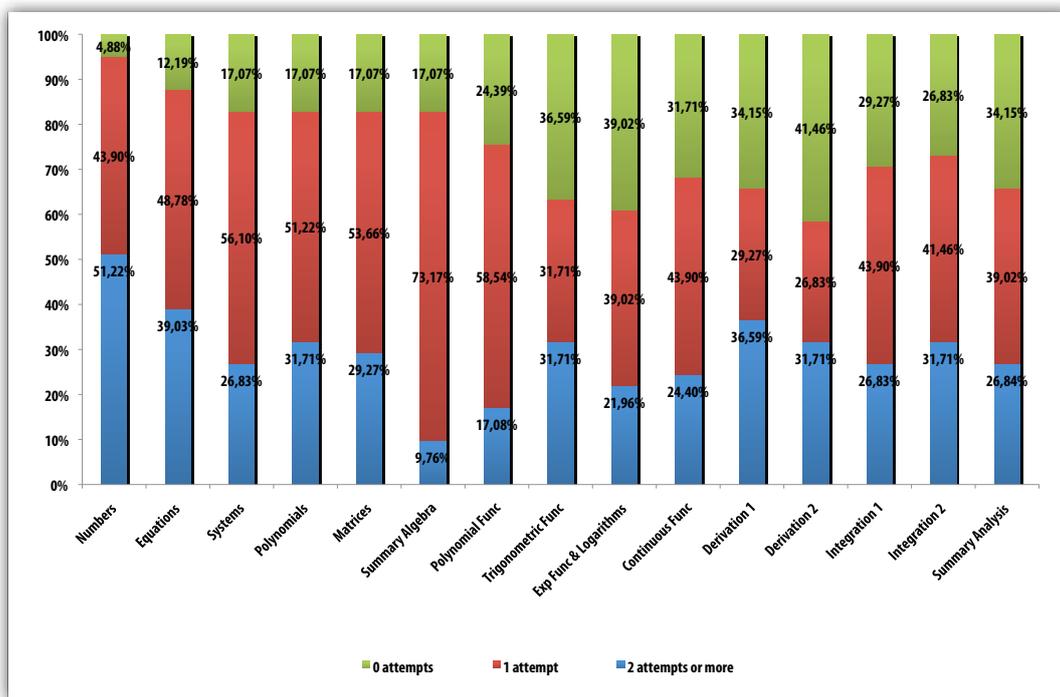
This section presents the results for the number of times the students attempted to take the practice quizzes, topic by topic; for the relationship between taking the practice quizzes and the grades obtained by the students in the assessment quiz of the respective topic; and for student profiles in relation to taking quizzes throughout each block.

Figures 1 and 2 show the number of attempts made for each practice quiz in the two semesters of the 2010/2011 academic year. The students are grouped as follows: those who made zero attempts, those who made only one attempt and those who made two or more (some of them made up to 13 attempts). For the purposes of this study, it is considered that a student made an attempt when a quiz was opened, even if it was not submitted to obtain the respective grade.

**Figure 1.** Percentage of students making 0, 1, 2 or more attempts for each practice quiz. First semester 2010-11.



**Figure 2.** Percentage of students making 0, 1, 2 or more attempts for each practice quiz. Second semester 2010-11.



In the first semester, there was a drop in the number of attempts to take the summary quizzes.

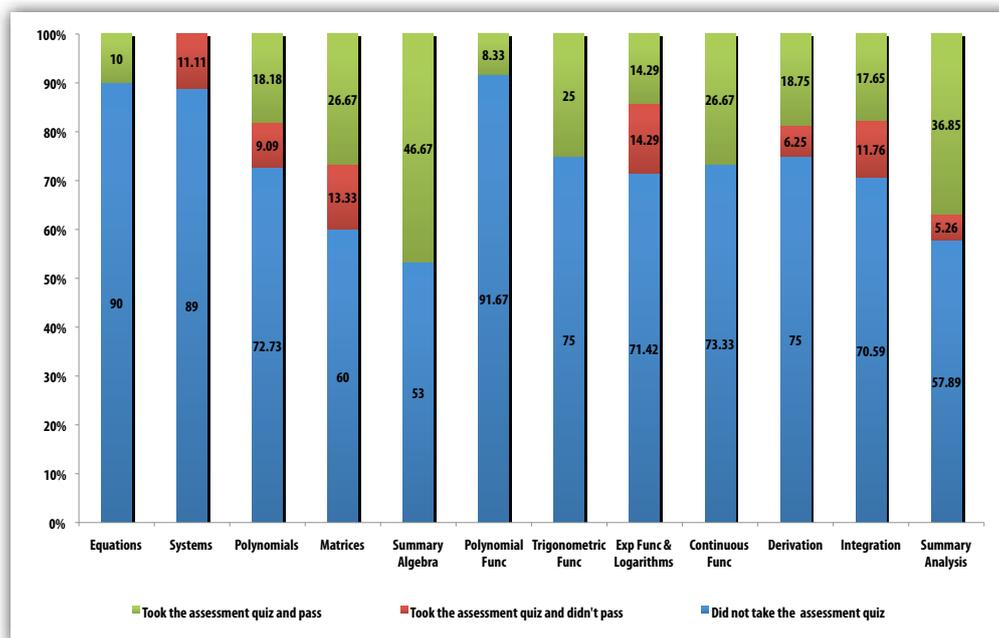
In the second semester, worthy of note is the difference between the students' behaviour in relation to taking the quizzes for the Algebra block and the Analysis block. In the Algebra block, the percentage of students that made zero attempts was low (stable at around 15%). In the Analysis

block, however, this percentage was up to twice as high. In addition, at the start of the semester, for the Numbers and Equations topics, the percentage of students making two or more attempts was 50.22% and 39.3%, respectively. This was clearly much higher than the percentage of students making two or more attempts for the rest of the semester's subjects. These high percentages for making two or more attempts were probably due to the novelty of the tool. This percentage once again exceeded 30% in the Derivation quizzes, particularly for the first part of the topic (Derivation 1).

Presented below are the results for the relationship between taking the practice quizzes and the grades obtained by the students in the assessment quiz of the respective topic. To simplify the reading of the results, they are shown as follows: the percentage of students that did not take any assessment quiz; the percentage of students that took but did not pass it; and the percentage of students that took and passed it. No details about the grades obtained are given. Before the results are presented, it is necessary to clarify that there are no data for the Trigonometric Functions assessment quiz in the second semester. Owing to a technical hitch, the students were unable to take it.

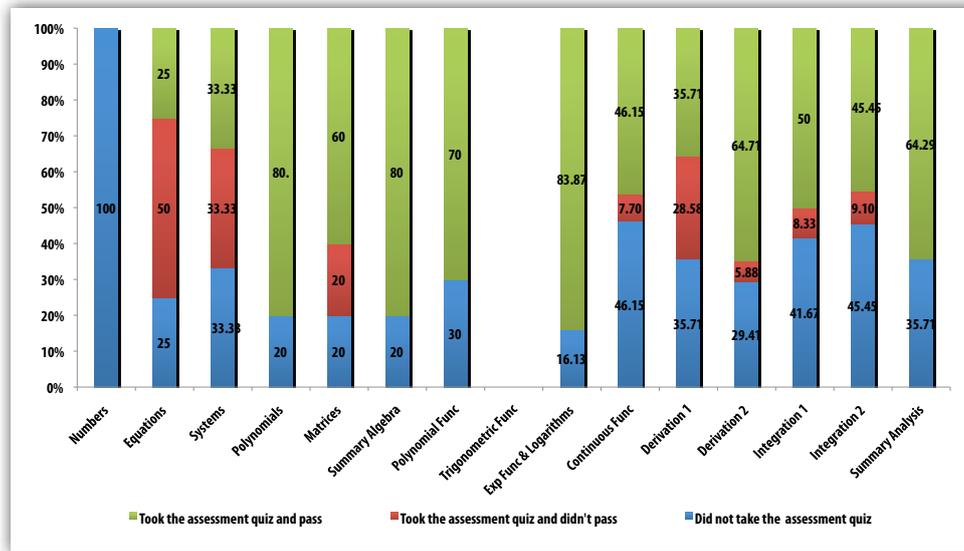
Figures 3 and 4 show the percentages for the grades obtained in the assessment quizzes by those students that made zero attempts to take the practice quizzes in either semester.

**Figure 3.** Percentages for the grades obtained in the assessment quizzes by those students that made zero attempts to take the practice quizzes. First semester 2010-11.



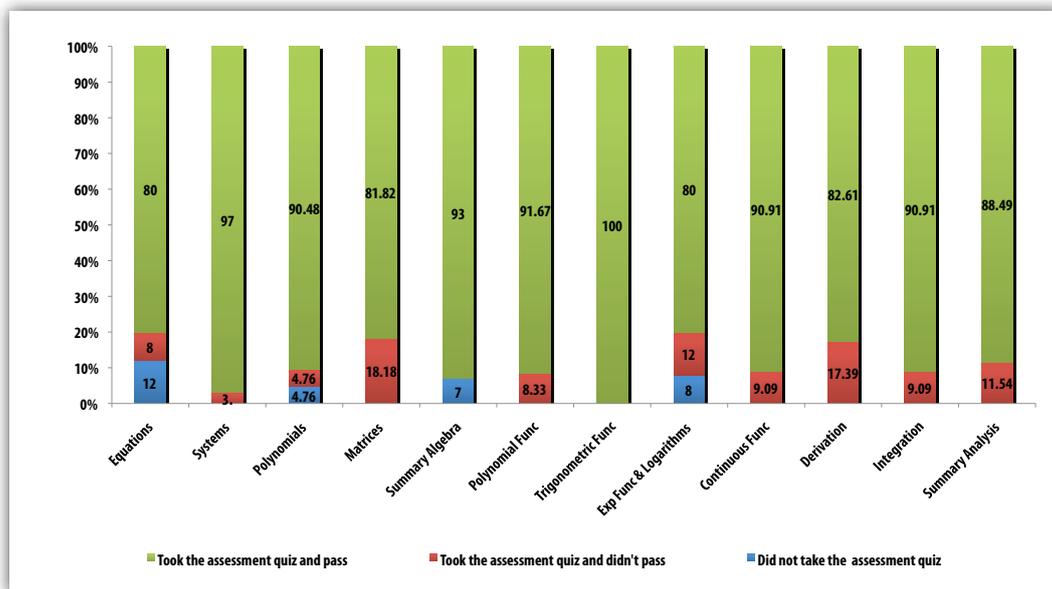
In the first semester, most of the students that did not take any practice quiz did not take the respective assessment quiz. In contrast, in the second semester, the percentage of students that did not take any practice quiz but took and passed the respective assessment quiz was considerably higher for most of the topics, and particularly so for the topics in the Analysis block. Indeed, this is the block in which, as seen earlier, the percentage of students that did not take any quiz was higher than in the Algebra block.

Figure 4. Percentages for the grades obtained in the assessment quizzes by those students that made zero attempts to take the practice quizzes. Second semester 2010-11.



Figures 5 and 6 show the percentages for the grades obtained in the assessment quizzes by those students that made only one attempt to take the practice quizzes.

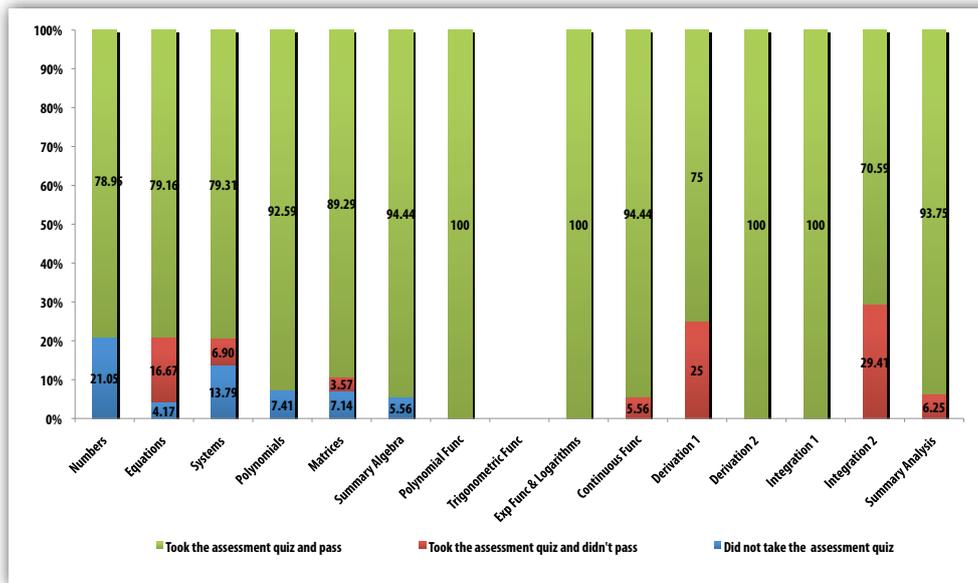
Figure 5. Percentages for the grades obtained in the assessment quizzes by those students that made only one attempt to take the practice quizzes. First semester 2010-11..



In both semesters, the percentage of students that made only one attempt to take the practice quizzes and then did not take any assessment quiz was low, and for most of the topics it was zero. In the second semester in particular, the percentage of students that did not take any assessment quiz was zero for the topics in the Analysis block. It is necessary to underscore the fact that there was a change

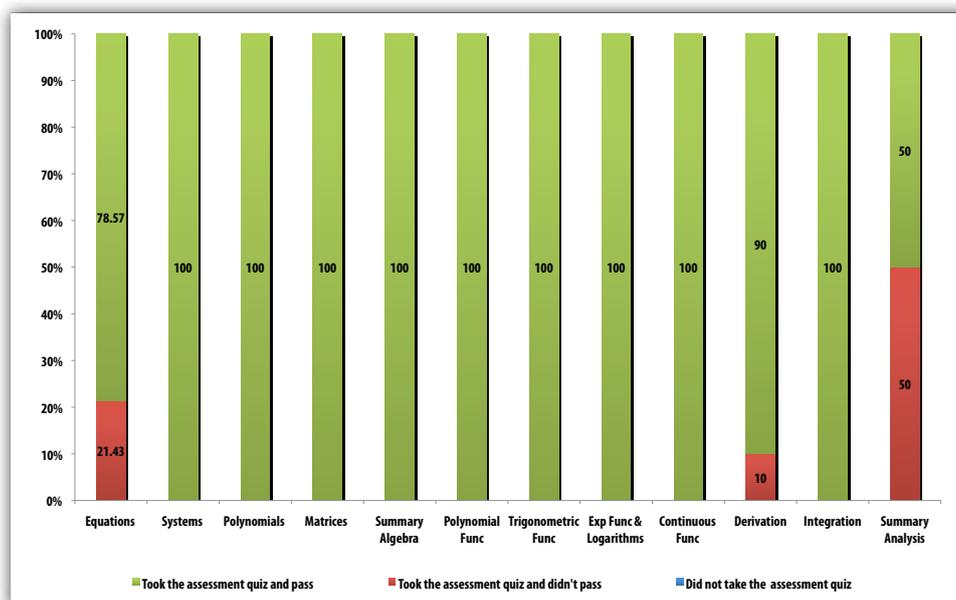
in the students' behaviour in that semester; the percentage of students that made only one attempt decreased, while the percentage of students that made zero attempts and the percentage of students that made two or more attempts increased in a similar fashion. In relation to students that took but did not pass the assessment quizzes, the highest percentages were for the Matrices and Derivation topics in the first semester, and the Derivation 1 and Integration 2 topics in the second semester.

Figura 6. Percentages for the grades obtained in the assessment quizzes by those students that made only one attempt to take the practice quizzes. Second semester 2010-11.

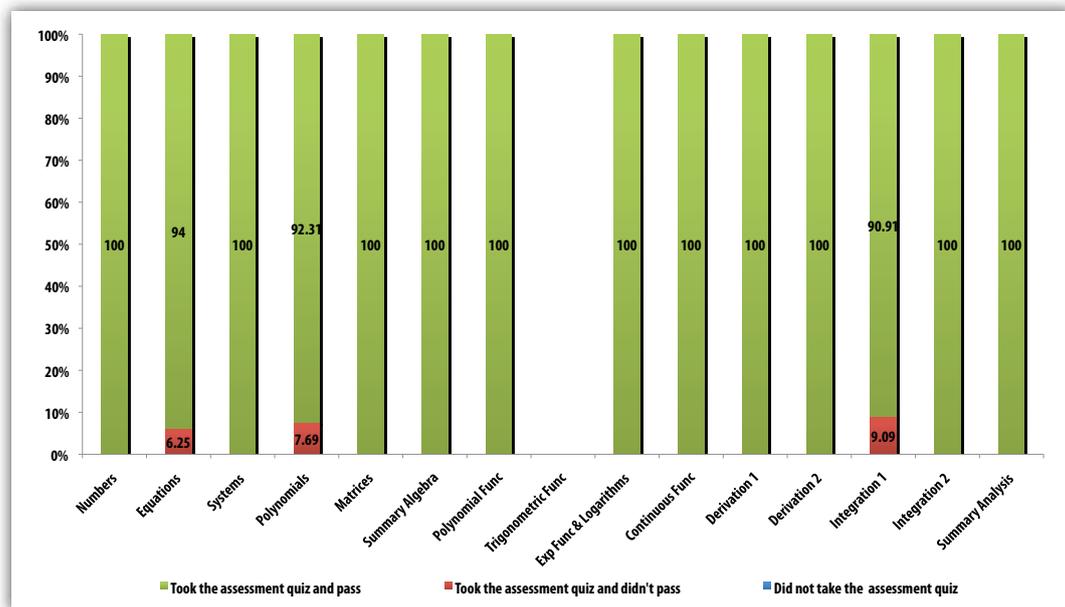


Figures 7 and 8 show the percentages for the grades obtained in the assessment quizzes by those students that made two or more attempts to take the practice quizzes.

Figure 7. Percentages for the grades obtained in the assessment quizzes by those students that made two or more attempts to take the practice quizzes. First semester 2010-11.



**Figure 8.** Percentages for the grades obtained in the assessment quizzes by those students that made two or more attempts to take the practice quizzes. Second semester 2010-11.



Worthy of note is that all of the students that made two or more attempts to take the practice quizzes took the respective assessment quiz. Every student took and passed most of the topics. However, for the Equations topic, and especially in the first semester since this was the first topic that the students took an assessment quiz for, the percentage of students that took but did not pass the assessment quiz was high. Regarding the Analysis block, not every student passed the Derivation quiz in the first semester or the Integration 1 quiz in the second semester. In the summary quiz for the Analysis block of the first semester, the percentage of students that did not pass was high, though it should be borne in mind that only four students made two or more attempts, two of whom did not pass.

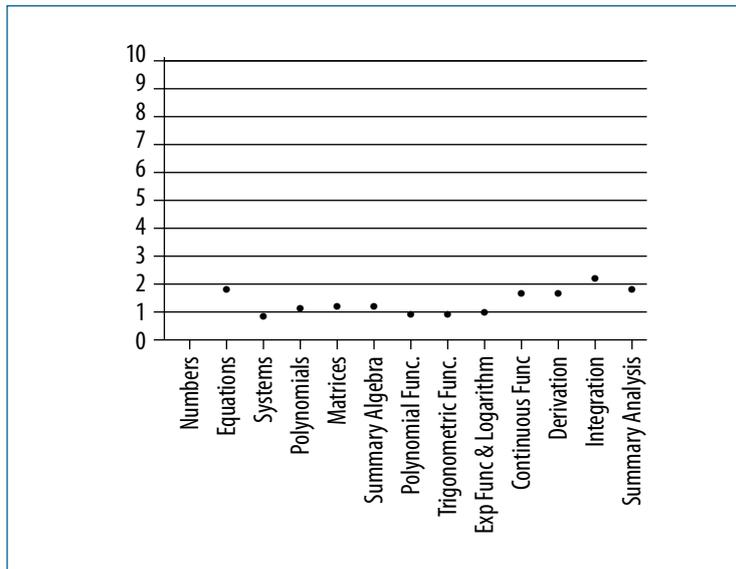
Figures 9 and 10 show, for each topic, the mean of the differences between the highest grade obtained in the practice quizzes and the grade obtained in the assessment quiz by each student. It should be noted that, in this calculation, only the students that made only one attempt (with a grade) and the students that made more than one attempt were taken into account.

In the first semester, the calculated mean was around one point; it was higher for the first topic (into which the assessment tool was introduced) and for the Continuous Functions, Derivation and Integration topics. In the second semester, the distribution was not as uniform, though it was generally below two points. After the technical hitch in the Trigonometric Functions topic, the greatest differences were in the Exponential Functions and Logarithms topic, and in the Derivation 1 topic. When comparing the results for both semesters, there is a drop in the mean of this difference in the Derivation and Integration topics in the second semester (excluding Derivation 1, which was more conceptual).

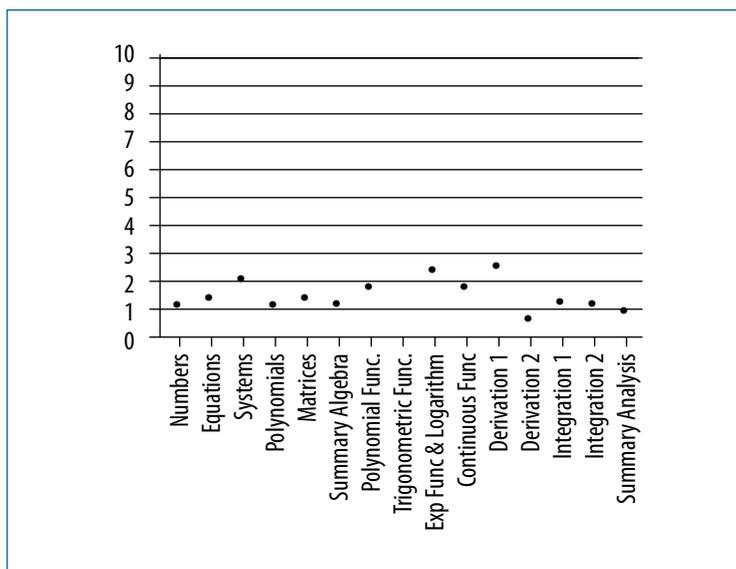
Besides studying the students' behaviour topic by topic, the authors wondered if it would be possible to establish student profiles in relation to their behaviour throughout the semester. On the

basis of the results, four student profiles were defined: students that make zero attempts to take practice quizzes; students that make one attempt to take practice quizzes; students that make two or more attempts; and students that adapt the number of attempts according to the grades obtained (the lower the grades, the higher the number of attempts, and vice versa). In order to classify a student into a specific profile, it was considered that there should be at least a two-thirds prevalence of the number of attempts. In the odd case where no number of attempts reached two thirds, a student's trend or evolution throughout the block prevailed.

**Figure 9.** Mean of the differences between the highest grade obtained in the practice quizzes and the grade obtained in the assessment quiz by each student. First semester 2010-11.



**Figur3 10.** Mean of the differences between the highest grade obtained in the practice quizzes and the grade obtained in the assessment quiz by each student. Second semester 2010-11.



Figures 11 and 12 show the percentage of students that fit into these profiles for the Algebra and Analysis blocks for the first and second semesters, respectively, of the 2010/2011 academic year.

Figure 11. Percentage of students that fit into the profiles defined. First semester 2010-11.

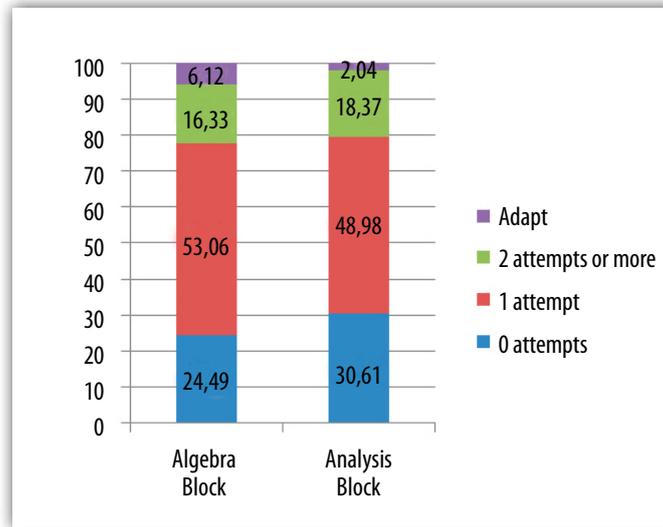
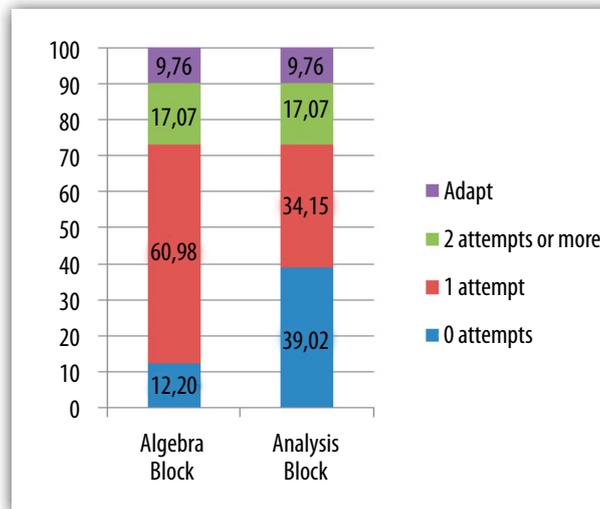


Figure 12. Percentage of students that fit into the profiles defined. Second semester 2010-11.



When changing from one content block to another, two profiles remained stable: students that made two or more attempts and students that adapted the number of attempts according to the grades obtained. Notwithstanding, in both semesters, albeit particularly so in the second, in each content block there was a different behaviour among the students that made fewer attempts (one or none). With the data available, there are no clear signs that would enable an explanation to be given for these students' change of behaviour.

## 4.2. Discussion board and e-mail messages

Presented below are the in-class interaction data based on the messages that the students posted to the discussion board, and student-lecturer interaction data based on the messages that the students sent to the lecturer's e-mail address.

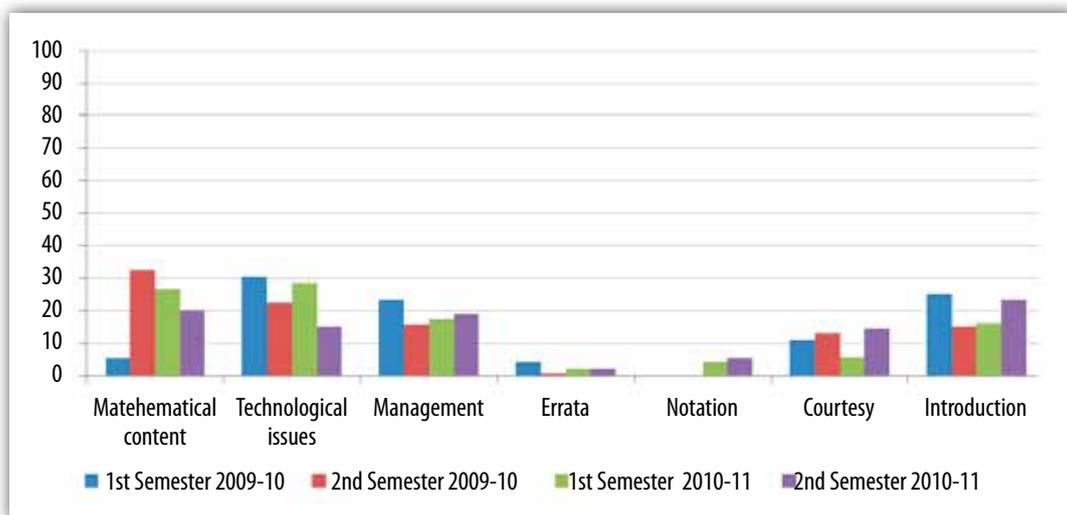
Figure 13 shows the percentage of messages that the students posted to the discussion board, by the thematic area of their content, in the final four semesters. In order to interpret the data, it is necessary to explain the dynamics of the subject in the 2009/2010 academic year. In the first semester, there were two assessment tests, one at the end of each block, each with six exercises that had to be done using a text editor. In the second semester, while the assessment model was the same as in the first, quizzes were introduced, which could be taken voluntarily. The messages have been categorised in the following manner:

- Mathematical content: messages containing an explicit or implicit question about a mathematical concept or procedure. They can originate from reading subject materials, from taking practice quizzes or from solving assessment quizzes.
- Technological issues: mainly messages for informing on or updating information about particular technical hitches or classroom incidents, and suggestions for solving fellow students' technical problems.
- Management: messages connected with managing materials (how to locate certain documents or links, complementary materials, etc.), managing quizzes (how to take them, the purpose of and engagement in assessment, etc.) and managing assessment (how to present the documents in the previous assessment model, requests to review the automatic correction in the current assessment model, how to obtain the final grade for a subject, complaints, etc.).
- Errata: messages asking about or informing on errata in subject resources.
- Notation: mainly queries about the notation that should be used to enter answers for automatic correction (new assessment model).
- Courtesy: messages thanking other participants for their answers or for clarifying a minor detail in relation to a question asked previously, or messages regarding social relations between or among students.
- Introduction: messages sent at the start of a subject, at the lecturer's request, for students to introduce themselves to each other.

In messages on technological issues, the differences between the various semesters were linked to both individual and classroom incidents occurring throughout a semester. But the greatest differences were those relating to messages containing mathematical content. There was a low percentage of messages of this type in the first semester of the 2009/2010 academic year, when the assessment model was different from the one in the 2010-2011 academic year. In the second semester of the 2009/2010 academic year, it is necessary to clarify that the increase in

the number of messages was not particularly due to the introduction of quizzes, which could be taken voluntarily, but rather to one highly active student on the discussion board. That student alone posted just over one third of all the messages posted on the discussion board (36.2%) and posted nearly half of all the messages containing mathematical content (49%), thereby offering regular reflections as well as submitting queries and requests for confirmation of having understood the content. Comparing the percentage of messages containing mathematical content posted in the first semester of the 2009/2010 academic year with the percentage of messages posted in both semesters of the 2010/2011 academic year, it was found that it increased considerably, and this was despite the fact that there was no noteworthy intervention by a particularly active student.

**Figure 13.** Percentage of messages that the students posted to the discussion board, by the thematic area of their content.



Honing in on messages containing mathematical content, presented below are the results for the origin of the messages (materials, quizzes or assessment tests giving rise to the message).

Figures 14 and 15 show the origin of the messages containing mathematical content that the students posted to the discussion board and sent to the lecturer's e-mail address, respectively. It is important to clarify that very few messages containing mathematical content were sent to the lecturer's e-mail address (17.9% and 10.3% of all messages sent to that address in the first and second semesters, respectively)

Figure 14 shows that quiz-related issues prevailed in the messages posted to the discussion board, particularly in the first semester. In contrast, Figure 15 shows that assessment-related issues prevailed in messages sent to the lecturer's e-mail address, usually as a result of some disagreement with a correction, giving rise to a mathematical discussion of the concept in question.

Figure 14. Origin of the messages containing mathematical content that the students posted to the discussion board

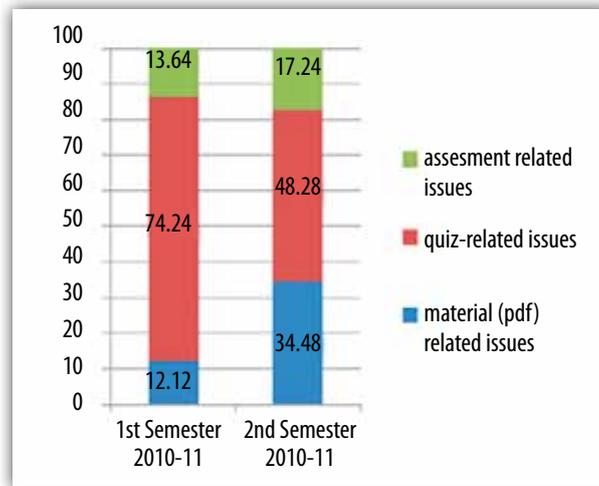
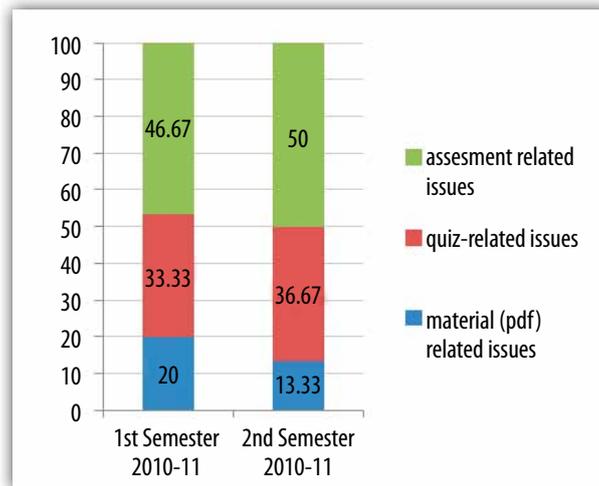


Figure 15. Origin of the messages containing mathematical content that the students posted to the discussion board lecturer's e-mail address



### 4.3. Drop-out

Figure 16 shows the percentage of students that dropped out of the subject in the Algebra block. This includes drop-outs both at the start of and during this block. With the new assessment model implemented, it was possible to establish exactly when a student dropped out of the subject.

In the first semester of the 2010/2011 academic year, of the 18.4% of students that dropped out, 12.2% did so at the start of the subject, without taking any practice or assessment quiz, and only 6.2% did so during the Algebra block. In the second semester of the 2010/2011 academic year, 2.4% of students dropped out at the start of the subject, and only 4.9% did so during the Algebra block. It was not possible to establish what percentage of the students that dropped out of the subject in earlier semesters (in the period prior to the experience presented here: from the second semester of the 2007/2008 academic year to the second semester of the 2009/2010 academic year) did so without starting to study the

materials. Indeed, it is believed that there may be a high degree of fluctuation in such values because the students' personal reasons for not starting a course of study are varied and unpredictable (Castles, 2004). Consequently, a comparison between the results for the 2010/2011 academic year and the results for earlier semesters in the Algebra block is not reliable. Despite that, however, it is clear that, for the semesters of the 2010/2011 academic year, the drop-out rate while taking the subject was very low.

Figure 16. Percentage of students that dropped out of the subject in the Algebra block.

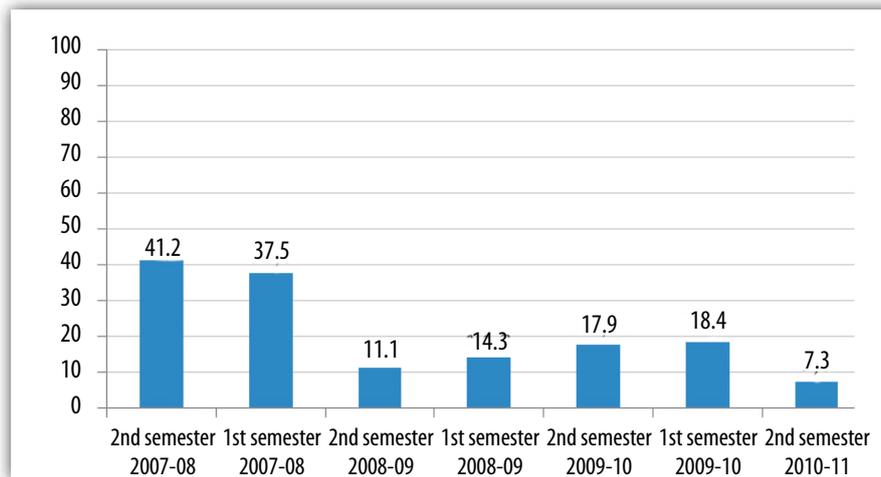
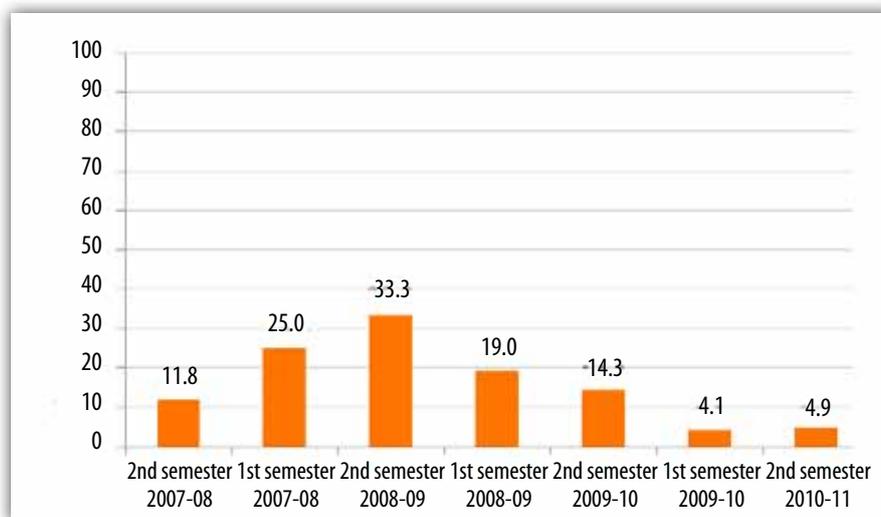


Figure 17 shows the percentage of students that dropped out of the subject in the Analysis block. This includes drop-outs both at the start of and during this block. The students usually considered that the content in this block was more difficult than in the Algebra block. Worthy of particular note, therefore, is the fact that the new approach helped to reduce the number of drop-outs during the Analysis block. The percentage of drop-outs in the semesters prior to the 2010/2011 academic year fluctuated between 10% and 30% of students. So the values had never been as low as they were in the semesters of the 2010/2011 academic year.

Figure 17. Percentage of students that dropped out of the subject in the Analysis block.



## 5. Discussion

The first research question was to establish whether taking practice quizzes with immediate, automatic feedback was a formative activity, that is, if it helped students to decide on their learning processes. To that end, the number of times students attempted to take practice quizzes was studied. It was found that the number of attempts fluctuated depending on the topics studied in both semesters. The students therefore decided to increase or decrease the number of attempts depending on the difficulties that they had in terms of answering questions or studying each topic. In both semesters, there was an increase in the number of attempts in the Analysis block, which is generally the one that causes most problems. Furthermore, and also in both semesters, all the students that practiced regularly (made two or more attempts to take a practice quiz) successfully passed the assessment quizzes for most of the topics. Similarly, most of the students that made only one attempt also passed the respective assessments. In addition, the existence of two particular student profiles —students that adapt the number of attempts according to the difficulties that arise (the stability of this profile is also worthy of note) and students that make two or more attempts throughout the semester— means that it is possible to assert that this methodology allows students to self-regulate their learning processes. Despite that, however, it is not possible to rule out any other factors that might have an impact on the number of attempts made.

The second research question was to establish whether the model worked as a new teaching methodology. In order to answer this question, two aspects were studied: the existence of actions promoting significant interaction and the practical quality of the feedback in relation to the principles proposed by Nicol and Macfarlane-Dick (2006). In the context of this subject, significant interaction is considered to be interaction that contributes to discussions on mathematical content. For the semesters over which the assessment proposal was implemented (2010/2011 academic year), there was an increase in the percentage of messages containing mathematical content that the students posted to the discussion board. Likewise, messages of this type, both posted on the discussion board and sent to the lecturer's e-mail address, originated mainly from taking practice and assessment quizzes. The results indicate that this model encourages mathematical dialogue between students and lecturers, and among students (principle 4).

Moreover, grading the practice quizzes by means of automatic correction allows students to be aware of how they are performing in relation, that is, to an optimum level of performance and, as already seen, to adapt their strategies to achieve better performance in their learning. Therefore, the feedback given firstly helps students to clarify what good performance is (principle 1) and secondly provides opportunities to close the gap between current and desired performance (principle 6).

If the analysis of the experience is complemented by information generated from the implementation of the proposed model, then lecturers are in a position not only to take decisions about teaching, but also to properly assess such decisions (principle 7). For example, on the basis of the results for the first semester of the 2010/2011 academic year, the authors decided to modify the duration of the Derivation and Integration topics. The improvement in the grades obtained by students that made one or more attempts and the reduction in the mean of the differences between

the highest grade obtained in the practice quizzes and the highest grade obtained in the assessment quizzes for these subjects allowed for a positive evaluation of that decision. Moreover, it was possible to locate the difficulties that the students experienced with those subjects more precisely. Indeed, in terms of the results for the first part of Derivation and the second part of Integration, room for improvement was observed.

Finally, the fall in the subject drop-out rate was studied. In both the Algebra block —if account is not taken of the drop-outs at the start of the subject, which could be due to any number of factors, such as excessive optimism at the time of enrolment, unforeseeable work-related events, illness of a student or a family member, etc.— and the Analysis block, the subject drop-out rate fell to its lowest in seven semesters. Despite that, however, in order to assert that such a low drop-out rate was due not only to an increase in the students' motivation, but also to an increase in their engagement, a specific study on students' motivations and perceptions while taking the subject is required.

## 6. Conclusion and future lines of innovation and research

This article presents the results obtained from the implementation of new teaching methodology on an online basic mathematics subject for future engineers. The proposed methodology is based on the conviction that learning should be based on student activities, and that students should have the necessary resources available to do them. In e-learning, the fundamental problem associated with a proposal of this type resides in the timing and the content or quality of the feedback that students receive in the course of their learning processes. In the authors' opinion, feedback is key, both emotionally and cognitively, to the acquisition of basic competencies in subjects of this type.

Specifically, they have considered a methodology consisting in taking weekly practice and assessment quizzes with (semi-) automatic correction and qualitative feedback. On this point, it is important to bear in mind the two aspects that guided the design of the quizzes. First, all the subject topics had to be covered and, second, specifying the source of a student's error had to be possible, as did providing proper explanations to facilitate an understanding of related content. This consideration led to the introduction of formative assessment as the principal axis of the teaching and learning process: it allows students to regulate their own learning processes and lecturers to accompany students properly, thus enabling them to certify the degree of competency acquisition.

In the light of the results of the experience in the classroom, the authors are able to assert that taking practice quizzes with immediate, automatic feedback is a good way of achieving a process of student self-regulated learning; furthermore, it allows lecturers to identify and react to problems in a responsive, timely manner in order to solve them. In addition, it has a decisive impact on increasing dialogue on mathematical issues on the classroom's discussion board. Finally, a particular aspect of the proposal's success is the significant reduction in the subject drop-out rate. Managing to achieve low student drop-out rates is one of the main concerns in an online education context, and the fact that, over the two semesters in which the new model was implemented, such low rates were regularly achieved allows for a positive evaluation of the methodology implemented.

The proposal presented in this article is a significant contribution to existing models of student assessment and follow-up on mathematics subjects, not only because of the results obtained, but also because it opens up a whole host of future lines of innovation and research in the field of online mathematics education.

The success of the experience in terms of its impact on the self-regulation of learning, the increase in mathematics communication and the reduction in the drop-out rate encourages the authors to continue working on this line of innovation and research. Firstly, on the definition and elaboration of adaptive quizzes that lead to greater customisation of learning; secondly, on the analysis of mathematical argumentation in dynamics of this type; and thirdly, on the impact of immediate feedback on emotional aspects, like trust for example. Consequently, the authors intend to examine the problem of students' self-efficacy, motivation and academic performance.

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## DOSSIER

# Innovation and Good Practices in University Government and Management

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**Abstract**

This brief introductory article takes a look at the main topics of this Dossier (innovation, good practices, government and management) in order to put them in context, to guide their scope and to open them up to experts with an interest in them.

**Keywords**

university; innovation; good practices; government; governance; management

## *Innovación y buenas prácticas en el gobierno y la gestión de las universidades*

**Resumen**

Se presenta un breve artículo introductorio sobre los principales ejes de este monográfico (innovación, buenas prácticas, gobierno y gestión), con ánimo de situarlo en contexto, orientar acerca de su alcance y abrir perspectivas a los expertos interesados en estos temas.

**Palabras clave**

universidad, innovación, cambio, buenas prácticas, gobierno, gobernanza, gestión

The Dossier of this monographic number of *RUSC-Universities and Knowledge Society Journal* focuses on a theme that is high on the agenda of many university managers and stakeholders in countries where the socioeconomic situation is similar to that of Spain. The reason for this choice of theme was not the situation that Spain is currently experiencing, though it does make it all the more relevant.

The title contains four key concepts: innovation, good practices, government and management. It may sound overblown, but the aim is to draw attention to a problem<sup>1</sup> that affects interuniversity teams' teaching and/or research (and even the RD&I system). Given that such teams make important and vital contributions to every facet of life outside the sphere of higher education, it goes without saying that the impact of the problem can also be discussed from the perspective of the UOC (Open University of Catalonia). This introductory article therefore intends to provide a general overview, without being exclusive or excluding.

The concepts referred to in the title are issues that have a major impact on many national university systems, and public systems in particular. In principle at least, the government and the management of institutions in private university systems are autonomous and more flexible, and they can more readily implement changes than those in public systems. This is, of course, assuming that they have leaders with vision and values.

Innovation and good practices are considered or interpreted differently in the various national systems:<sup>2</sup> European, North American, Latin American, Australian, North African, South African, Asian or Far Eastern. That is why anyone interested in these issues should have a global overview while focusing on the systems that are either closest to them or more relevant to their vision and interests.

## 1. Innovation and change

The word 'innovation' has been fashionable for several decades. It may have different meanings and content for different people. It is connected with the introduction of changes, with new ways of seeing or doing things. The most intensively or extensively cited definition is perhaps the one by the Austrian economist J. Schumpeter, with the updated view of M. Porter. In reality, that point of view, which is very popular in the world of business, implies that innovation is the creation or modification of a product in order to introduce it in the market. Many variants of that concept have developed over the years, possibly around its core, which is 'creating, modifying or changing', with the addition—as an essential complement—of the answer to the question: Why?

In our case, it is a matter of innovating or changing: Why? And also how? This is an important matter to which attention is not always paid. Change may be sought without really knowing which direction to take or what the destination is. In this case, any innovation or change in any direction might be right and proper.

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1. A problem to which, *a priori*, there is neither a solution nor a perceived solution.

2. And even within them.

It would seem logical to think that a change in the form (and also the content?) would be sought, since this is where various aspects of the functions of universities at the service of society have been implemented.

## 2. A network society

We live in a society that has changed and is changing a lot. This may sound redundant, since society has always changed, and a lot, and that is the feeling its members no doubt had at a given time. Recently, however, that change is also being modulated by the persistent and very deep structural crisis of the current economic system of the so-called 'developed world'.

Current change is fast, deep and global, in a network world and on the World Wide Web. Changes have always existed, and most of them were probably considered equally as 'deep' for the generations living through them at a given time. But 'fast' and 'global' are the distinguishing traits of the current model; we are experiencing a fast global change. And, playing a major role in that process are information and communication technologies (ICTs), which are not just a technological support for the current network society. Although the term was not coined by the sociologist M. Castells, he has used it widely and endowed it with content.

As alluded to earlier, in order to change or innovate, it is essential to know which direction to take and why.<sup>3</sup> This is perhaps the point where the reason for and the direction of the change begin to diverge. This is a matter of content, which began to be discussed and guided at the World Conference on Higher Education (UNESCO, Paris, 1998). Many years have gone by since then, but it is considered to be the last effort that was made on a global scale. It is a document that scholars and change managers really ought to revisit.

However, content issues that have such enormous scope were not intended to be dealt with in this monographic number, and that is why the concept of 'good practices' accompanies the word 'innovation': this is much more modest and, needless to say, practical.

## 3. Aspects of innovation

Innovation or change<sup>4</sup> can occur in any of the functions of universities at the service of society:<sup>5</sup> 1) teaching; 2) research; 3) management. It should be noted that this is the order in which they are usually expressed. Though the logical order would be 2-1-3 (research, teaching, management), since the creation and application of knowledge should come first. However, the order that

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3. By the way, it is quite hard to reach any agreement on either in the socioeconomic context.

4. Change, why and how? Without wishing to shock anyone, here it would be worth thinking about what their target audience is (to enable them to be considered as innovations). In other words, who benefits from them, who needs them and who wants them?

5. In this article, the assumption is that they are the traditional ones, so as not to introduce greater complexity.

society appears to demand is 1-3-2 (teaching, management, research). Something appears to be amiss.

From the internal viewpoint of universities, it would be worth considering the following as current functions:

- A) Learning, for both students and lecturers (instead of simply teaching in the case of the latter). In other words, transferring, sharing and disseminating knowledge. Here, the meaning of the term 'knowledge society' comes into play, with the help of the network society; thus, the shared creation and application of knowledge can also be included.
- B) Promoting and being a distinctive, important and renowned hub of the global RD&I system. In other words, creating, applying and questioning knowledge.
- C) Managing the system that supports the two previous functions, thereby adding value to it. Here, various innovations occurring in general management and talent management can be considered. This implies deep-seated changes in mindsets and actions in relation to the views generally held on this function, which is even considered to be residual.
- D) Governing, considered as running the university community and guiding it towards achieving its goals (in terms of its *raison d'être* and values), based on the formulation, implementation and evaluation of a strategy. And doing so in a context where the 'Ivory Tower' notion of universities is dwindling and interaction with university system stakeholders is increasing.

In theory, interaction can occur in every single one of the aforementioned functions. Depending on the function, change is easier or harder, has a greater or lesser impact, and requires more or less funding. In the case of Spain, these issues are well addressed in the Report of the Committee of International Experts EU2015.

First of all, the biggest and best innovations have occurred in the RD&I system, as a result of both the power of the human mind and accumulated knowledge; in the current era, development and technological innovation have revolved around ICTs. Such innovation, the least regulated and most dependent on the capacities of teams, is nuanced and modulated by the funding system, as has always been the case.

Secondly, innovations are occurring in aspects of teaching (learning, for both students and lecturers). Such aspects might be:

- a) Content: What to learn?
- b) Methodology: How to learn?
- c) Time: When to learn?
- d) Place: Where to learn?

These changes are probably the ones with which university teach staff are most familiar, as are the most experienced students. In principle, they are not actually hard to implement, because universities have quite a lot of autonomy in this respect. They are often driven by the sheer determination and

hard work of isolated lecturers or groups, who either give up or disband because they do not receive the appropriate backing.

Changes in management and, above all, in government are rare and complex, and not necessarily because they require greater funding, which is not the case. In recent years, the term 'governance' has been introduced as a conceptual innovation of the term 'government'. The change<sup>6</sup> is interesting, especially when taking account of the definition of the term contained in the dictionary of the Royal Spanish Academy (the body in charge of regulating the Spanish language): Art or way of governing, the objective of which is to achieve lasting economic, social and institutional development by fostering a healthy balance among the State, civil society and the market economy.

The Dossier of this monographic number of *RUSC-Universities and Knowledge Society Journal* comprises a selection of six articles that either present specific cases of good practices or reflect on important issues for innovation and change, as described in this introductory article.

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6. Which is not simply semantic.

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## Dossier “Innovation and Good Practices in University Government and Management”

### ARTICLE

# Higher Education Governance Reform in Practice. Matching Institutional Implementation Practices and Policies

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### Abstract

Governance is one of the most important higher education policy reform areas in the European Commission. The experience of many years in this field shows that in Europe the diversity of both higher education systems and higher education institution typologies is an important aspect to consider when assessing which governance model to apply in each case. Due to this diversity, there is no ideal governance model for each institution and/or higher education system, and the most ap-

appropriate strategy to follow varies depending on the mission and typology of each higher education institution. The increasing tendency towards the globalization of higher education and the economic crisis are impacting directly on universities, forcing them to position themselves in this context. Implementing an appropriate governance model according to the corporate strategy of choice is essential, although good practice models in one case might not be directly applicable to another.

The European Commission works in parallel with two types of governance instruments: firstly, policy instruments to promote the exchange of good practice and mutual learning between and among governments, countries and institutions. In recent years, the need for transparency regarding how different higher education institutions perform in the various fields where they operate is of increasing interest. Moreover, financial instruments available through programmes such as Erasmus facilitate the development of pilot projects and studies presented at the initiative of transnational consortia. This article reviews the latest trends in higher education governance in Europe, with special emphasis on the need to preserve the diversity of higher education systems and institutions through transparency tools, showing relevant examples of cooperation projects for improving governance practices.

### Keywords

governance reform; university management; quality assurance; internationalisation; Europeanisation

## *La reforma de la gobernanza de la educación superior en la práctica. Puesta en práctica de los objetivos políticos en la gestión universitaria*

### **Resumen**

*La mejora de la gobernanza es uno de los temas más importantes de la agenda política de la educación superior en la Comisión Europea. Tras muchos años trabajando en este campo, la experiencia demuestra que en el caso de Europa es importante considerar la diversidad de sistemas educativos y de tipologías de instituciones de educación superior a la hora de analizar los modelos de gobernanza que han de aplicarse en cada caso. Esto conlleva que no exista un modelo de gobernanza ideal para cada institución y/o sistema de educación superior, y que la estrategia varíe según los objetivos y el tipo de cada institución de educación superior. La creciente globalización de la educación superior y la crisis económica están afectando directamente a las instituciones, obligándolas a posicionarse en este contexto. Implantar un modelo de gobernanza adecuado a la estrategia institucional elegida es esencial, si bien los modelos de buenas prácticas que pueden usarse en un caso no son directamente aplicables a otro.*

*La Comisión Europea trabaja con dos tipos de instrumentos en el área de gobernanza: por un lado, los instrumentos políticos fomentan el intercambio de buenas prácticas, el aprendizaje mutuo entre gobiernos, países e instituciones, y la creación de herramientas para la rendición de cuentas. Por otro lado, los instrumentos financieros a través de programas como Erasmus facilitan la elaboración de proyectos piloto y estudios que se presentan a iniciativa de consorcios transnacionales. Recientemente está cobrando importancia la necesidad de proporcionar mayor transparencia en cuanto a la actividad y la eficiencia con la que trabajan las instituciones de educación superior. Este artículo revisa las últimas tendencias de la gobernanza en Europa, con especial énfasis en la necesidad de preservar la diversidad de sistemas y tipos de instituciones a través de las herramientas de transparencia para líderes institucionales, dando ejemplos de los proyectos de cooperación más relevantes en materia de gobernanza.*

### **Paraules clau**

*reforma de la gobernanza, gestión de universidades, evaluación de la calidad, internacionalización, europeización*

## 1. Introduction

Governance is one of the main policy reform areas on higher education modernisation agendas. Higher education governance involves not just aspects of internal university governance, but also the roles of the state and external stakeholders. This is a complex reform area covering many aspects of higher education systems and their day-to-day operation, such as human resource management, funding, quality assurance, course planning, access and internationalisation.

The importance of this reform area is underlined in the European Commission's 2011 communication on the modernisation agenda for higher education, which signals higher education governance (together with funding) as one of the key areas for action. The focus on governance reform in the 2000/2010 period was characterised by widespread reform efforts in EU member states, where the main trend was to increase institutional autonomy. Higher education institutions are legally autonomous in all EU states, although the degree of autonomy varies from country to country. Supported by the assumption that institutions with greater autonomy are more capable of focusing their institutional strategies on their particular strengths and of adapting to a changing environment at regional and international levels (European Commission 2006, 2011), all European countries have framed institutional autonomy national accountability systems (involving assessment and checks) to ensure that institutions respond to societal needs. At the same time, institutional autonomy has been combined with appropriate accountability mechanisms such as performance contracts and multi-year agreements between states and institutions. As a reaction to this, the position of executive heads of institutions has been strengthened and new institutional governance bodies such as advisory or supervisory boards have been introduced in a number of institutions, usually including external stakeholders. However, it remains essential for higher education institutions not to be constrained by over-regulation that would otherwise prevent them from achieving the aspirations that society expects from them.

In parallel, institutions nowadays have to justify their performance to a greater extent than in the past, notably as a result of introducing external quality assurance systems. This is placing new demands on senior management within higher education institutions, which calls for a professionalisation of such management, including through training. This need for further leadership and management is also reflected as a priority topic in EU programmes.

At systemic level, the challenge posed by the diversity of typologies and missions of higher education institutions is a very important related aspect, which raises challenges for governance and quality assurance in higher education. In Europe, this diversity is regarded as a positive characteristic since diverse higher education systems are more responsive to rapidly changing social and economic needs. For instance, it is considered positive to respond to challenges such as those that seek to better serve the needs of an increasingly heterogeneous population of learners. Furthermore, reforms such as those promoted within the framework of the Bologna Process have resulted in the creation of even more diverse typologies of higher education institutions with different missions, and the economic crisis will probably reinforce this tendency towards diversity by forcing institutions to better place themselves by analysing their strengths and weaknesses within their context and by defining strategic action plans accordingly.

Increasing diversity calls for transparency as a key element in the EU strategy for the modernisation of higher education systems. Clearer information on the performance of institutions can inform the choices of students, employers and policy makers. University managers are also direct beneficiaries of transparency since many institutions are unaware of the areas in which they excel (apart from specific cases mainly within the research mission). Higher education institution leaders and managers could increase the effectiveness of their decisions, in particular to strengthen the relevance and quality of teaching and research, labour market outcomes, and innovation and entrepreneurship. Institutions benefit from transparency since it allows them to better position themselves and improve their development strategies, quality and performance.

This article reviews the contribution of the European Commission to issues of governance and transparency in relation to the challenge of modernising European higher education. To that end, the EU has a number of policy and funding instruments. Furthermore, policy priorities within EU funding programmes are aligned with such objectives. The review examines the main actions in this area, with a focus on specific examples of tools and actions directly related to the improvement of institutional governance. Section 2 presents the impact of diversity in higher education governance reforms, and section 3 briefly describes the main EU policy instruments in this area. Section 4 presents examples of projects addressing the improvement of institutional governance funded by the EU.

## 2. Higher education governance in a diverse landscape

The importance of diversity as regards governance reform is underlined in the main European documents on higher education, both at national and EU levels, stressing the need to take account of the variety of higher education system types (with national characteristics) and institutions (which vary in size, missions and profiles). Institutional diversity is considered one of the key strengths of higher education in Europe.

Some of the reasons for increased diversity in Europe are connected with Bologna Process reforms, which have a direct impact on the quest for new governance models: one of the effects is the creation of new types of institutions in some countries, which demand non-traditional governance models for their success; another is the increasing tendency of higher education institutions to merge into bigger organisations to foster cooperation and efficiency, which has led to discussion about the most appropriate governance models for managing such institutions.

The importance of the link between governance and diversity gave rise to a meeting of Director Generals for Higher Education of EU Member States on this topic under the Hungarian Presidency of the EU in Budapest in April 2010. The need to address diversity was not only reviewed at systemic level, but in particular at institutional and programme levels. At the meeting, there was general agreement on the need to encourage institutions to profile themselves in all missions, identifying their main strengths and resources; it was also felt that institutions could excel in many important dimensions other than research, such as teaching quality, knowledge transfer and innovation, or even internationalisation.

In order to achieve a greater diversity of profiles, efforts are required to give higher visibility and rewards to dimensions other than research, and in particular to teaching quality. These dimensions/profiles should be reflected more clearly in career paths and instruments, such as quality assurance and funding mechanisms, particularly ensuring that academic staff that demonstrate excellence in teaching quality are recognised adequately. As a reaction to this aim, countries such as Finland, Denmark and the Netherlands are now working on the development of funding that is more multi-dimensional, awarded according to missions, performance targets and/or quality assessments. In some countries, this can represent up to 30% of total funding, while it is considered expedient to keep a strong funding basis related to student numbers and graduates. Unfortunately, an optimal model with a full set of performance and assessment indicators for the non-research dimensions does not yet exist. European initiatives such as U-map and U-multirank, described later, aim to bring more transparency to these other important missions of higher education systems and institutions, and to improve existing tools along those lines.

As positive as diversity may be, it also has the consequence of making it impossible to propose an ideal governance model for all higher education institutions and systems, thus rendering the debate on the subject more complex. Diversity in demographic changes, national enrolment targets and expected further expansion affects the appropriateness of governance models, of the best typology of institutions or of the nature of study programmes.

Furthermore, increasing diversity puts strain on existing quality assurance and evaluation systems. There is a need for flexibility in quality assurance applied to more innovative and required activities. Efforts need to be made, for example, on the evaluation of institutional capacities for self-evaluation and internal quality assurance, on the assessment of lifelong learning activities, and on the strengthening of the role of various feedback mechanisms (such as surveys of graduate labour market success). In parallel, funding mechanisms and appropriate incentives for academic staff should be adapted to the conditions of increased diversity to recognise their involvement. Moreover, the involvement of academic staff is considered essential to ensure the quality of actions such as the international mobility of students and excellence in teaching, and in some countries the lack of recognition of such activities on the same level as research activities is considered to be demotivating even. Quality assurance systems must also address this diversity for a fair evaluation of the work of each institution according to its profile, recognising excellence in its various dimensions.

At programme level, tailor-made programmes for non-traditional learners and flexible learning paths are increasingly required, especially nowadays due to the impact of the economic crisis. There is consensus on the need to reduce the existing gap between societal needs and the institutional perception of such needs. This and some of the aforementioned challenges call for a better involvement of relevant stakeholders in decision-making processes, including those outside the higher education sector (e.g., employers or civil society representatives). Such involvement of external stakeholders can be articulated by representation on the governance bodies of institutions, by specific project-based cooperation agreements, by staff and student mobility actions, and by other means.

### 3. Main European Union policy initiatives on governance

This section reviews the main lines of action within the European Commission's policy instruments on the governance reform area, notably those related to diversity, transparency and cooperation with relevant higher education stakeholders. These can be divided into three categories as follows:

#### 3.1 Reports on the impact of governance reforms across Europe

At the time of writing this article, the latest state-of-the-art research on governance reform at European level was an independent study providing an in-depth overview of policy changes and reforms in the governance domain of European higher education over a period of 10 years. This study entitled "Impact of Higher Education Governance Reforms across Europe (2006-2010)" was conducted together with independent studies on curricular and funding reform areas in higher education.

The study highlights the diversity of the European Higher Education Area: the different governance aspects of higher education modernisation agendas have been addressed to varying degrees in different countries, although further reforms are deemed necessary, especially to allow universities more institutional freedom. The report concludes that under the right conditions, with sufficient funding and smart financial incentives, institutional autonomy has a direct positive effect in terms of performance in the primary processes of universities. As the study underlines, there appears to be a link between the output of the primary processes (numbers of graduates and articles published) and the level of institutional autonomy.

The study provides recommendations on the need to revisit the balance between autonomy and accountability, mentioning that what seems to be gained in terms of autonomy might too easily be lost on excessive accountability requirements. Traditional means of state regulation and state micro-management tend to be replaced by new methods of accountability and reporting to other authorities, calling for the need to assess the means and ends of accountability in European higher education.

Finally, the report underlines the need for increased investment in higher education and research across Europe, without which it is unlikely that universities will be able to completely fulfil the growing expectations of their role within the European knowledge society and their overall contribution to European competitiveness. Governance reforms in combination with sufficient levels of funding are likely to contribute to enhanced system performance. This requires the balance of public and private investment in higher education and research to be revisited.

#### 3.2 Strengthening university-business cooperation

Business involvement in higher education is a horizontal topic with clear positive effects on funding and governance reforms, as well as on ensuring that curricula are up to date and meet the needs of employers and society. With the aim of supporting closer cooperation between the worlds of

academia and work in Europe, the European Commission annually organises the University-Business Forum, a platform to foster dialogue and actions on issues like lifelong learning, mobility, entrepreneurship, knowledge transfer, curriculum development and delivery, and governance.

The Forum contributes to a structured dialogue between the two spheres, demonstrating both parties' interest in working in partnership. In order to support implementation, a pilot action called "knowledge alliances" was launched in April 2011 (with a view to continue being implemented annually) to ensure greater societal and economic relevance and outreach of higher education by strengthening the employability, creativity and innovative potential of graduates and lecturers, and the role of higher education institutions as drivers of innovation.

### **3.3 Transparency initiatives on mapping and ranking missions and performance**

The European Union's higher education modernisation agenda underlines the importance of transparency and diversification based on the strengths of the different higher education institutions. In order to identify these strengths, institutions need tools that allow them to benchmark themselves against other higher education institutions at national and international levels.

The European Commission supports several initiatives to develop tools and policies to improve transparency. One of the most relevant is the EU sponsored U-map project. U-map developed a classification model to categorise the rich diversity of higher education institutions, taking inspiration from the well-established Carnegie Classification in the United States. This methodology categorises higher education institutions according to different missions: teaching and learning, research, innovation and knowledge transfer, regional engagement and internationalisation.

The relatively recent existence of higher education rankings had a considerable influence over governance decisions in many institutions. Unfortunately, in many cases this reaction was unexpected and has a dubious positive impact, especially as regards diversity: the vast majority of existing rankings focus narrowly on the research dimension, ignoring performance in areas such as teaching, internationalisation, innovation and community outreach. In doing so, they do not cover the diversity of higher education and, in practice, they are known to include no more than around 3% of higher education institutions worldwide.

In order to improve this situation, and since it is commonly accepted that despite the drawbacks of exiting rankings they are here to stay, the European Commission launched in 2009 the feasibility study entitled "Design and testing the feasibility of a Multidimensional Global University Ranking", also known as U-multirank, which designed and tested a personalised multi-dimensional ranking concept, covering performance in five dimensions: research, teaching and learning, innovation and knowledge transfer, regional engagement and internationalisation. The main aim of the approach is to serve as a useful tool for decision making for any end user, not resulting in a single overall listing of universities (the end result would not lead to a league table). Its main characteristic is to offer users the possibility to make a personalised ranking tuned to their own personal preferences and objectives in the different areas of interest (dimensions). The study proved the feasibility of this multidimensional ranking concept, underlining that further work was still required to develop some

indicators. Furthermore, it also identified several challenges, among which the most critical is the need to further improve data in terms of availability, robustness and comparability, as well as the need to implement a strategy for periodic data collection. Some 159 higher education institutions of diverse profiles took part in the initiative, proving that institutional managers could be provided with valuable information to enable them to define governance measures and strategic plans.

As a follow-up of this study, the European Commission has recently launched (March 2012) a new call to implement a first version of this ranking towards the end of 2013, with the aim of it being published annually. This subsequent phase will build on the findings of the U-multirank study and will create a web tool enabling users to choose the type of institutions of interest (e.g., e-learning institutions, those from just a small number of countries, etc.) and then select the performance indicators of any of the five dimensions that are relevant to their search. This transparency tool is intended to provide users, such as institutional leaders, students and policy makers with more accurate performance information than the that offered by existing rankings on which to base their decision making, although as explicitly mentioned in the call, this ranking is regarded by the European Commission as complementary (and not a substitute) to other relevant higher education tools, such as quality assurance.

## 4. European projects on higher education governance

As one of several funding instruments of the European Commission, and as a complement to the policy initiatives presented earlier, the Erasmus programme (mainly known for student and staff mobility actions) offers the possibility to fund cooperation projects to support the objectives of the higher education modernisation agenda.

Taking the form of a call for proposals (usually with two to three year-long projects with a minimum of three partners from three European countries), the topic of higher education governance has been a priority area since 2009, and several projects have focused on pilot studies in relation to improving governance at systemic or institutional levels.

Outlined below are just some of the projects focusing on the most significant challenges relating to governance at institutional level, all of which have the highest potential to improve existing governance models both at systemic and institutional levels. They have been signalled by independent experts of the European Commission as the most innovative and/or for being examples of good practice:

- **Autonomy Scorecard:** The main outcome of this project is a report comparing university autonomy across 26 European countries. In addition to an in-depth analysis of the current state of institutional autonomy in Europe, the study includes four scorecards which rank and rate higher education systems in four autonomy areas: organisational, financial, staffing and academic autonomy.
- **European University Quality Management Tools for Lifelong Learning:** This project created a model and tools for quality management in lifelong learning (LLL) organisations and

- continuing education. Its motivation is to respond to the lack of systematic tools to analyse university processes and outcomes focusing on lifelong learning. The model and tools are based on applying the EFQM model to the LLL field.
- **Shaping Inclusive and Responsive University Strategies:** Also focusing on the area of management of LLL actions, this project provides different profiles and interests in LLL, which are at different stages of LLL implementation, and an opportunity to develop and enhance their strategic LLL approaches.
  - **European Higher Education Management and Development:** This project contributes to the professionalisation of institutional senior management and to improving areas such as business-university cooperation governance. It focuses on improving relevant competencies of higher education institutional leaders. It proposes a master programme to provide these professionals with the necessary qualifications for top-level higher education management competence.
  - **Strategic University Management: Unfolding Practices:** This project aims to identify good practices and to exchange university strategic management practices. A platform will be created for best practice knowledge transfer. One of its main activities is desk-research into the current state-of-the-art of strategic university management projects, tools and techniques to facilitate the continuous improvement of strategic management of higher education institutions.
  - **European Benchmarking Initiative on Higher Education:** Building on previous benchmarking initiatives in higher education, this project proposes a modern management tool to support progress on institutional reforms, increased operational efficiency and the capacity for innovative changes in order to adapt to new challenges in their context. Target groups are university leaders and decision makers, staff at various levels from all over Europe and other relevant stakeholders. The project focuses on four key areas: governance, university-enterprise cooperation, curriculum reforms and LLL.
  - **Indicators for Mapping and Profiling Internationalisation:** This project attempts to measure the internationalisation of higher education, proposing a methodology to improve transparency and accountability in internationalisation. It is expected to provide a set of relevant indicators, a choice of individual internationalisation profiles and a potential comparison with other Europe-wide institutions.
  - **Innovative OER in European Higher Education:** Beyond a strong conceptual basis for open educational resources (OER) in Europe, this project examines the innovation cycle in awareness raising, strategy building (institutional frameworks), pedagogical models, business cooperation and pilot experiments. It conducts pilot studies into areas where OER functionalities can be achieved, such as OER multi-campus (stakeholder engagement sessions) and OER internationalisation (manuals). Best practices in institutional OER development plans (with scenarios for multi-campus approaches) and institutional and multi-campus pilot experiments are analysed, and a report will be created with multi-campus best practices.

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## Dossier “Innovation and Good Practices in University Government and Management”

### ARTICLE

# Information Technology Incident Management: A Case Study of the University of Oviedo and the Faculty of Teacher Training and Education

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## Abstract

Since their introduction into higher education institutions, information technology (IT) resources have become an indispensable, dynamic and controversial component of teaching- and research-related activities. This article explores some of the complex issues surrounding such resources through a study of the most representative IT incidents that occurred at the University of Oviedo and in one of its faculties, specifically the Faculty of Teacher Training and Education. It also aims to provide some guidelines to improve decision making in this particular field, and also to disseminate a number of significant findings in relation to the use of such technologies by higher education centres.

To that end, incidents reported at the University of Oviedo (with 30,000 people across four campuses) over three consecutive academic years are analysed. Incidents occurring in computers (which may include software and peripheral devices) used by students and lecturers in the Faculty of Teacher Training and Education's classrooms are also analysed. The results obtained show that, while the number of IT devices has increased, the number of incidents has remained constant. This indicates that users are able to use them better. Most of the problems reported by the university and faculty alike were connected with software. This suggests that robust centralised services for program updating and maintenance are required.

## Keywords

new technologies; IT incidents; education centre management; higher education

## *Gestión de incidencias informáticas: el caso de la Universidad de Oviedo y la Facultad de Formación del Profesorado*

### *Resumen*

*Las instituciones educativas universitarias incorporan progresivamente los recursos informáticos, que se convierten en instrumentos indispensables, dinámicos y controvertidos en la acción docente e investigadora. Este trabajo ex post facto intenta descubrir algunos rasgos de tal complejidad, a través del estudio de las incidencias informáticas más representativas que tuvieron lugar en la Universidad de Oviedo y en una de sus facultades (Formación del Profesorado y Educación). También pretende aportar pautas para tomar mejores decisiones en este ámbito y difundir las actuaciones significativas de uso de estas tecnologías en los centros de educación superior.*

*Para ello se analizan las incidencias recogidas durante tres cursos sucesivos en la Universidad de Oviedo, institución que acoge a unas treinta mil personas, repartidas en cuatro campus. También se analizan las actuaciones de los equipos que utilizaron los estudiantes y profesores de las aulas de la Facultad de Formación del Profesorado y Educación. Los resultados obtenidos destacan que, aunque aumenta el número de dispositivos informáticos, la cantidad de incidencias generadas permanece constante. Esto apunta a que los usuarios saben emplearlos mejor. La mayoría de los problemas, tanto en cuanto a la institución universitaria como a la facultad, están relacionados con el software, por lo que se sugiere la implementación de potentes servicios centralizados de actualización y mantenimiento de los programas utilizados.*

### *Palabras clave*

*nuevas tecnologías, incidencias informáticas, gestión centro educativo, educación superior*

## 1. Introduction

Nowadays, education centres systematically incorporate information technology (IT) resources into every area of activity. They have become an indispensable component of teaching- and research-related activities. Rather than information processors, computers have become the cornerstones of most academic activities, both for content development and subject methodologies. Technology helps to bring the cost of such activities down, and computers (which, for the purposes of this article, may include software and peripheral devices) are ever-more accessible, powerful and portable. This evolution has a quantitative and qualitative impact on education institutions' processes (Gutiérrez, Palacios & Torrego, 2010a). Mobile telephony devices allow computer services to be used anywhere, thus blurring the boundaries between specific computing spaces and their configuration. The Internet also changes the substantial use of computers, which become media for communication and personal expression (Acikalin, 2010). Underlying this dynamic, complex phenomenon are the IT incidents that occur and the software updating and maintenance that is required.

Managers in charge of buying, distributing and maintaining computers and their network services have to re-adapt their spaces, times and educational methodologies. Such managers occasionally focus their efforts on buying resources and software; after doing so, they realise that it is not easy to find reports or comparative experiences that serve as guidance for the proper use, servicing and maintenance of such resources. This evolution marks the difference between those institutions that are able to manage technological advances and complexity effectively, and those that are not (Bozionelos, 2004)..

## 2. The unique, dynamic ecology of IT resources and spaces

While reviewing the literature on IT incidents, the authors considered works that analysed the following: the use of IT resources in higher education centres (Lowerison et al., 2006; Selwyn, 2007); experiences describing the unique relationship between IT resources and users in the field of education; and the direct impact of IT resources on curricular development (Biscomb, Devonport & Lane, 2008; Gutiérrez, Palacios & Torrego, 2010b; Inan et al., 2010). The authors also analysed the IT management designs of Gibert (2006) and Oyewole (2010), as well as works by Menchaca and Contreras (2009) on networked educational activities.

These studies underscore the fact that education centres are formed by people with diverse profiles and social and cultural backgrounds. As a result, IT resources have a variety of users and heterogeneous uses, thus making the phenomenon a unique case in each education institution (Shell & Husman, 2008). Moreover, the academic context dictates the handling of such resources in a unique environment of experimentation and learning, where many members of the community share the same computer. At one and the same time, this leads to innovative academic achievements and inappropriate uses, breakdowns and deviations from the educational objectives set. The close interaction between a person and a machine, and the high phenomenological potential associated

with that, means that operational guidelines are necessary. In this respect, institutions publish operational rules for IT in internal usage documents and regulations.

In the early days, computers were concentrated in specific rooms to which students had access at certain times, basically when their activities required the use of computers. They were conceived as enclosed, isolated spaces. Subsequently, they were connected via local networks so that printers and other services could be shared. Today, computers are everywhere and are open to external communications, to local interactions via Intranets and to global access via the Internet.

Many applications have become dynamic and are available on remote servers and from virtual libraries in the cloud (Witten et al., 2009); this means that users have no option but to be online, though it does relieve from having to install and maintain such programs.

While the initial goal of IT resources in education institutions is to allow users to do academic work or administrative tasks, it is easy to establish that computer users actually use such devices for other, occasionally ambiguous purposes, such as recreational activities. With access to the Internet, the choice of objectives multiplies while new activities emerge, such as visiting social networking sites or communicating via them. Although they provide a communicational dimension, they may lead to deviations from academic objectives and potential problems (Sureda et al., 2010), and that is the reason why some works suggest strict rules for the use of networked computers (Flowers & Rakes, 2000). In contrast, other works defend the unrestricted, open exploration and innovation that IT offers. In this respect, it would seem that a new profile for the 'superquick' student has emerged: the digital native (Bennett et al., 2008; Prensky, 2001; Selwyn, 2009) or the net generation (Carlson, 2005; Judd & Kennedy, 2011). This is the type of student that has the ability to multitask; he or she can do several tasks at the same time without losing attention on any of them or needing more time to do them (Bowman et al., 2010; Junco & Cotten, 2010; Willingham, 2010).

This new context is broad and hard to delimit, and centres should offer their members the opportunity to use hardware and software with certain restrictions and under specific rules, that is to say, an institution's own set of applications and computers, whether connected to a server or not, that is available to students, lecturers and administrative staff.

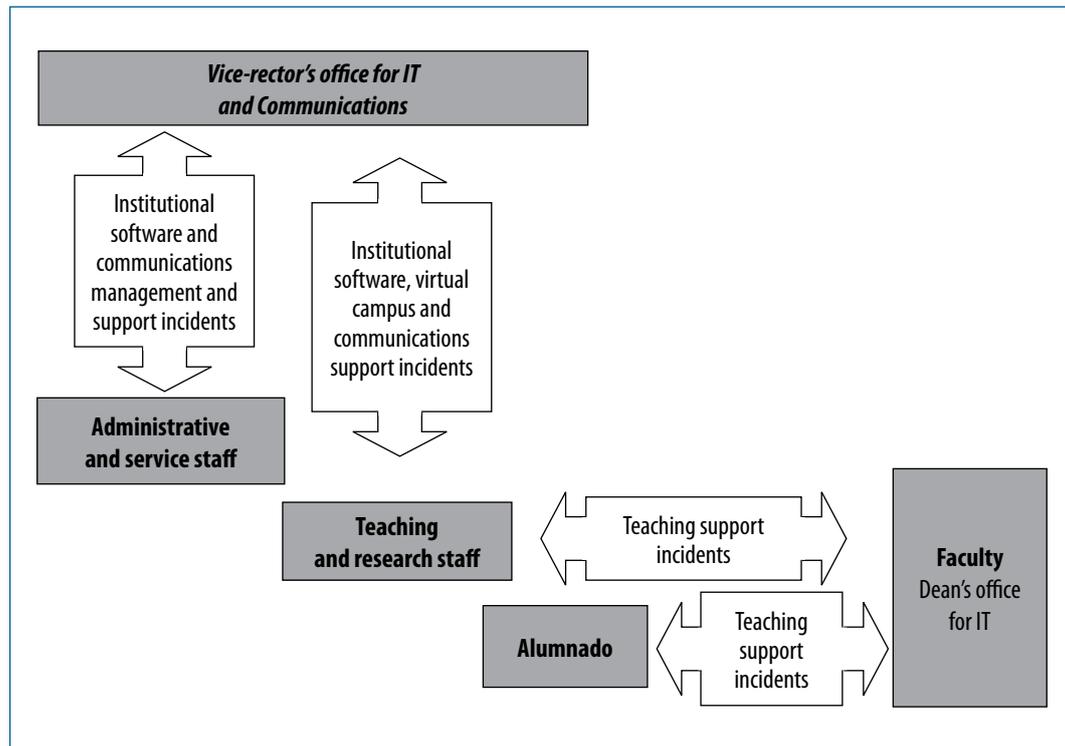
### 3. IT and communications incident management at the University of Oviedo and in its faculties

At the University of Oviedo, there are 30,000 people across four campuses: Oviedo, Gijón, Avilés and Mieres. It was essential to define the types of user of each IT resource, since software services and specific security levels vary accordingly. As a result, three types of user were defined: students (25,000), lecturers (2,020) and administrative and services staff (1,680). There are no strict boundaries between these three types of user because, on some occasions, students and lecturers may share computers and, on others, lecturers perform administrative and managerial tasks.

Incident management is performed at two action levels (Figure 1): institution level and education centre level. At institution level is the User Care Centre (UCC). This type of service is

commonplace in higher education institutions. It sorts out IT problems for the academic and administrative communities as a whole. At education centre level, which can be a specific faculty, the service provides lecturers and students with assistance for incidents arising from teaching-related activities.

Figure 1. Process of distributing IT incidents between the vice-rector's office and faculties.



At institution level, the UCC is formed by two coordinators, 11 technicians and three telephone operators, who deal with an average of 70 incidents a day, 25 of which require the staff to visit the place where the broken down computer is located. The centre receives 833 e-mails a month. There is an automated IT incident management tool (XPERTA), as well as an institutional website for support.

At faculty level, there is a service for sorting out problems and breakdowns connected with teaching-related activities, which collaborates very closely with the university's UCC. In this case, incidents occurring in computers used by students and lecturers in the Faculty of Teacher Training and Education's classrooms were also analysed. There were 1,912 students in this faculty in the 2010/11 academic year, during which it had 170 computers for teaching-related activities (Table 1) located in a number of different spaces, as well as the associated 48 flat-screen monitors, 123 CRT monitors and 13 printers.

Table 1. Educational spaces and resources in the Faculty of Teacher Training and Education

<i>IT resources</i>		<i>Non-IT resources</i>	
<i>Spaces</i>	<i>Number</i>	<i>Number of spaces</i>	<i>Resource</i>
For teaching the students (joint lectures and seminars)	37 spaces (with 1 PC)	30	1 VHS player
For lecturers' meetings	4 spaces (with 2 PCs each)	34	1 television
Open access to students	1 space (with 25 PCs)	15	1 DVD player
IT room for teaching (a)	With 44 PCs	13	1 audio amplifier for a public-address system
IT room for teaching (b)	With 21 PCs	37	1 overhead projector
IT room for teaching (c)	With 11 PCs	39	1 video projector
IT room for teaching (d)	With 24 PCs	11	1 interactive board
Total PCs managed	170		

## 4. Methodology

### 4.1 Aim

The aim of this descriptive study is to show the most representative IT incidents that occurred at the University of Oviedo and in one of its faculties, specifically the Faculty of Teacher Training and Education. It also aims to provide some guidelines to improve decision making in this particular field, and also to disseminate a number of significant findings in relation to the use of such technologies by higher education institutions.

### 4.2. Data management procedure

The study was carried out at two levels: institution level and education centre level. In order to analyse the institution-level incidents affecting the university's lecturers and administrative staff, reports of breakdowns and malfunctions of IT resources were collected for the 2008/09, 2009/10 and 2010/11 academic years.

For the compilation of the incident reports, the vice-rector's office for IT and Communications had an e-mail, telephone support and fax services, all of which were centralised in the UCC. Users also had the opportunity to report an incident directly via an automated IT incident management tool (helpdesk-XPERTA). These were the means through which a user was able to report an incident to IT Services, which would then send a technician to sort out the problem. The data about the user reporting an incident were included in a log. In addition, the incidents were classified by topic, response time and resolution time.

In order to analyse education centre-level incidents affecting the Faculty of Teacher Training and Education, a short incident report form was chosen, similar to the one used by the Polytechnic University of Valencia. The form contained the following eight items:

- Incident date
- Lecturer reporting the incident
- Incident location
- Description
- Person dealing with the incident
- Incident follow-up: resolved, with the date and a brief description of its origin
- Incident follow-up: pending further action
- Remarks

These incidents were dealt with by the respective members of staff from the dean's office and by four grant-holding IT students responsible for sorting out any problems with the computers in the first instance, and then for updating software and for performing inventories and preventive maintenance of IT resources.

## 5. Results

### 5.1 Institution-level data

The number of institution-level incidents reported between the 2008/09 and the 2010/11 academic years varied between a minimum of 181 in August 2009 and a maximum of 767 in March 2009: for the 2008/09 academic year, the mean (M) was 518.75 (with a standard deviation [SD] of 150.19; for the 2009/10 academic year, M=490.08 (SD=109.9); and for the 2010/11 academic year, M=501.83 (SD=98.66). With the distribution by the months shown in Table 2, there were no statistically significant differences in the aforementioned means between the 2008/09 and 2009/10 academic years ( $t(11)=1.283$ ,  $p=0.226$ ), between the 2009/10 and 2010/11 academic years ( $t(11)=0.655$ ,  $p=0.526$ ) or between the 2008/09 and 2010/11 academic years ( $t(11)=-0.549$ ,  $p=0.594$ )

Table 2. Incidents reported to the UCC at the University of Oviedo

<i>Incidents raised</i>	<i>2008/09 academic year (September-August)</i>	<i>2009/10 academic year (September-August)</i>	<i>2010/11 academic year (September-August)</i>
Total in the academic year	6,225	5,881	5,614
<i>Incidents raised</i>	<i>2008 calendar year (January-December)</i>	<i>2009 calendar year (January-December)</i>	<i>2010 calendar year (January-December)</i>
Total in the calendar year	6,078	6,014	5,910

Table 3 shows the incident data, by type: mechanical or hardware breakdowns such as problems with a computer's mother board, power source or internal devices; program problems; network and voice or data connection failures; problems with malware and viruses; and other atypical incidents difficult to classify. Having analysed the year-on-year evolution of each incident type, there were no significant differences in hardware, software, network or any other types of incident apart from viruses.

For that variable in the 2008/09 academic year,  $M=32.333$  ( $SD=15.86$ ); in the 2009/10 academic year,  $M=34.66$  ( $SD=16.42$ ); and in the 2010/11 academic year,  $M=15.58$  ( $SD=6.82$ ). There were statistically significant differences between the 2008/09 and 2009/10 academic years ( $t(11)=3.788$ ,  $p=0.003$ ) and between the 2008/09 and 2010/11 academic years ( $t(11)=4.010$ ,  $p=0.002$ ).

**Table 3.** Distribution of incidents reported to the UCC at the University of Oviedo, by type and academic year

Academic year	Hardware			Software			Network			Viruses			Others		
	2008/2009	2009/2010	2010/2011	2008/2009	2009/2010	2010/2011	2008/2009	2009/2010	2010/2011	2008/2009	2009/2010	2010/2011	2008/2009	2009/2010	2010/2011
TOTAL	1,166 (18.3%)	1,061 (18%)	1,140 (19.1%)	3,941 (61.8%)	3,612 (61.4%)	3,790 (63.6%)	213 (3.3%)	147 (2.5%)	207 (3.5%)	388 (6.1%)	416 (7.1%)	187 (3.1%)	668 (10.5%)	645 (11%)	634 (10.6%)

The number of IT incidents, by type (Table 3), remained constant over the period analysed. Most of the problems were found to be connected with software, maintenance and program installation issues (around 61-63%). To a much lesser extent, around 18-19% of the incidents were found to be connected with mechanical and component breakdowns, 3% with communications network failures and 6% with viruses.

The times taken to sort out the incidents were analysed by distinguishing between internal hardware and peripherals (printers and mice for example). A distinction was also made between issues connected with basic software (operating system, Microsoft Office and similar programs) and corporate software (Gauss, Sies, Sicalwin). In nearly 90% of the cases, the incidents were sorted out in a period of two weeks; those connected with corporate software were the quickest to be resolved, while those connected with a computer's hardware and basic software were the slowest.

The UCC's web-based service was visited 32,118 times in 2010; visits per month varied between 1,950 in August 2011 and 4,321 in September 2011. It should be noted that the section receiving the most visits was the one for obtaining software under the university's corporate licence, which accounted for 27.4% of all visits. There was also a high number of visits connected with the configuration of Wi-Fi access, which accounted for around 10% of the searches.

## 5.2 Education centre-level data for the Faculty of Teacher Training and Education

At the specific faculty level, it was calculated that each computer for teaching (which, as mentioned earlier, may include software and peripheral devices) had been in operation for 10 lecture hours a day for eight months per academic year, which represented around 1,600 hours of total operating time.

Among the incidents occurring in the 2010/11 academic year, which were specifically distinguished by type (Table 4), worthy of note are those connected with software, which accounted for 53%; the most frequently requested actions were the full or partial installation of programs connected with teaching and with a computer's basic operation.

Table 4. Incidents, by type, in the 2010/11 academic year in the Faculty of Teacher Training and Education

<i>Incident type</i>	<i>Number</i>	<i>%</i>
<b>Network incidents</b>	<b>140</b>	<b>11.1</b>
Network failures, IP or Proxy checking, network management system restart	60	4.8
Password changes, username unification and/or problems with user accounts	45	3.6
Wi-Fi and software installation or laptop configuration	32	2.5
Remote desktop configuration	3	0.2
<b>Software incidents</b>	<b>671</b>	<b>53.3</b>
Installation/uninstallation/partial update of software in classrooms	312	24.8
Installation/uninstallation/partial update of software in open access rooms	190	15.1
Video problems (projectors or monitors)	71	5.6
Audio problems	46	3.7
Full installation of software and disk cloning	38	3
Video problems (monitors)	14	1.1
<b>Hardware incidents</b>	<b>224</b>	<b>17.8</b>
Replacing/checking hardware in classrooms or open access rooms	155	12.3
Replacing/checking hardware in the meeting room or lecturers' room	44	3.5
Replacing network/mains/splitter cables	25	2
<b>Printer incidents</b>	<b>78</b>	<b>6.2</b>
Printer problems in the open access room (including toner replacement)	37	2.9
Printer problems in the lecturers' room (including toner replacement)	19	1.5
<b>Software and hardware incidents</b>	<b>78</b>	<b>6.2</b>
Repairing and/or checking computers in rooms	75	6
Viruses, internal hardware breakdowns, general check, memory	3	0.2
<b>IT management</b>	<b>90</b>	<b>7.2</b>
Recycling/replacing computers and/or materials	40	3.2
Inventory tasks and computer labelling	26	2.1
Orders for consumables (paper, etc.) and hardware (cables, splitters, etc.)	20	1.6
Requests for IP addresses	4	0.3
<b>Total</b>	<b>1,259</b>	<b>100%</b>

## 6. Discussion

A statistical analysis of the computer incidents and breakdowns showed what had happened over three academic years. On the basis of that analysis, it is possible to extract inferences about the strengths and weaknesses of IT resources, mainly to guide preventive action efforts to ensure that incidents do not occur.

The average number of incidents reported per day to the UCC at the University of Oviedo was 25. There were some months when the level of IT activity and number of incidents were low, such as the month of August, and there were others when they were high, coinciding with the start of each semester. The total number of incidents in each academic year remained constant at around 6,000; it dropped slightly in the period from 2008 to 2010, though not significantly. This data would seem to suggest that as the number of IT resources and applications increases, so too does the users' level of knowledge with respect to sorting out problems on their own.

In the faculty, of particular note are the incidents arising from software installation and maintenance. Monitor and projector problems should also be underscored.

Even though the design of operational rules should be precise and effective, in higher education such rules are usually minimal and open to interpretation. It would seem that, at this educational level, their design does not have an impact on the number of incidents (Garlan & Noyes, 2004); furthermore, such guidelines are actually enhanced by unexpected events that occur in academic life (Koh & Frick, 2009). On other occasions, rules are considered known and are adhered to in a self-regulated way (Schraw, 2010).

These premises are combined with the challenge of providing fast incident management. To that end, a small, clear protocol was designed, as was a free-flowing communication channel with the coordinator in order to achieve problem-solving speed. So, in the faculty analysed, the rules applied to computer users were reduced to the following guidelines:

For students:

- Access with credentials and identity documents
- Opportunity to save documents on the computer or server, and on user devices
- Quota of free printouts (50 pages)
- Initial and final obligation to check the state of the computer
- No penalties

For lecturers:

- In the event of a problem, an incident form must be completed and sent to the staff in charge of following it up.

These rules were complemented by online instructions on the web page of the vice-rector's office for IT, which provided guidance on the proper use of hardware devices and software.

The compulsory nature of the initial incident report, identifying both the problem and the user, helped to ensure that the user took responsibility for the proper handling of shared resources. The education institution provided usernames that were valid throughout the students' academic periods. Using computers that required personal password authentication by a server provided security and prevented any improper use. Four hierarchical user types were created according to their permissions:

- Username and password access for a personal user, authenticated by a central server, with administrative restrictions (guest user or student) or full software management and computer control rights (administrator or lecturer).
- Generic "SUBJECT" user, showing a subject's typical documents during a session.
- Specific username and password access for the computer used; easily accessible data that are repeated across all computers in the same activity area.
- Open access without a password

The users did not completely shut down the computers, but simply closed the sessions. This reduced the boot time and prevented new users from getting access to other people's profiles. Keeping computers on at all times meant that software could update automatically at night when they were not being used.

Of particular note are specific printer-related incidents. Due to the high cost of printing consumables, classroom computers were usually connected via a network to a single printer, which maximised resources in nearby rooms or offices that might also have shared a printer. A flexible control of the permitted number of free printouts for each student (limited to 50 pages a day) was also carried out. This had a dissuasive impact on excessive consumption. Now, the tendency is to manage all documents on digital media to avoid having to print them out.

## 7. Conclusions

The new technological ecosystem offers people greater flexibility in terms of how and where they work. The specific barrier of the IT room is vanishing while portable personal devices are being systematically incorporated (laptops, notebooks, PDAs, pocketPCs, iPads, etc.), all of which are connected to networks via Wi-Fi technology anywhere. This makes information and communication technology (ICT) management essential in any space, including the management of computers that do not belong to the institution.

The number and variety of IT devices is increasing yet the number of incidents remains constant, and this indicates that users are better able to manage them. Most of the problems reported by the university and faculty alike were connected with software. This suggests that robust centralised services for program updating and maintenance are required. This coincides with the increase in incidents in online spaces and servers. The education centre is expanding its scope of action, and

responds to incidents in virtual places, where students and lecturers coincide in asynchronous and synchronous real time, far from traditional academic infrastructures. As a result, incidents occur in study rooms, in corridors or recreational areas, where Wi-Fi access to networks is also provided, as is access to the power supplies required to keep students' portable devices working. Such openness can compromise IT security, so it is essential to effectively manage computer access protocols. Such protocols must also ensure that they do not prevent sessions from being quickly launched.

It is necessary to share solutions to IT challenges connected with new spatial needs and new uses, where personal and academic activities come together. The management of delocalised software and the influx of portable, interconnected hardware devices mean that responses to incidents have to be given anywhere, anytime. This involves the provision of versatile, fast solutions, with minimal, flexible rules and comprehensive online support.

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## Dossier “Innovation and Good Practices in University Government and Management”

### ARTICLE

# Pluralist University Government. An Analysis Proposal Based on Stakeholder Theory

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### Abstract

The main aim of this article is to reflect on the possibilities of developing pluralist university government in the current political and social context, which requires university institutions to be much more open and connected to their social environments, particularly from a knowledge society perspective.

It analyses a number of aspects relating to the implementation of stakeholder participation in university government, including decision-making processes and the supervision of university activities by society, as an expression of universities' greater social responsibility.

Taking a stakeholder theory approach, it identifies the main characteristics of people, groups and institutions either affected by or interested in university affairs, and considers the importance of striking up positive relationships with the social environment.

Based on the literature in this field, the authors put forward a number of theoretical proposals to identify not only the interested parties, but also their roles in the decision-making processes of universities' day-to-day operations.

### Keywords

university government; stakeholder theory; university social responsibility; social participation; decision-making; higher education

## *Gobierno universitario pluralista. Una propuesta de análisis desde la teoría de los stakeholders*

### **Resumen**

*El objetivo principal del trabajo es reflexionar sobre las posibilidades de desarrollar un gobierno universitario pluralista en el actual contexto político y social, que demanda a las instituciones universitarias un mayor grado de apertura y vinculación con su entorno social, especialmente desde la perspectiva de la sociedad del conocimiento.*

*El artículo analiza algunos aspectos relacionados con la implementación de procesos de participación de los stakeholders en el gobierno universitario, en algunos ámbitos del proceso de toma de decisiones y fiscalización de las actividades universitarias por parte de la sociedad, como expresión de una mayor responsabilidad social de las universidades.*

*El ensayo se desarrolla desde la perspectiva de la teoría de los stakeholders para identificar las principales características que poseen las personas, los grupos o las instituciones que son afectadas por el quehacer universitario, o se encuentran interesadas en él, así como respecto de la importancia de establecer relaciones positivas con el entorno.*

*A partir de cierta bibliografía relacionada con el tema, se proponen algunos esquemas teóricos para identificar cuáles son las partes interesadas de la universidad, así como el rol que les compete en la toma de decisiones en diferentes procesos asociados al día a día universitario.*

### **Palabras clave**

*gobierno universitario, teoría de los stakeholders, responsabilidad social universitaria, participación social, toma de decisiones, educación superior*

## **1. Introduction**

Since university access was opened up to the masses, the importance of the relationship between universities and society has grown. Higher education is now among the range of aspirations, claims and needs of diverse individuals and social groups, all of whom identify knowledge and education with success and social and economic benefit.

From a theoretical perspective, one aspect that influences stakeholder identification is the way in which the analysis is shaped by an organisation's approach to social responsibility, which requires that stakeholders be placed at the centre of an institution's management practices (Cortina, 2006).

Properly identifying the interested parties is the first step in the process of implementing the concept of social responsibility in organisational management, a situation endorsed by Moneva (2007), who asserts that the first step in the strategic process of CSR<sup>1</sup> is to define the parties participating in the organisation. Along with this comes the need to identify who the stakeholders of the organisation are.

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1. Corporate social responsibility.

Since it is so important for organisations to identify such stakeholders, there is an obvious need to speak of decision-making from an institutional viewpoint, a subject which, within the organisational management sphere, is related directly to its government.

This article discusses the possibilities of applying stakeholder theory to shape pluralist university government that enables the various interested parties to participate in the decision-making processes of university affairs, beyond the typically passive role of stakeholders in accountability procedures that universities implement (e.g., by publishing social responsibility reports).

## 2. Stakeholder theory

Stakeholder theory was first systematised by R. Edward Freeman in 1984 (Donaldson & Preston, 1995; Lozano, 1999; Post et al., 2002; Matten et al., 2003). From a strategic management perspective, it defines this concept as “any group or individual who can affect or is affected by the achievement of the organisation’s objectives” (Freeman, 1984).

A key aspect in this theory is to identify the stakeholders in each organisation, since it is often unclear who the interested parties are due to the many forms, characteristics and definitions that interest groups may take (Lozano, 1999; Hax, 2006; Setó, 2007).

Some criteria for identifying the stakeholders in an organisation are related to the distinction as to whether they are internal or external. Executives, employees and shareholders form the first group, while the second encompasses customers, suppliers, public organisations and financial entities, among others (Lozano, 1999; Moneva, 2005; Marín, 2008).

In turn, stakeholders can be classified as primary or secondary (Clarkson, 1995; Marín, 2008); all the actors connected with an enterprise’s production process are *primary* stakeholders. The environment and public administrations are *secondary* stakeholders.

It is usual for organisations to limit their identification of stakeholders to formally instituted groups (e.g. trade unions) or to groups with which they have contractual relationships (e.g., employees, customers and suppliers) (Post et al., 2002; Antonacopoulou & Meric, 2005; Hax, 2006).

Yet Mitchell et al. (1997) indicate that both the stakeholder theory put forward by Freeman in 1984 and later versions are missing the same aspect: they do not provide objective criteria for determining clearly and accurately when an individual or group qualifies as a stakeholder of an organisation.

So those authors propose three criteria that an individual, group or institution must fulfil in order to be recognised as stakeholders in an organisation:

- Power: the capacity to achieve the results they desire in a co-active manner, by using physical force, money or rules;
- Legitimacy: the generalised opinion of citizens that the actions of individuals or organisations are desirable and suitable, in accordance with the rules, values, beliefs and definitions particular to that social system;

- Urgency: the degree to which the claims of the interested parties require immediate attention, based on the existence of two conditions: (1) the claim is time-sensitive; (2) the claim is important or critical to the stakeholder.

Under these criteria, Mitchell et al. (1997) identify a typology of stakeholders based on the presence of one or more proposed elements, recognising the more dominant nature of urgency with regard to claims that stakeholders place on an organisation.

Table 1. Categories, attributes and types of stakeholders.

Stakeholder category	Attribute held	Stakeholder types
<b>Latent</b>	Power	1. Dormant: their most immediate concern is to acquire a second attribute (legitimacy or urgency).
	Legitimacy	2. Discretionary: their relationship with the organisation moves in a philanthropic sphere, given that they neither hold power nor have any urgent claims to satisfy.
	Urgency	3. Demanding: they have a clearly formed claim, but do not possess enough force or social recognition for their claim.
<b>Expectant</b>	Power and legitimacy	4. Dominant: the interest, expectations and claims of these individuals or groups are important for the organisation.
	Power and urgency	5. Dangerous: because the claim lacks legitimacy, it could be imposed by the use of power or regulations, or even by coercion.
	Legitimacy and urgency	6. Dependent: because they lack power, they become dependent on other internal or external stakeholders to ensure that their claims are met by the organisation.
<b>Definitive</b>	Power, legitimacy and urgency	7. Because they hold all three attributes, they become a priority stakeholder for the organisation and will demand that their claims are satisfied in a very short time.

Source: Based on Mitchell et al. (1997)

Organisations wishing to implement a stakeholder system of management must first identify who the interested parties in their affairs are; that is, which parties will be affected by or show interest in the actions taken and decisions made by that organisation.

Then it is essential to make changes to the organisation's management to enable the interests and needs of the individuals, groups or institutions identified previously to be incorporated. It is therefore fundamental to generate spaces, instances and mechanisms in order to integrate the stakeholders into corporate government and management.

### 3. Universities' relationship with their stakeholders as a key factor for achieving pluralist university government

According to the European Commission (2008), the government structure of European universities is organised around four main bodies: (1) an executive body, represented by the figure of the university rector or president; (2) a collegiate academic body, responsible for teaching and research; (3) a decision-making body in charge of the university's strategic planning and main orientation; and (4) an advisory or supervisory body, appointed to monitor university activities, both academic and financial.

The European Commission itself (2008) states that there is a dominant, majority participation of external actors in decision-making bodies —and especially those charged with the evaluation and supervision of universities— in some European countries.

Universities as institutions created by society are not exempt from making efforts to identify stakeholders and their concerns, needs and interests. Indeed, according to Pérez and Peiró (1997), they should place more emphasis on doing so because:

universities are only legitimised if they respond to the social claims and needs for which they were created and which justify their continued existence and social dimension. If universities' sensitivity to social claims and needs is lost or annulled, then decision-making begins to be determined basically by internal politics and by the logic of corporate interests and power games played out by the different groups and bodies of the institution itself.

The European Commission (2008) also states that it is important to identify the sources that legitimise the decisions taken in the higher education sphere. Therefore, university government:

“... focuses on the rules and mechanisms by which various stakeholders influence decisions, how they are held accountable, and to whom. [...] refers to ‘the formal and informal exercise of authority under laws, policies and rules that articulate the rights and responsibilities of various actors, including the rules by which they interact’...”

Thus, the concept of ‘stakeholder universities’ arises, which according to Jongbloed and Goedegebuure (2003) implies that universities must be in constant dialogue with their interest groups to survive in a system where claims are heterogeneous and unpredictable. Therefore, it is possible to speak of universities that are sensitive to their environment, which are capable of effectively managing relationships with their interested parties and of developing permanent links with their stakeholders that, over time, guarantee reciprocity and receptiveness.

But above all, it is possible to speak of universities' capacity to identify what the needs and problems of their stakeholders are, shouldering them as their own when defining their institutional objectives, normally described in their strategic plans, where the presence of interested parties should be explicit and manifest (Gaete, 2010).

Nevertheless, Burrows (1999) claims that simply identifying universities' interested parties is not

sufficient, since it is a first step that offers no efficient solution for understanding or prioritising stakeholders' claims. Burrows proposes four dimensions according to their concerns and claims: location, state of participation, potential for cooperation or threat, and their relevance in and influence over the organisation.

The location of stakeholders describes the classic dimension that distinguishes between organisations' internal and external interested parties. The state of participation refers to both active and passive stakeholders: the former are those with whom the organisation maintains some form of exchange, transaction or legal obligation; while passive stakeholders are those who have been or may be affected involuntarily by university actions.

The third dimension proposed by Burrows distinguishes between the interested parties' potential for cooperation or threat with regard to achieving their objectives, which implies integrative or defensive strategies in each case. Finally, a distinction should be made between the type of interest (institutional, financial and social dependence) and the type of influence (formal, economic and political) used by stakeholders to achieve their aims.

In short, 'stakeholder universities' according to Brunner (2011) are characterised by the following aspects:

- They combine the collegiate traditions and self-government of universities with the claims of external stakeholders.
- They give priority to the public good while operating in a competitive environment, applying the postulates of new public management.
- They separate strategic management bodies from academic affairs.

Universities in the 21<sup>st</sup> century cannot be oblivious to the need to incorporate stakeholders into corporate government. The presence of society's representatives in university government strengthens interdependence and interactivity between universities and society (Pérez & Peiró, 1997); it entails multiple benefits for all the actors that interact in this form of university government; and it is vital to go beyond the figure of the Board of Trustees in Spanish universities, for example, with regard to the incorporation of stakeholders into university government and also, albeit gradually, into other spheres of university affairs.

Likewise, Rodríguez et al. (2007) state that participation in corporate government implies building interest networks and applying collaboration strategies, thus reinforcing stakeholders' joint supervision of others' actions, and they propose various mechanisms for pluralist government to identify different levels of interested parties' participation:

According to Kehm (2011), greater stakeholder participation in universities' decision-making presupposes an evolution from the concept of government to 'governance', which reflects a weakening of state-led and academic-led coordination models, as a result of which the model based on stakeholder needs is strengthened. Furthermore, Kehm states that the concept of governance implies the participation of social actors in decision-making, their inclusion in decision-making structures and, concurrently, greater coordination of decision-making procedures, which is why it is necessary to determine the degree of legitimacy that each stakeholder possesses to participate in university decision-making processes.

Table 2. Mechanisms for pluralist corporate government

<i>Level</i>	<i>Aim</i>	<i>Focus of the relationship</i>
Remaining passive	No aim or relationship exists.	The organisation does not relate to its stakeholders. Their concerns are voiced through protests, letters, the Internet, etc.
Monitoring	To find out stakeholders' opinions.	Monitoring the media and the Internet. Second-hand reports from other stakeholders (one-off interviews).
Informing	To inform or educate stakeholders.	Bulletins, letters, pamphlets, reports and websites. Speeches, talks and public presentations. Access to the facilities and routes. Press releases and press conferences, advertising.
Performing transactions	To work together in a contractual relationship in which one partner directs the objectives and provides the funds.	Alliances between the public and private sectors, private funding initiatives, subsidies, marketing with cause, lobbying.
Consulting	To obtain information and opinions from stakeholders on which to base internal decisions.	Surveys, focus groups, evaluation of work environments, individual and public meetings, work meetings, consultation forums, online forums, opinion surveys.
Participating	To work directly with stakeholders to ensure that their concerns are understood and taken into account in decision-making processes.	Multiple stakeholder forums, consultation panels, processes for reaching consensus, participatory decision-making processes.
Collaborating	To join or form a network of stakeholders to reach consensus and develop joint action plans.	Joint projects, voluntary initiatives involving two or more stakeholders.
Delegating	To delegate decisions on a specific topic to stakeholders.	Democratic stakeholder government (e.g., members, shareholders, members of special committees, etc.).

Source: Based on Rodríguez et al. (2007)

Lastly, it should be noted that certain obstacles arise from the university system itself, hindering stakeholder participation in university decision-making:

Table 3. Obstacles that hinder stakeholder participation in universities

<i>Internal sphere</i>	<i>External sphere</i>
Excessive rigidity of the organisational structure, organised in an extremely vertical, hierarchical manner, making participation by external actors unfeasible or not sufficiently operational.	The genuine interest that stakeholders show in actively participating in university decisions.
The high degree of specialisation existing in faculties fragments the organisational culture, which leads to power groups that are not interested in opening up participation spaces.	The stakeholders' negative perception of the importance and relevance of their participation, due to the fact that it is either a legal imposition on universities or a passing fad.
Regulations governing administrative procedures, especially those of public universities.	Excessive technical and procedural complexity impedes effective participation in decision-making.
Universities' inexperience when it comes to implementing more participatory decision-making processes.	The incapacity of stakeholders to see participation as an opportunity to solve their own problems.

Source: Adapted from Gaete (2009)

Thus, universities will operate more efficiently and successfully if they manage to adapt their government and governance structures and procedures to the claims of their environment (Brunner, 2011). Of particular importance here is the implementation of processes of greater stakeholder participation in university management and decision-making, as a strategy whereby universities adapt to the requirements of the current knowledge society.

## 4. Proposal for incorporating stakeholder participation in university government

This proposal seeks to place emphasis on identifying and analysing university stakeholders from the viewpoint of their characteristics or attributes, to facilitate their participation in the evaluation of decisions and the supervision of activities relating to university affairs, as an expression of pluralist university government.

### 4.1. Identification and classification of university stakeholders

Based on the approaches of Mitchell et al. (1997) and Burrows (1999), we propose the following matrix for analysing the characteristics or dimensions that each stakeholder possesses, as well as their location in relation to university affairs.

In terms of the way in which this matrix works, the first column should contain all the individuals, institutions or groups that each university considers to be its interested parties; these are the parties that it intends to identify and classify as stakeholders. In the example, the classification of interested parties is the one proposed by the European Commission (2008), marking their location as internal or external.

Next, in relation to the stakeholders' dimensions or main characteristics, three of the dimensions proposed by Burrows (1999) are used, without incorporating information on the degree of interest in and influence over the organisation into the matrix, due to the fact that these aspects are related to the power, legitimacy and urgency noted by Mitchell et al. (1997); this avoids a duplication of information on similar matters.

The dichotomous nature of the matrix in this sphere encourages universities to evaluate stakeholders according to each pair of proposed alternatives (location, role and stance), which may change according to the topic for which the analysis is being performed.

In the third part of the matrix, in order to characterise the stakeholders' interest in or influence over university affairs, the three stakeholder categories that can be configured in line with the approach of Mitchell et al. (1997) are collated according to the combination of criteria proposed by those authors (power, legitimacy and urgency).

Table 4. Stakeholder identification matrix

Stakeholders	Dimensions (according to Burrows)						Stakeholder categories (according to Mitchell et al.)									
	Location Int./Ext.	Participation Active/ Passive		Potential Cooperation/ Threat			Latent			Expectant			Definitive			
							Dormant	Discretionary	Demanding	Dominant	Dangerous	Dependent	Priority			
							1	2	3	4	5	6	7			
Regional government	X															
Employers	X															
National students' associations	X															
Trade unions	X															
Civil society	X															
Graduates	X															
Students' parents	X															
University government		X														
Employees		X														
Students		X														

Source: Own elaboration (2012)

## 4.2. Stakeholder participation in university government and management

In the quest to provide specific examples of this type of participation, worthy of note is the existence of various good practices on this matter in Spanish universities' social responsibility reports:<sup>2</sup>

From these reports, it was found that several Spanish universities are making efforts to balance out the distribution of university government posts according to gender, through their equal opportunities offices. In university management, some institutions acknowledge the application

2. An analysis of content of a comparative nature was performed on fifteen university social responsibility reports, of Spanish universities that provide online access to such documents.

of social responsibility criteria when contracting and selecting suppliers, or the fact that they have signed up to the principles of the Global Compact. They stress that both initiatives promote greater interaction with their stakeholders and expand participation spaces.

**Table 5.** Good practices of stakeholder participation in university government and management in Spain

<i>University</i>	<i>Good practices</i>	<i>Report period</i>
UNED – National University of Distance Education	• Institutional social responsibility committee formed by internal actors and representatives of social organisations.	2009/2010
UNIA – International University of Andalusia	• UNIA environmental steering group, formed by representatives of specialist external organisations and academics from other Spanish universities.	2008
University of Murcia	• Multi-stakeholder dialogue with an active listening system, via an online questionnaire to evaluate university actions.	2009/2010
University of Santiago de Compostela	• Existence of a trade union participation board.	2006/2007
University of A Coruña	• Implementation of an electronic voting system to elect university government representatives.	2010
University of Cadiz	• Participation of social and economic actors in: the development of new curricula; identification of society's educational needs; and competencies that graduates need to acquire.	2008/2009
University of Cantabria	• Consultation with stakeholders on their relationship with the university, using semi-structured interviews and focus groups.	2009/2011

Source: Own elaboration (2012)

Finally, a proposal for participatory evaluation techniques and categories is being developed so that stakeholders can participate in some of the main affairs of university government and management.

In the case of the matrix shown above, certain aspects of university management are identified where the participation of different kinds of stakeholders can be incorporated, in accordance with the topic being analysed.

In the last two columns of the matrix, various aspects relating to the interested parties' participation in universities are proposed. The levels of participation and the evaluation techniques are distinguished to act as a guide for the roles and ways in which each stakeholder can participate in university decision-making.

Table 6. Matrix for stakeholder participation in university management

<i>Sphere of participation</i>	<i>Participating stakeholders (examples)</i>	<i>Level of participation (Rodríguez et al., 2007)</i>	<i>Participatory evaluation technique<sup>3</sup></i>
Strategic plan development	Teaching staff	Collaboration	Consensus conferences
	Non-academic staff		
	Senior managers		
	Unions		
	Board of trustees		
	Students		
	Businesses		
Accreditation processes	Teaching staff	Consultation	Citizen panels
	Students		
	National accreditation agency		
	Employers		
	Graduates		
	Conference of rectors		
	Ministry of education		
Annual budget formulation	Board of directors	Participation	Participatory budgets
	Trade unions		
	Students		
	Regional government		
	City council		
Definition of institutional policies and procedures	Teaching staff	Participation	Quality circles or studies
	Non-academic staff		
	Students		
	Senior managers		
	Trade unions		
	Board of trustees		
	Suppliers		

Source: Adapted from Gaete (2009)

3. The classification of instruments and mechanisms to facilitate civil society's participation in decision-making is the one proposed by Gomà and Font (2001).

## 5. Conclusions

In recent decades, universities have been exposed to the impact of numerous social changes, and in particular to the phenomenon of mass access to higher education, thus eliminating the elitism that had been the dominant expression of university education for many centuries. A large and growing sector of post-modern society has the need and aspiration to become involved in university affairs, especially in relation to the training of university professionals.

Thus, one of the most important challenges that 21<sup>st</sup>-century universities face is the formation of permanent, reciprocal relationships with society, and in particular with individuals, groups and institutions that are affected by or interested in university affairs; that is, their stakeholders.

In that context, it seems logical and consistent that universities should develop government structures of a participatory nature, in which stakeholders can become actively involved in decision-making processes and in the supervision of university activities, especially of the results obtained by such higher education institutions.

Pluralist university government should not be associated with one specific or isolated practice; on the contrary, opening up participation spaces in university decision-making processes should be linked to their social responsibility, thus enabling them to meet the claims and needs that society currently demands of universities.

The possibilities for stakeholder participation in university government will undeniably be limited by the legal frameworks of each country, especially in the case of public universities. This is not, however, an excuse for university institutions not to apply—or to curtail the application of—the approaches formulated in this article, especially those relating to the strengthening of an organisational culture in which actors outside the university participate.

The proposals made and the analysis performed in this article clearly do not seek to impinge upon the principle of autonomy that university institutions possess in order to carry out their fundamental tasks: teaching and research. On the contrary, the possibilities of stakeholder participation described here aim to incorporate the contributions of interested parties into decision-making processes, and particularly so in the areas of university government and management.

Thus, universities are faced simultaneously with the opportunity and the challenge of implementing spaces, processes or instances of stakeholder participation in university government, transforming universities into a sphere into which society not only feels effectively integrated, but also involved as part of an institution that should have no other purpose than to respond to social concerns. This will counteract the endogamy that has generally existed in universities since their creation in the Middle Ages.

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## Dossier “Innovation and Good Practices in University Government and Management”

### ARTICLE

# A Hyperlink-based Model for the Management of Teaching Documents in a University Centre

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### Abstract

Documents containing teaching information (course guides, curricula, rules, etc.) constitute an essential resource in higher education, particularly for students. Their importance has been stressed over the last few years, on the one hand by the creation of the European Higher Education Area (EHEA), which has re-emphasised the need for sources of teaching information, and on the other by the widespread use of information and communication technologies (ICTs), which provide easy access to such sources. Consequently, the management of such documents is now one of the key procedures that university centres need to apply to the organisation of teaching. With this in mind, the main objective of this article is to present a new centre-level model for the management of

teaching documents, implemented via a new software package developed for that purpose: SGD2F2. This new model represents an attempt to overcome the drawbacks that many centres experience when using the current model to manage teaching documents. Although this proposal has been developed for a particular faculty, by making a few alterations it could be adapted for use by any university centre or body responsible for the management of teaching.

### Keywords

EHEA; higher education; teaching document; HTML; metadata; document management system; ICTs; Internet

## *Modelo de gestión de documentos docentes en un centro universitario, basado en hipervínculo*

### *Resumen*

*Los documentos con información docente (guías docentes, temarios, normas, etc.) constituyen un recurso imprescindible en la enseñanza superior, especialmente para el alumnado. Su relevancia se ha acentuado en estos últimos años, por un lado, con la puesta en marcha del espacio europeo de educación superior (EEES), que ha relanzado la necesidad de fuentes de información docente, y, por otro, con la difusión del uso de las tecnologías de la información y la comunicación (TIC), que ha facilitado el acceso a dichas fuentes. Por este motivo, la gestión de tales documentos constituye en la actualidad uno de los procedimientos clave en la organización de la docencia de centros universitarios. El objetivo de este artículo es presentar un nuevo modelo de gestión de documentos docentes en relación con el centro implementado a través del desarrollo de un software: SGD2F2. Este modelo trata de solventar los inconvenientes evidenciados en el modelo de gestión de documentos docentes habitualmente utilizado en los centros. Aunque esta propuesta ha sido desarrollada en el ámbito de una facultad en concreto, podría ser aplicada, con algunas modificaciones, a cualquier centro u órgano universitario de gestión de docencia.*

### *Palabras clave*

*EEES, educación superior, documento docente, HTML, metadatos, sistema de gestión documental, TIC, web*

## 1. Introduction

Today, documents containing teaching information (course guides, curricula, etc.) are one of the cornerstones of the organisation of teaching for any university degree course. Therefore, ensuring that university centres manage such documents properly is a challenge in a context marked by two particularly significant factors: the implementation of the European Higher Education Area (EHEA) and the widespread use of information and communication technologies (ICTs).

### Implementation of the EHEA

In the new EHEA paradigm, course guides play a leading role. They are a source of information about each subject, encompassing everything from general aspects to detailed activity planning; in other

words, they contain a teaching-learning plan (Pérez Martell et al., 1999). Course guides contribute to the materialisation of the principle of transparency (Marcellán Español, 2005) and, furthermore, they are a help tool for students, the aim of which is to support the 'learning-to-learn' premise. These documents express the lecturers' and students' commitment to the work required by a particular subject ("Guía docente: el esqueleto de una asignatura"), in the sense that such documents contain all the activities that need to be carried out. Moreover, they are publicly available, even during the enrolment period ("Estatuto del Estudiante Universitario", 2010).

Quality assurance is a key concept of the new degrees within the EHEA framework in Spain, which is incorporated by means of quality assurance systems (QASs). In order to assist with the design of QASs, the AUDIT Programme sets out a series of guidelines that enable priority actions aimed at improving the quality of higher education to be identified. In this respect, the problem discussed in this article —optimising the management of teaching documents— falls under guidelines 1.4 and 1.6 of the "AUDIT Programme: Guidelines, definition and documentation for internal quality assurance systems in higher education". Respectively, Guideline 1.4 and 1.6 stipulate that a centre must be provided with mechanisms "so it can design, manage and improve its services and physical resources in order for student learning to develop appropriately" and "to ensure that updated information on degrees and programmes is published periodically". In short, the model presented here is associated with the notion of the quality of teaching on new degree courses.

The implementation of the EHEA implies a process of phasing out the types of degree offered previously (Royal Decree 861/2010). At the University of Granada (UGR), this is a gradual process: each year, lectures for such degree courses stop being taught, although students have the right to sit an exam for two years following that academic year. For students on such degree courses, curricula, practical class criteria and assessment criteria constitute a valuable set of reference documents, especially for those subjects for which lectures are no longer given, because they guarantee the right to be examined under the best circumstances. In short, the teaching context is changing, and it requires that teaching documents should faithfully meet their objectives.

### Widespread use of ICTs

The other decisive factor is the growing use of ICTs. This emerging factor has turned the Internet into the primary medium for providing students with documents (Collis & Moonen, 2006). In fact, the advantages that such technologies offer (no constraints with regard to time or distance, low costs, greater dissemination, usability, etc.) have led their use in higher education to be encouraged, as evidenced by the UGR's strategic plans ("Plan Estratégico 2006-2010 de la UGR") or the programme agreements (Barón & Roca, 2006; ODAP 2009, 2010 and 2011, for UGR centres) within the Spanish university context ("Modelo de Financiación 2007-2011 de las Universidades Públicas de Andalucía"). However, ICTs can play a role over and above that of serving as a medium for the dissemination of teaching documents. As explained later, there are some technical aspects of ICTs that can be used for the management of teaching documents.

## 2. Management of teaching documents in university centres

The usual (straightforward or naïve) model for the management of teaching documents in university centres can be analysed from the students' or lecturers' perspective; that is to say, from the viewpoint of the main audience that such documents —and their authors— target.

A student, for example, might ask this simple question: How do I get hold of a teaching document? Using ICTs, there are now several answers to that question because they may, for example, be available on institutional websites (university, centre or department), a learning management system (Moodle, SWAD, etc.), a lecturer's website, a lecturer's subject blog, a social networking site (Facebook, Tuenti, etc.) and so on. So there are myriad alternatives for obtaining such documents from the Internet. However, if the question is about which of the (very likely) high number of files available for download from the Internet is the most up to date version, then the answer is not as straightforward, particularly for a student.

In order to analyse the usual model for the management of teaching documents in centres, course guides for new degrees are a good example to take. After the teaching staff has produced them, they are usually submitted independently by their respective authors to a number of bodies or websites. Copies (files) of such documents are hosted on website servers by their respective webmasters, which may occasionally lead to maintenance operations on such destination websites. For example, at a faculty's or department's request, whether at the start of the academic year or during the elaboration of programme agreements, it is usual for lecturers to submit course guides independently to such bodies. For the centre, this management model is simple because it emulates the way in which such documents are published in paper form, even though their format is now electronic.

In theory, when a course guide is updated or amended, this model requires that every copy available on the Internet should be instantly replaced. This involves initiating the process of submitting copies to bodies that make such documents available on the Internet (centre, department, etc.) and pursuing website maintenance tasks on various sites, all of which ought to take place immediately. However, the reality of the matter is that files may not have been submitted to one or other of the bodies that make such documents available, basically because it is hard to remember the whole list of bodies or website servers that maintain copies of them. Likewise, even when files are submitted, there is a risk that, in the case of a centre, the total submission-receipt-website maintenance time will be too long, which may mean that there is too much of a delay with regard to updating teaching documents on a centre's website.

From the above, it is possible to deduce that the traditional management model involves both a laborious task for the teaching staff and a significant chance of there being a mismatch between the various versions of course guides available on the Internet. In fact, it is quite likely that some of the course guides submitted and made available on a centre's website at the start of an academic year will not have been updated midway through the year, probably due to an oversight by a lecturer after amending one of them. In addition, lecturers authoring the course guides often submit copies to the websites that they use the most, which are not necessarily the same as those used by students.

These oversights are likely, especially given the number of course guides that the teaching staff may actually have to manage, and the number of bodies to which they have to submit them. These shortcomings, illustrated for the case of course guides, can be extrapolated to all other teaching documents.

Consequently, it is possible to conclude that the usual model for the management of teaching documents is both lacking in reliability (for students) and laborious (for lecturers). Thus, such documents do not actually fulfil the function that is required of them within the EHEA framework. Indeed, they become a source of regrettable confusion for students. It is precisely with the intention of overcoming such mismatches that the authors are proposing an alternative model, which is now being used successfully in the UGR's Faculty of Pharmacy.

The need to seek out and find a new model was determined by the implementation of new degree courses and the phasing-out of the types of degree offered previously. This new and changing context will last for several years in the UGR's Faculty of Pharmacy. So, for every upcoming academic year, a new degree course year will be taught and an old-style approved degree course year will be phased out. In short, in a context of high volatility across all subjects that the Faculty has to organise and manage over this adaptation period, the number of documents is twice what it used to be.

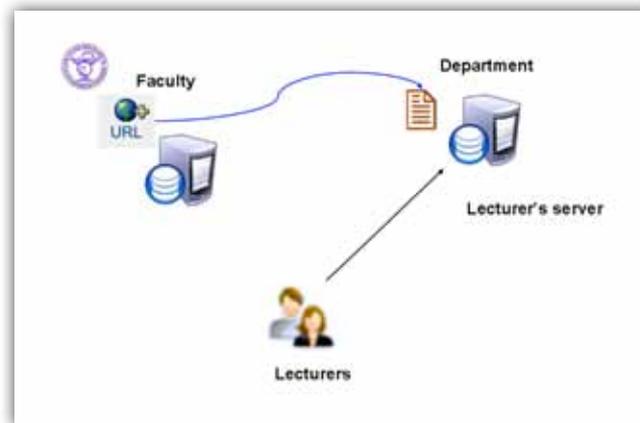
Appendix 1 contains a SWOT (strengths-weaknesses-opportunities-threats) analysis of the usual model for the management of teaching documents in the context prior to the 2010/2011 academic year in the UGR's Faculty of Pharmacy (Casanueva et al., 2000). Both the number and severity of the weaknesses and threats led the authors to seek out and find an alternative model with the following priority objectives:

- i. To increase the reliability of teaching documents available on the Faculty's website. Specifically, to ensure that such documents are the most up-to-date versions.
- ii. To simplify both the Faculty's receipt of such documents and the updating of web pages on which they are made available.

### 3. Proposed model for the management of teaching documents

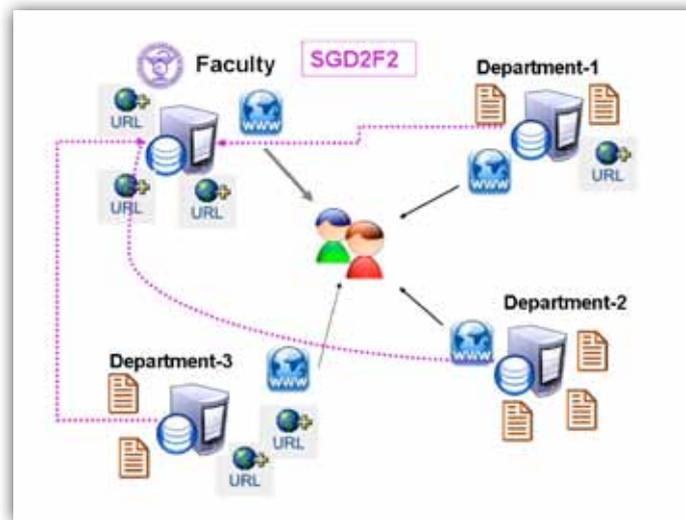
The management of teaching documents in a centre should be conceived as a flexible, dynamic and efficient process. It has to be flexible and dynamic because the context of application may change over time, in the short and medium terms, either as a consequence of implementing/phasing out degree courses, the introduction/elimination of subjects or documents, or even the need to supply new types of document. For its part, efficiency is imposed as a requirement, the aim of which is to minimise the delay with regard to updating documents on the Internet. These are the principles that guided the development of the new document management model that the authors propose, which is implemented via the software package called SGD2F2 (Sistema de Gestión de Documentos Docentes de la Facultad de Farmacia).

Given the problems encountered with the usual model for the management of teaching documents (Section 2), the Academic Planning Committee of the UGR's Faculty of Pharmacy considered the need to seek out and find a solution. As a first step, it was agreed that only uniform resource locators (URLs) or hyperlinks to teaching documents for subjects included in the UGR's Faculty of Pharmacy's degree courses would be stored on the centre's website server. Only the respective hyperlink for each document —a copy of which (a file) would therefore only be found on the department's website server, on a lecturer's website server or, in general on the website chosen by the document's author— should be submitted to the centre. Owing to the fact that it is compulsory to provide teaching documents on the department's web page (ODAP 2009, 2010 and 2011, for UGR departments) and given the proximity of that body to the lecturers, the decision taken was feasible in practice. Figure 1 shows a diagram of that decision and its context.



**Figure 1.** Diagram of the decision on which the new document management model is based. Only the hyperlinks for teaching documents are stored; their associated files can be found on the websites chosen by their authors (lecturer's server, department's server, etc.).

On the basis of that restrictive decision, it was possible on the one hand to increase the reliability of the documents made available on the UGR's Faculty of Pharmacy's website because it linked to the most up-to-date versions (chosen by the author), and on the other to simplify the Faculty teaching staff's work because the submission of files (when produced or amended) to the Faculty was not necessary, with the resultant savings in website maintenance. In essence, the idea behind the decision was to take advantage of HTML hyperlink facilities, thus defining a new management model. Figure 2 shows a diagram of how it functions: access to a document via the Faculty's website directs to a copy of it (file) specified by the author (lecturer) available somewhere on the Internet.



**Figure 2.** Diagram of how the new model for the management of teaching documents functions. Access to a teaching document via the UGR's Faculty of Pharmacy's website directs to the file specified by the lecturer on the Internet.

Unfortunately, the proposed model gave rise to a serious problem in practice: How would it be possible to obtain a hyperlink efficiently and reliably for each and every one of the teaching documents for the subjects of the various degree courses taught in the UGR's Faculty of Pharmacy? Bearing in mind that the string of characters forming a URL has to be one-hundred percent accurate, this question posed a technical problem in terms of collecting the necessary data (hyperlinks). In order to solve this problem, the development of a new software package (SGD2F2) was initiated. This software package implements the procedures associated with the new model, among which there is a module dedicated to data collection.

Generally speaking, the management of teaching documents in a centre can be divided into two stages. In the first stage, documents are received and then classified by a university centre. In the second stage, such documents are made available on the centre's website; this involves uploading the documents to the Internet and possibly editing web pages on the centre's website. Taking the proposed model into account, the development of the SGD2F2 software package initially focused on automating the following procedures:

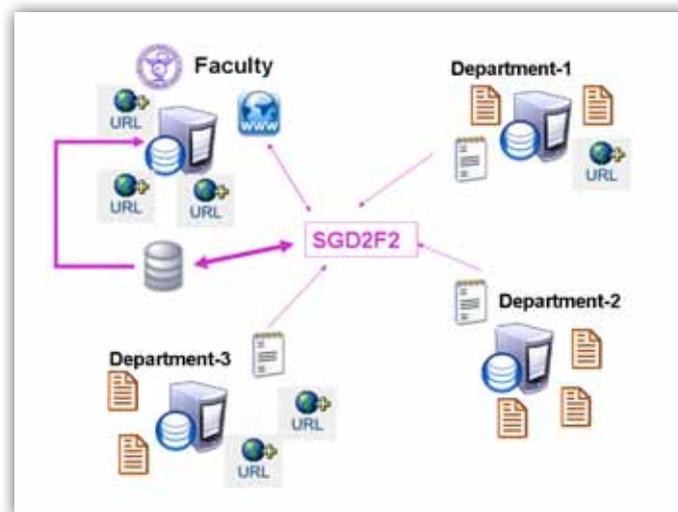
1. Collecting information about the teaching documents produced for the subjects taught at the centre
2. Classifying such documents
3. Editing the centre's web pages on which such documents are made available

For the first two procedures, a metadata structure to codify the necessary information for each document and the aforementioned data compilation module were designed. For the third procedure, an SGD2F2 software-package module was produced to generate the web pages, given that the task of uploading the documents to the Internet had been outsourced as a result of the decision taken.

### 3.1. Description of the SGD2F2 software package

The SGD2F2 software package was programmed in PHP (a general-purpose server-side scripting language) using functionalities for connection to MySQL databases. The functioning of some of the modules into which the software package was structured is presented below. The purpose of such modules was to automate processes originating from the management model introduced. In fact, without such automation, the applicability of this model would probably have been rendered uncompetitive due to the shortcomings it would otherwise have had.

The data (metadata) required by the SGD2F2 software package are channelled through the departments. To a text (ASCII) file called an SGD2F2 file and by following a specific syntax, each department saves information about the teaching documents for the subjects taught in the UGR's Faculty of Pharmacy. The syntax design focused on basic aspects of the documents (location), without considering other details (HTML styles, etc.). In essence, an SGD2F2 file is nothing more than a sketch of the web page containing the department's teaching documents. In fact, changes to the web page or, more generally, to websites containing such documents do not affect the SGD2F2 file, as long as the internal structure of teaching document directories is maintained. In addition, given that it is text based, an SGD2F2 file can be created using any word processor on any platform. Figure 3 summarises the SGD2F2 approach to data collection.

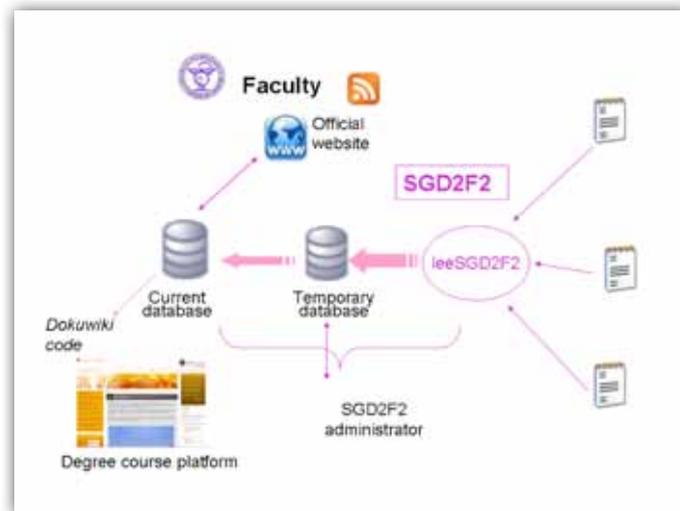


**Figure 3.** Diagram of SGD2F2 data processing and its interaction with web pages on which teaching documents are made available on the Faculty's website.

Each SGD2F2 file defines a set of metadata, where each element references one document. In turn, every field of a metadata item is located in a row in the file, following an order that identifies it. Each metadata item (document) includes details of the document and information about the subject to which it refers. The syntax rules for SGD2F2 files can be found at <http://farmacia.ugr.es/guiasdocentes/docu/IndicacionesFicheroTXT.htm>. In order to simplify the creation of SGD2F2 files, a program called `leesgd2f2.exe` was developed. This program automatically checks the syntax for errors.

After processing all the departments' files, the SGD2F2 software package stores their content on

an initial MySQL database, which can be described as temporary. Once the temporary database has been satisfactorily checked, and on request by the SGD2F2 administrator, it immediately becomes final. The final database is the one that interacts with the SGD2F2 module that is responsible for generating web pages containing teaching documents on the UGR's Faculty of Pharmacy's website. By using the two MySQL databases, the process of proofing/reviewing the information supplied to the SGD2F2 software package does not negatively interfere with the functioning of the centre's website. Figure 4 shows a diagram of the general functioning of the SGD2F2 software package.



**Figure 4.** Diagram of the internal functioning of the SGD2F2 software package, as well as the additional functionalities available for the current academic year (information export in DokuWiki code and RSS feed).

Besides the functionalities described earlier, the SGD2F2 software package has three additional ones that are briefly described below.

#### *RSS feed*

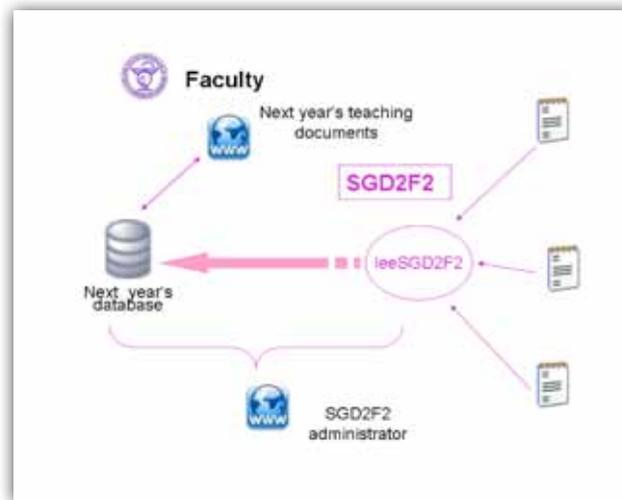
The SGD2F2 software package has an RSS feed (see Figure 4), via which news about teaching documents that students might be interested in is disseminated.

#### *DokuWiki code*

The SGD2F2 software package has a module that allows the content of web pages containing teaching documents to be exported to DokuWiki code. This functionality (see Figure 4) simplifies the maintenance of information about the UGR's Faculty of Pharmacy's degree courses (including information about their teaching documents) that is available on the UGR's degree course platform (<http://grados.ugr.es/>). This platform requires DokuWiki code. Thus, the work is cut down to copying and pasting text using that platform's code editor.

#### *Teaching documents for the next academic year*

Article 23 in Chapter 6 of the "Estatuto del Estudiante Universitario" (2010) stipulates that subject teaching information must be available in the enrolment period.



**Figure 5.** Diagram of the internal functioning of the SGD2F2 software package for the management of the next academic year's teaching documents.

This rule has led to the development of an SGD2F2 module that, using existing basic functionalities, allows teaching documents for the next academic year to be managed independently from those already in force. Figure 5 shows its internal functioning, which follows the steps described earlier, albeit with slight differences because it was designed as a simplified version of the SGD2F2 module described earlier for the current academic year.

To conclude this description, the authors performed a joint SWOT analysis (Casanueva et al., 2000; Guerras Martín & Navas López, 2007) of the proposed management model and the SGD2F2 software package, while also incorporating the findings of its application in the UGR's Faculty of Pharmacy. This analysis, which is collated in Appendix 2, shows that the behaviour of the system developed is good and that it is a potential solution to overcome the weaknesses and threats posed by the usual management model (Appendix 1).

The proposed model requires the collaboration of departments, and more precisely of one of their members, who should be responsible for the SGD2F2 file. So, to counteract the threat that a lack of collaboration would pose, the Faculty has implemented the following measures:

- Public information about the SGD2F2 software package is provided. This information is aimed at departments and particularly at those responsible for creating their respective departments' SGD2F2 files (<http://farmacia.ugr.es/guiasdocentes/info/>).
- Collaborating departments are acknowledged. News of their participation is published on a website. This was the case for 2010/11 academic year ([http://farmacia.ugr.es/guiasdocentes/info/ListaDptoyResp2010\\_11.htm](http://farmacia.ugr.es/guiasdocentes/info/ListaDptoyResp2010_11.htm)).
- The work done by those responsible for creating SGD2F2 files is acknowledged..

## 4. Conclusions

The model for the management of teaching documents implemented via the SGD2F2 software package is an improvement on the model usually used in centres because it solves the problems that the latter model poses (analysed in Section 2) and it offers a series of additional functionalities (described in Section 3). Likewise, its application allows management synergies to be created between the centre and the departments involved in teaching. In essence, this system provides the departments with a flexible mechanism for the dissemination of documents aimed at students via the centre's website. Bearing in mind that the departments are jointly responsible for the development of teaching, this service makes the centre's website a very valuable asset.

The SGD2F2 software package has been in use in the UGR's Faculty of Pharmacy since the start of the 2010/11 academic year. One year after its implementation, 80% of the departments had collaborated in the initiative, including every department responsible for more than one subject in the UGR's Faculty of Pharmacy ([http://farmacia.ugr.es/guiasdocentes/info/ListaDptoyResp2010\\_11.htm](http://farmacia.ugr.es/guiasdocentes/info/ListaDptoyResp2010_11.htm)). These data are evidence of the following:

1. The majority of departments collaborated with the UGR's Faculty of Pharmacy via the SGD2F2 software package in its first year of implementation.
2. The departments that did not provide the SGD2F2 in the 2010/11 academic year did not actually submit any information about teaching documents to the UGR's Faculty of Pharmacy. In some cases, the SGD2F2 files of certain departments were produced by the Dean's Office of the UGR's Faculty of Pharmacy. This happened when a minimum of information had been submitted and none of those departments' members had produced them. Oddly, a common denominator for both types of department was that they participated in the UGR's Faculty of Pharmacy by teaching just one subject.
3. The moderate difficulty of the SGD2F2 file syntax is outweighed by the following advantages, particularly when a department is responsible for more than one subject:
  - Flexibility in terms of submitting a broad range of document types to the Faculty (see document types in the definition of the SGD2F2 file syntax), which vary from one subject to another.
  - Ease of jointly managing all teaching documents in a single text file, which, in essence, can be considered a sketch of the web page on which the department's teaching documents are made available. In fact, in the majority of cases, the person responsible for collating the course guides for the department's website was the person responsible for creating the SGD2F2 file.

The model presented in this article falls within the framework of what Collis and Moonen (2006) refer to as "the logistics of participating in education". It is a solution to the problems related to teaching documents identified in the UGR's Faculty of Pharmacy, and is implemented via a strategy

that has taken account of the educational context and its expectations (Duart & Lupiáñez, 2005). The changes that have been implemented in the UGR's Faculty of Pharmacy represent an attempt to make improvements by following a planned process, and not simply by incorporating new features or one-off fads for a limited period of time (Salinas, 2004). The process's development in general and its implementation in particular are the result of teamwork (Duart & Lupiáñez, 2005), in which the UGR's Faculty of Pharmacy has been fully involved (Salinas, 2004). In essence, the proposed system has allowed the UGR's Faculty of Pharmacy to make the management of teaching documents more flexible by integrating ICTs, an initiative that responds to the UGR's Faculty of Pharmacy's commitment to improving the quality of teaching (Salinas, 2004).

Finally, although the proposed model has been developed as a solution for a particular faculty, it is not limited to it. In fact, by making a few alterations, the SGD2F2 software package could be adapted for use by any university centre or body responsible for the management of university teaching.

## Appendices

### **A.1. SWOT analysis of the usual model for the management of teaching documents in centres (used in the University of Granada's Faculty of Pharmacy in the 2009-10 academic year)**

#### *Internal analysis*

##### Strengths:

- It does not require any special software infrastructure because it can be applied directly by making use of the administration tools available on the University of Granada's (UGR's) Faculty of Pharmacy's website.
- It does not require any type of information for the teaching staff or departments. It is very intuitive (similar to classic paper-based publishing).

##### Weaknesses:

- It requires every document, including every updated or corrected version of it, to be submitted to the Faculty.
- There is a high likelihood that documents made available on the UGR's Faculty of Pharmacy's website will not be the most up-to-date versions of them.
- Continuous file storage on the Faculty's server, with the ensuing consumption of physical resources.
- Constant updating of the Faculty's web pages on which documents are made available.
- After their receipt by the Faculty, documents are classified manually by the administrator.
- There is a considerable delay with regard to updating teaching documents on the UGR's Faculty of Pharmacy's website due to the total submission-receipt-website maintenance time required.

### *External analysis*

#### Opportunities:

- It does not require any coordination with departments.

#### Threats:

- There is a high risk of generating misinformation among students due to obsolete versions of documents on the centre's website.
- It is laborious for teaching staff, particularly for authors of the various documents.
- Responsibility is assumed by the UGR's Faculty of Pharmacy, since it provides documents (that have not been updated) containing incorrect information.
- Implementing new degree courses and phasing out the types of degree offered previously (introduction and elimination of course years). High volatility across all subjects.
- The changing organisation of teaching over a period of seven years will lead to constant amendments of the Faculty's teaching web pages.
- In the preparatory months leading up to the next academic year, the Faculty must also manage its new course guides.
- A significant increase in the number of documents that the centre needs to manage.

## **A.2. SWOT analysis of the hyperlink-based model using the SGD2F2 software package**

### *Internal analysis*

#### Strengths:

- Support provided by the UGR's Faculty of Pharmacy.
- There is a high likelihood that files linked from the Faculty's website will be the most up-to-date versions.
- Simplifying the task for lecturers because they do not need to submit files to the Faculty.
- It does not give rise to a long-term increase in financial or human resources for the Faculty because the automation of the process will compensate for the initial investment.
- Simplifying the management of teaching documents in the Faculty, since the process is automated and also shared with departments.
- Freeing up part of the memory of the server used to store teaching document files.
- SGD2F2 files are text based, so they can be created using any word processor on any platform. They are also very small.
- The Faculty's web pages containing teaching documents are automatically generated by the SGD2F2 software package. The web pages do not require any maintenance when there is a change to an existing document, when a new document needs to be added, or when new degree courses are implemented and the types of degree offered previously are phased out.

- There is a minimal delay with regard to updating teaching documents on the centre's website because the submission-receipt-website maintenance process is automated.
- An SGD2F2 file syncretically contains elements of a department's web pages on which teaching documents are made available, but it does not determine what they look like because it does not include style specifications. The syntax of such files is robust with regard to the style of a department's website.
- Maintenance of the SGD2F2 file from one academic year to the next requires minimal changes.
- A syntax-check program is available: leesgd2f2.exe.
- The SGD2F2 software package provides departments with a channel for disseminating a broad range of teaching documents.
- An RSS feed is available to disseminate information about the management of teaching documents.

#### Weaknesses:

- Requires a minimum of collaboration of departments, and more precisely of one of their members, to create the SGD2F2 file.
- The complexity of the syntax rules for SGD2F2 files.

#### *External analysis*

#### Opportunities:

- Implementing new degree courses and phasing out the types of degree offered previously, on an annual basis. High volatility across all subjects.
- In the preparatory months leading up to the next academic year, new course guides must also be managed ("Estatuto del Estudiante Universitario", 2010).
- A significant increase in the number of documents that the Faculty needs to manage.
- Public administrations and universities encourage the dissemination of teaching documents on departments' and centres' websites.
- Departments must disseminate teaching documents on their respective web pages (programme agreements).
- Each department usually has a person in charge of producing and coordinating the web pages of the programme agreement or of its teaching documents, for whom the creation of the SGD2F2 file would not be complicated.

#### Threats:

- Departments responsible for one or two subjects may not have the necessary motivation to create the SGD2F2 file.
- Lack of collaboration by some departments.

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## Dossier “Innovation and Good Practices in University Government and Management”

### ARTICLE

# Opportunities for Managing Human Capital in University Spin-offs. A Dynamic Analysis

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### Abstract

Creating university spin-offs (USOs) should be one of the cornerstones of a country's business development. Yet a number of studies have identified two factors that limit their growth: access to funding difficulties and a lack of management skills among entrepreneurial teams. In order to identify potential solutions for the latter of those factors, an analysis was performed to determine how the implementation of certain human resources policies affects the creation and retention of

human capital in USOs. If successfully implemented, such policies can contribute to a more efficient management of the market value of such organisations. So, after diagnosing what the human capital component of Spanish USOs is considered to be, a causal analysis was performed. The approach taken to the analysis was that acquiring and retaining human capital is a strategic problem for such organisations. The outcome of the analysis is a series of policy proposals that, taking account of the differential characteristics of USOs, aim to foster the recruitment, development and retention of human capital as the basis of such organisations' business competitiveness.

### Keywords

human capital; spin-off; human resources management; entrepreneurship; strategic management

## *Oportunidades de la gestión del capital humano en las spin-offs universitarias. Un análisis dinámico*

### *Resumen*

*La creación de spin-offs universitarias debería constituir uno de los pilares sobre los que sustentar el desarrollo del tejido empresarial de un país. Sin embargo, de los análisis realizados se desprenden dos factores que limitan su crecimiento: las dificultades de acceso a fuentes de financiación y la falta de habilidades de gestión del equipo emprendedor. Para poder contribuir a solucionar la segunda de las dificultades detectadas, se ha realizado un análisis destinado a explicar cómo la implantación de determinadas políticas de recursos humanos puede afectar a la creación y mantenimiento del capital humano en las spin-offs universitarias, y con ello contribuir a una gestión más eficiente de su valor en el mercado. A partir del diagnóstico de cuál es la consideración del capital humano en las spin-offs españolas, se ha desarrollado un análisis causal que plantea la adquisición y mantenimiento del capital humano como un dilema estratégico para este tipo de organizaciones. Del análisis realizado se han derivado una serie de políticas propuestas que, teniendo en cuenta las características diferenciales de las spin-offs universitarias, están encaminadas a favorecer la captación, el desarrollo y retención de su capital humano como base de su competitividad empresarial*

### *Palabras clave*

*capital humano, spin-off, recursos humanos, emprendimiento, dirección estratégica*

## 1. Introduction

The creation of new businesses generally has a number of positive effects such as job generation, economic and social development and innovation, among others. Likewise, businesses created within a university environment, which are known as 'university or academic spin-offs', have several advantages over other, more traditional technology transfer mechanisms such as patents. Businesses of this type are usually located close to where they are created, thus fostering local economic development (Zucker et al., 1998); they generate revenue that benefits both the founders and the host universities (Bray & Lee, 2000); they drive changes in institutions (Brooks & Randazzese, 1998); and they increase the level of interaction between universities and their social environments (Dorfman, 1983). In addition, spin-offs provide alternative job opportunities for staff working in public research

centres, who often find it impossible to further their scientific careers in such organisations, or even to find a job in the first place (Hernández et al., 2003).

Most university spin-offs (USOs) take the form of small technology consultancies. Attracting and retaining human capital, which is represented by the stock of senior professionals in them, constitutes the cornerstone of their competitive edge (Calvo, 2011). However, managing such human capital is complex and requires skills that entrepreneurs do not usually have.

This article therefore intends to answer the question that managers of USOs so often ask: What differential policies for human resources should be taken into account in organisations of this type in order to attract and retain the value of their human capital? Two assumptions serve as the starting point: a) a USO's competitive edge stems from the recruitment, development and retention of its human capital, and b) a USO's human capital management is not comparable to that of other businesses. Two differential factors of USOs that should be taken into account are their small size and their proximity to universities.

This article is divided into four sections: the first is this introduction; the second is an initial diagnosis that allows the current situation of USOs' human capital to be determined; based on that diagnosis and a prior causal analysis, the third is a series of policy proposals regarding the recruitment, development and retention of human capital in organisations of this type, all of which are aimed at fostering their market competitiveness; the fourth and final section provides the main conclusions drawn from the study.

## 2. Initial diagnosis of Spanish USOs' human capital

While there is no commonly accepted way of defining the concept of human capital, most definitions point to a set of distinctive basic competencies of an intangible nature (Bueno Campos, 1998) that are capable of providing a durable competitive edge (Cañibano et al., 1999).

If human capital is considered to be the stock of individual knowledge that experienced employees of an organisation possess (Bontis et al., 2000), then it is possible to assert that businesses created within a university context have a significant human capital component (Correa, 2009). In Spain, USOs are mainly created on the basis of tacit, uncodified knowledge; it is the entrepreneurs' personal know-how that underpins the potential development of such businesses (Rodeiro et al., 2008).

As a framework of reference for the analysis, some data relating to general aspects of Spanish USOs will be shown, as will others relating to their human capital. For that purpose, the studies by Rodeiro et al. (2008) and Ortín et al. (2007) were taken as the reference. Respectively, those studies analysed a total of 72 and 70 USOs created in Spain (Table 1).

Table 1. General characteristics of USOs and their human capital

<i>General characteristics of USOs</i>			
		Ortín et al. (2007)	Rodeiro et al. (2008)
Mean number of employees		8.34	8.01
Sales/Mean turnover volume (Euros)		16,737,022	291,972
Mean balance figure		832,967	378,779
<i>Characteristics of technology inventors</i>			
Mean number of people that develop technology		Not available	4.5
Source knowledge area	Technical teaching	Not available	50%
	Experimental sciences	Not available	25%
	Health sciences	Not available	9.2%
Percentage of inventors who are also business founders		Not available	80%
Role of the inventor in the business	Advisor/consultant	7%	33%
	Director	43%	32%
	Managing director	Not available	17%
<i>Characteristics of business founders</i>			
Mean number of people that set up a business		2.66	3.6
Mean age (years)		39.2	33.8
Percentage of doctors		20%	20%
Percentage of businesses having a founder with prior business experience in the USO sector		57.7%	59.7%
Percentage of businesses having a founder with prior experience of setting up businesses		26%	32%
Main reason for setting up a business		Identifying a business opportunity	Identifying a business opportunity
Main barrier to growth		Access to financial resources	Access to financial resources

Source: own elaboration based on Ortín et al. (2007) and Rodeiro et al. (2008)

One of the conclusions that can be drawn from the above data is that the majority of the creators of technology exploited by USOs actually plays an active role in them. The study by Rodeiro et al. (2008) shows that 50% of the people that develop a technology eventually become directors of their respective businesses, whereas 33% become consultants. The study by Ortín et al. (2007) shows that 43% of the founders eventually become directors, whereas 7% become consultants. This means that the characteristics of the 'inventors' have a major impact on a business and its management.

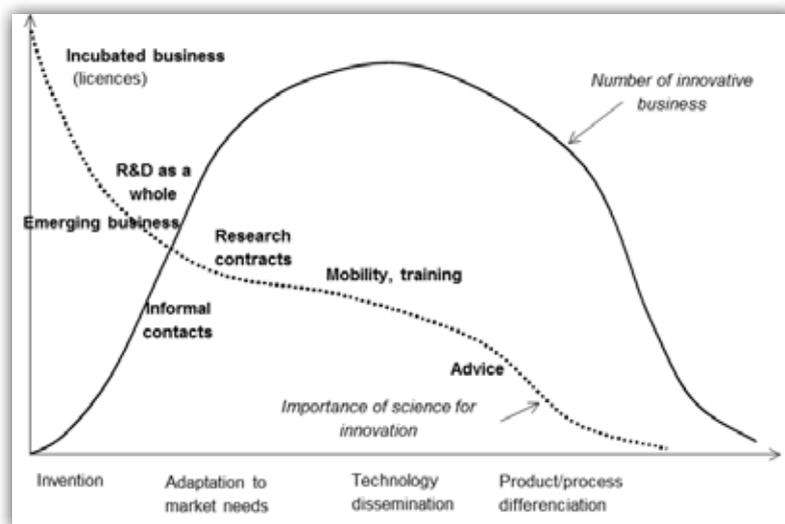
The mean age of USO founders is below 40 (the mean age of entrepreneurs in Spain is 41, GEM, 2010), and 'Identifying a business opportunity' is the main reason for creating them. It is also possible to see that the entrepreneur group is highly qualified; indeed, 20% are doctors.

As the main factors limiting the growth of USOs, the literature points to a shortage of financial resources (Tobar, 2004; Sbragia & Ozório, 2004; Díaz, 2004) and the entrepreneurs' lack of management skills (Bruderl et al., 1992; Lee & Tsang, 2001; Rodeiro & Calvo, 2011).

The latter of those factors, the lack of management skills, is connected with businesses' intellectual capital creation (Madrigal Torres, 2009); entrepreneurs of such businesses also highlight it as one of the main problems that they encounter (Rodeiro et al., 2008). The people that create USOs usually have a high level of technical skills, but they do not have the required training in the field of management (Ortín et al., 2007).

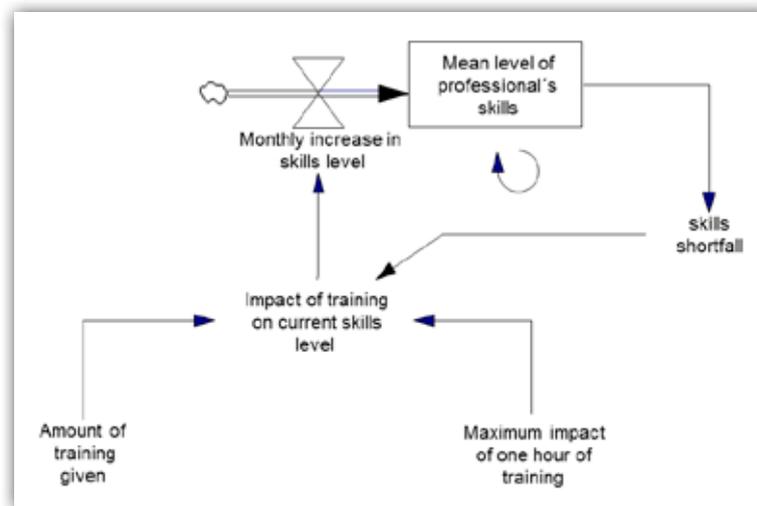
This lack of university entrepreneurs' management skills may have direct consequences, such as poor work team coordination, the inability to meet deadlines according to the business plan, minimal market orientation of technologies and products created, small networks of contacts and inadequate business management. Consequently, many USOs may not achieve any considerable growth (Harrison & Leitch, 2005; Lockett et al., 2005). The failure of such businesses is often due to management team problems, basically because managing a business is very different from managing a research laboratory (Timmons, 1994). In order to improve business management, both know-how and know-who are vital (Mustar, 1997). Problems such as these, which USOs have to grapple with, may go some way to explaining why their growth has slowed down (Chiesa & Piccaluga, 2000; Cardozo & Engleman, 2004; Harrison & Leitch, 2005).

Moreover, the institutional framework does not appear to be adequate in terms of ensuring a smooth university-business relationship that is capable of generating USOs, or indeed of achieving the virtual organisation flexibility that has become the norm in business relationships (Ritter & Gemüden, 2003; Hakansson, 1982). The financial results of patent commercialisation, commissioned research or collaboration agreements between research groups or institutes and business organisation do not manage to achieve what is expected from a process of networked business value generation (Pérez-Astray & Calvo, 2011). Seen from an innovation lifecycle approach (Figure 1), such a poor impact (Pekerman & Walsh, 2007) may be explained by the type of know-how that science usually offers, and by the demand for such know-how in a business's innovation cycle.



This situation suggests that human capital management in USOs is of paramount importance. Rather than by their investment in assets, the value of USOs is mainly determined by the perceived value of their professionals' know-how and experience. In this respect, the role of training (formal and informal) in the value creation processes of USOs is fundamental. From a dynamic viewpoint, it is worth bearing in mind the approach put forward by Warren (2000), who asserts that, while training programmes increase the development of skills, oversight and a lack of continuous reinforcement are mechanisms that lower the level already achieved (Figure 2). This feedback loop allows a dynamic balance to be maintained with regard to the skills levels of professionals in businesses that invest in continuing development, a key aspect of the USO value chain.

Figure 2. Limits on growth of professional skills.



Source: adapted from Warren (2000)

The analysis performed makes it possible to assert that human capital constitutes the cornerstone of USOs when it comes to generating their competitive edge. Consequently, its absence is one of their main barriers to growth. So, in the authors' opinion, it is necessary to identify management practices that allow such organisations' strategies to focus on creating and retaining their human capital.

### 3. Selection of best practices and their relationship to human capital generation

#### 3.1. Causal and sensitivity analysis

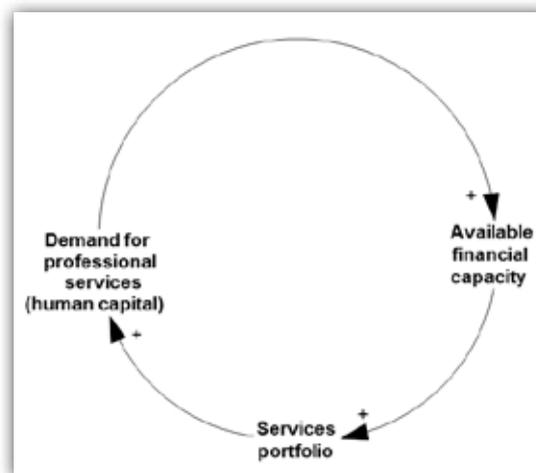
For more than two decades, theoreticians of strategic thinking have considered the impact of certain human resources practices on organisational strategy. Various studies support the positive relationship between certain human resources practices and better organisational performance (Kaufman, 1992; Terpstra & Rozell, 1993; Bartel, 1994). Taking that approach as a reference, and on the basis of the

specific dynamics of human resources management in USOs (Calvo, 2011; Stearman, 2000), a series of policy proposals regarding the recruitment, development and retention of human capital in organisations of this type have been made, all of which aim to foster their market competitiveness.

Regarding the approach taken to the analysis in this study, the strategic aspect governing the survival of USOs is their capacity to acquire and retain human capital that the market requires, in the form of their stock of professionals or know-how. In order to offer differential, innovative services, such businesses must allocate resources to training their professionals, not only to increase and enhance their technical know-how, but also to develop their business skills. At the same time, owing to their small size and minimal financial resources, they have to make a turnover in the short term in order to survive. Professionals forming part of such organisations, whose salaries are often lower than average for the sector, value the ability to learn and the employability aspects that organisations of this type can offer them. However, trying to combine short-term survival with medium-term growth potential through investment in Research, Development & Innovation (RD&I) is tough and often thwarts their professional expectations. They leave as a result, and this leads to an intellectual decapitalisation of such businesses.

Given that the situation was found to be a dynamic problem, the authors identified a series of feedback loops to help them take an in-depth look at the strategic problem posed (Figure 3).

Figure 3. Basic loop

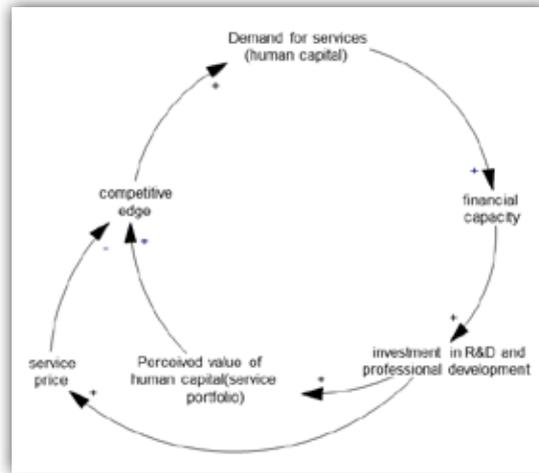


Source: own elaboration

External demand for services determines the financial capacity of a business and allows it to create its portfolio of professional services, linked to the training of its human capital (Figure 4). If demand goes up and the business manages its professionals' knowledge well, then that will lead to a USO's growth in the long term. The greater the human capital offered by a USO, the greater the client's perceived competitive advantage of the business. This will lead to a higher demand for services, which in turn will strengthen the business-client relationship and foster its growth (positive loop).

However, creating a greater stock of human capital, which requires bigger investment in R&D and professional development, will increase the internal cost of services. This will lead to higher prices, which in turn will weaken future demand for services (negative loop).

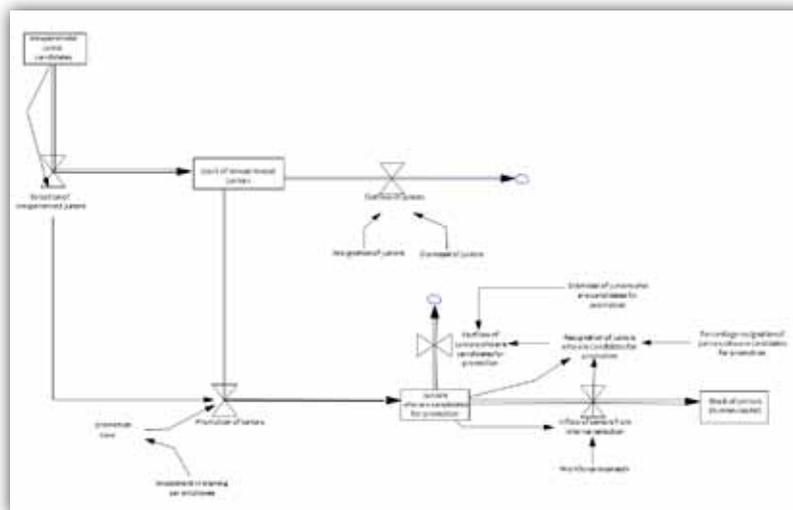
Figure 4. Competitive edge loop



Source: own elaboration

On the basis of this prior causal analysis, managed with a focus group formed by 16 human capital management experts in professional service businesses, a flow model was designed. This flow model enables an evaluation of the relationship between investment in training, the existence of human capital (number of senior professionals recruited through internal selection processes) and an organisation's growth (retaining the number of senior professionals over time). A constant factor to bear in mind is that USOs usually take on inexperienced junior members of staff and train them internally, but that during the process, many of those professionals resign from the organisation, thus rendering the process of skilled human capital management and retention more difficult (Figure 5).

Figure 5. Flow of human capital



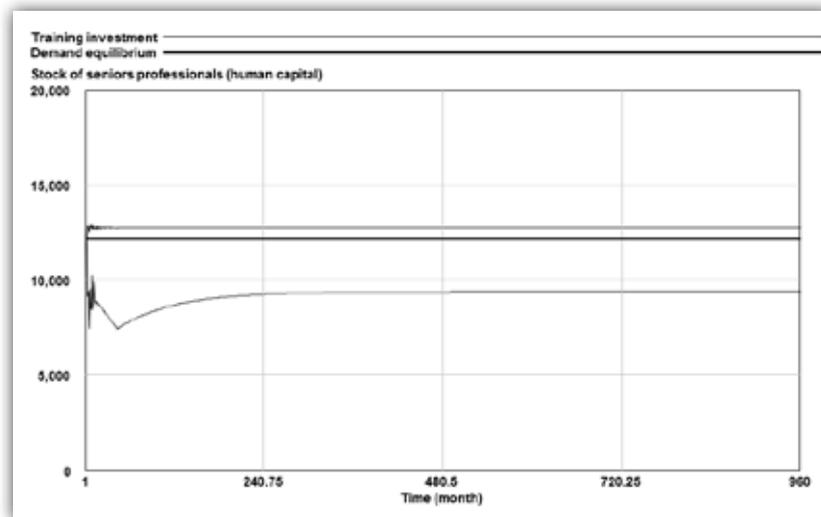
Source: own elaboration

If account is taken of the fact that consolidating the professionals' experience takes time, then the main impact of greater investment in training will be a shortening of the time in which inexperienced

professionals (genuinely inexperienced junior members of staff) will get the required promotion to join a business's team of senior professionals, on the assumption that the demand for projects is sufficient to generate vacancies on that team. Also taking account of the fact that businesses value the existence of human capital in organisations of this type, having a workforce of senior professionals will provide a USO with a competitive edge over other businesses, which will foster its growth.

Thus, considering a scenario of demand of professional services equilibrium, the sensitivity analysis (Figure 6) shows that investment in training becomes a point of leverage for the growth of organisations of this type. This is so because an increase in investment in training per employee above the sector's mean increases the stock of senior professionals, which allows an organisation to adapt to the requirements of demand (conversely, investment in training below the sector's mean has the opposite effect).

**Figure 6.** Sensitivity of training investment in the stock of senior professionals (human capital)



Source: own elaboration

However, the difficult balance between the flow of professionals and demand for projects makes it essential to define a series of specific human resources policies for USOs, the aim of which is to align the internal capacities of an organisation with the intellectual capital demand of the market.

### 3.2. Human capital recruitment and selection

Thanks to their privileged relationship with niche universities and research groups, USOs are able to lower the costs (Fama & Jensen, 1983) associated with recruiting and selecting human capital. From this perspective, USO managers have privileged access to specialised human capital with high potential, since they can take advantage of the information asymmetry (Eisendhardt, 1989; Fama & Jensen, 1983) that prior knowledge of the candidates —through their participation in academic activities— provides them with. Likewise, they may be able to maintain differential recruitment and selection advantages by entering into favourable agreements with academic institutions.

### 3.2.1. Access to different knowledge areas

USOs can recruit employees with different skills from different areas. The directors of such businesses have the direct opportunity to recruit staff from the departments in which a technology has been developed. They can also recruit staff from other knowledge areas, which will facilitate the future growth and development of such organisations.

RECOMMENDATIONS and POLICIES: USOs should approach university graduates and researchers in knowledge areas that are different from those of their founders. In this respect, including people with profiles that are more entrepreneurial, such as graduates or students on master's degree or postgraduate courses in Business Administration and Management, would allow a USO's lack of business skills and knowledge of the market to be overcome. Other studies such as Labour Relations, Languages and International Relations could be sources of qualified staff, who would be able to collaborate on a USO's management tasks or internationalisation processes.

### 3.2.2. Knowledge retention

USOs originate from certain research groups and departments of a university, so they know their members directly. This situation is maintained over time because many of their founders keep in touch with the departments in which a technology has been developed. In addition, USO founders often use their network of contacts within a university to obtain information about students or researchers in other departments. Therefore, such links with source institutions mean that USOs have prior knowledge of the potential candidates that it might want to employ and are able to identify which of them could increase their stock of human capital in the future. Thus, when it comes to taking on new staff, one of the major problems is eliminated: information asymmetry.

RECOMMENDATIONS and POLICIES: For USOs to continue counting on universities as potential sources of employees, who are known directly or indirectly, such businesses and their directors should maintain links with source institutions.

In this respect, the proposal is to strengthen the use of shared facilities, the temporary employment of staff and the promotion of cooperation agreements.

### 3.2.3. Flexible employment

By temporarily employing students and researchers, USOs are able to find out about the real skills of university members employed in them. It also allows a degree of labour flexibility and certain advantages with regard to employing people in the future. Currently, the Torres Quevedo programme offers three-year subsidies when R&D staff (doctoral students and technologists) are employed by businesses, technology centres, entrepreneurial associations and science and technology parks.

The aim of the programme is to stimulate the supply and demand for researchers, and to foster the transfer of R&D outcomes and their implementation in the productive system.

RECOMMENDATIONS and POLICIES: To strengthen the use of programmes of this type, which allow doctoral students to be employed to undertake internships in businesses. To do that, it will be necessary to increase the dissemination of such programmes and to highlight the positive outcomes obtained from these or earlier ones.<sup>1</sup>

### 3.3. Human capital development

In the previous causal analysis, the problem posed by either investing in professional development (investment connected with R&D) or allocating the selected professionals' time to the commercial exploitation of already acquired know-how determines the strategic importance of this policy.

The policy proposal involves maintaining strategic alliances with research groups and university teaching staff. Relationships with research groups will allow USOs to access one-off elements of already developed know-how to exploit them in the market, shaping a make-buy mixed human resources system (Miles & Show, 1984) that is favourable from a competitive viewpoint.

Relationships with university lecturers will enable USOs to benefit from the specialised training of their professionals at a lower cost than on the open market.

#### 3.3.1. Greater time and financial constraints

The literature points out that financial constraints are some of the main problems that USOs face, and this has repercussions for the development of their human capital. USOs cannot afford to maintain permanent R&D departments. They do not have the financial capacity to do so, in the early years at least. Yet, not allocating time and resources to training their professionals may give rise to a moral hazard problem (Eisendhardt, 1989; Fama & Jensen, 1983). Employees with knowledge-worker profiles take on greater workloads in exchange for lower pay in the hope of furthering their development and innovative capabilities. Yet USOs wholly allocate their staff to the commercial exploitation of their stock of know-how. In the medium term, this policy will lead junior professionals, who are candidates for promotion, to resign, with the ensuing intellectual decapitalisation of such businesses and loss of competitiveness. In addition, USOs have to cope with a constant re-adaptation of their capacities in their early years of existence, when many of them are still positioning themselves in the market. This gives rise to time constraints for training their staff; most employees spend most of their time on day-to-day operations and short-term activities.

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1. The IDE (incorporation of doctors into enterprises) programme ran from 1997 to 2001, and was then replaced by the Torres Quevedo programme for doctors and technologists. According to the evaluations carried out, the impact of the programme was positive (Sanz Menéndez, Cruz Castro & Aja, 2004) In fact, several years after forming part of it, six of the 10 doctors still had stable employment in the same business.

RECOMMENDATIONS and POLICIES: To ensure that the development of USOs' human capital fits into their time and financial constraints, such organisations will have to carry out a prior selection of their staff, by taking advantage of their privileged relationships with the university community. Moreover, strategic alliances with research groups will allow USOs to access one-off elements of already developed know-how to exploit them in the market, shaping a make-buy mixed human resources system that is favourable from a competitive viewpoint. In addition, relationships with university lecturers will enable USOs to benefit from the specialised training of their professionals at a lower cost than on the open market.

### 3.4. Human capital retention

The retention of professionals in USOs is directly related to the fulfilment of their professional development expectations, to the consistency of selection and development policies, and to their pay (in relation to what they might be able to command in the market). When such employees leave, especially if that happens after they have been working for a USO for some time (senior professionals), it will lead to a loss of competitiveness stemming from the total non-recovery of the investment made in their training, a decline in its portfolio of commercial services linked to the stock of human capital, and to a loss of financial resources because money will have to be spent on selecting and training new professionals.

#### 3.4.1. Greater commitment

On many occasions, employees that join the workforce of USOs have a direct link with the founders or directors of such businesses and/or are entering into their first contract of employment. This means that they have a greater moral commitment to the business and to the people managing it.

RECOMMENDATIONS and POLICIES: USOs should create a formal commitment, binding on both parties, in the form of tie-in agreements, training commitments or confidentiality agreements (to keep research outcomes secret) in order to strengthen the commitment created during their foundation. Likewise, USOs should design policies to strengthen their employees' identification with the general business objectives. The purpose of doing so is to align the creation of specialised human capital with the needs of the market.

#### 3.4.2. Business growth potential

Since USOs are businesses that originate from universities, a high level of growth is expected from them. However, their growth is often moderate (OECD, 1998) and their impact on the economy is relatively low (Callan, 2001). If the growth, size, profits and products of such businesses are modest, then retaining their human capital will be more difficult. In contrast, if USOs expand their markets, then they will be in a better position to retain their employees.

RECOMMENDATIONS and POLICIES: USOs should pursue real growth, working in global markets that allow them to expand. In order to do so, it is vital for them not to limit themselves to consultancy activities alone. Rather, they should become the holders of technologies with direct applications in the market.

## 4. Conclusions

USOs need to maintain a degree of rationality and dynamic balance in the decisions they take on the use and management of their resources and capacities (Foss & Knudsen, 2003; Diedrickx & Cool, 1989; Amit & Schoemaker, 1993; Rumelt, 1984).

From a dynamic perspective, if USOs design their human resources practices to serve as the cornerstone of their competitive edge, then they will take decisions on which policies to implement in order to retain a certain level of human capital in their respective organisations.

Table 2. Human capital management in USOs

<i>Human capital management actions</i>	<i>Differential aspects of USOs</i>	<i>Policy proposals</i>
Recruitment and selection	<ul style="list-style-type: none"> <li>• Privileged access to specialised human capital (technical and entrepreneurial)</li> <li>• Information asymmetry</li> <li>• Favourable contractual relations (temporary employment and lower costs)</li> </ul>	<ul style="list-style-type: none"> <li>• Participation in academic activities</li> <li>• Recruitment of researchers from the same knowledge area or complementary areas</li> <li>• Employment of internship students</li> <li>• Participation in the Torres Quevedo programme</li> <li>• Dissemination of their activity and image among the university community</li> <li>• Demand for favourable contracting regulation of lecturers and researchers</li> </ul>
Development	<ul style="list-style-type: none"> <li>• Lack of financial capacity in development investment</li> <li>• Moral hazard problems</li> <li>• Speed and lower cost</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic alliances with research groups</li> <li>• Training assignments awarded to university teaching staff</li> <li>• Occasional employment of researchers for business activities</li> <li>• Maintaining training links with source universities</li> </ul>
Retention	<ul style="list-style-type: none"> <li>• Greater commitment</li> <li>• Future employment</li> <li>• Growth potential</li> </ul>	<ul style="list-style-type: none"> <li>• Consistency of selection and development policies</li> <li>• Training assignments awarded to university teaching staff, in line with the needs identified</li> <li>• Systems for the explicit storage of know-how</li> <li>• Design of a framework of confidentiality in relation to the use of know-how</li> <li>• Incentive systems for training and participation in commercial objectives</li> <li>• Subsequent collaboration agreements with research groups and temporary employees</li> </ul>

The outcome of the analysis performed is a series of policy proposals that, taking account of the differential characteristics of USOs, aim to foster the recruitment, development and

retention of human capital. Making full use of the information asymmetry that knowing and having privileged access to valuable candidates (in terms of their know-how and potential) offers, fostering collaboration agreements with research groups and university teaching staff to stimulate the growth of their portfolio of services and the development of their professionals, and implementing retention mechanisms based on reducing moral hazard problems and promoting new collaboration agreements to increase relational capital are some of the measures proposed. This will allow the commercial activities and human capital development of such businesses to be aligned, which will help them to overcome the formulated strategic problem and foster their future growth (Table 2).

In the authors' opinion, this analysis represents a good starting point for future research into the strategic management of USOs, a field in which few studies have been undertaken.

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## Dossier “Innovation and Good Practices in University Government and Management”

### ARTICLE

# Digital Scholarship and the Tenure Process as an Indicator of Change in Universities

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### Abstract

In this paper, the author aims to demonstrate that a practical barometer of how universities are dealing with the changes wrought by a digital, networked world can be found in the manner in which their reward and tenure processes recognise digital scholarship. The use of new technologies by academics to perform research, construct knowledge, disseminate ideas, engage students in learning and conduct a wide range of scholarly activities generates a number of issues for established reward and tenure systems, which can be seen as a representative microcosm of the issues facing universities more generally.

### Keywords

tenure; digital scholarship; promotion; research; metrics

## *La producción académica digital y el proceso de obtención de la titularidad académica como indicador del cambio en las universidades*

### **Resumen**

Con este artículo el autor quiere demostrar que el reconocimiento a la producción académica digital en los procesos de recompensa y titularidad académica es un barómetro útil para saber cómo las universidades abordan los cambios introducidos por el mundo digital y en red. El uso de las nuevas tecnologías en la investigación, en la construcción de conocimiento, en la difusión de las ideas, en los procesos para que el alumnado participe en el aprendizaje y en una amplia gama de actividades académicas da lugar a una serie de problemas para los sistemas de recompensa y titularidad académica establecidos, que pueden entenderse como un microcosmos representativo de los problemas a los que deben enfrentarse las universidades desde un punto de vista más general.

### **Palabras clave**

Proceso de titularidad académica, producción académica digital, promoción, investigación, mediciones

## Digital scholarship

The term 'digital scholarship' can be viewed as a convenient shorthand to contrast with traditional, 'analogue' forms of scholarship. However, Weller (2011) suggests that 'digital' is only one aspect of a trilogy, the convergence of which makes for significant change. It is the combination of digital content with a global network and open approaches that is significant in higher education, proposing a definition of "someone who employs digital, networked and open approaches to demonstrate specialism."

There are different interpretations as to the scope of digital scholarship; an information science perspective emphasises the curation and collection of digital resources, whereas a digital humanities perspective uses it in a broader sense to cover a range of scholarly activities afforded by new technologies. It is this more wide-ranging interpretation which is intended in this paper.

As the American Council of Learned Societies Commission on Cyberinfrastructure for the Humanities & Social Sciences observes, there are multiple interpretations of digital scholarship:

"In recent practice, 'digital scholarship' has meant several related things:

1. Building a digital collection of information for further study and analysis
2. Creating appropriate tools for collection-building
3. Creating appropriate tools for the analysis and study of collections
4. Using digital collections and analytical tools to generate new intellectual products
5. Creating authoring tools for these new intellectual products, either in traditional form or in digital form" (<http://cnx.org/content/m14163/latest/>)

Perhaps more fruitful is to consider an example of a particular technology-based approach in order to demonstrate the issues that digital scholarship raises. Blogging is one of the more well-established approaches that would be included under the banner of digital scholarship, and so acts as a microstudy of all the issues in digital scholarship, although almost any of the new Internet technologies would suffice. Firstly, it has the digital, networked and open approach central to its use – these are not attributes that have been grafted onto it. So we see bloggers linking to each other, operating open comments, using ‘open’ services such as YouTube and Flickr to embed content to make their posts multi-media. Moreover, such services are democratic and easy to set up.

Blogs are also the epitome of the type of technology that can lead to rapid innovation. They can be free to set up, are easy to use and, because they are at the user’s control, they represent a liberated form for expression. There is no word limit or publication schedule for a blog; the same blog may mix posts about politics, detailed subject analysis, sport and personal life. Blogs can remain unread or have thousands of subscribers.

It is this freedom of expression and open approach that is both their appeal and their problem for scholarship. The questions one might ask of blogs in relation to academic practice are true of all digital scholarship:

1. Do they represent ‘proper scholarship’ (however that might be defined)?
2. Are they central or peripheral to practice?
3. Are they applicable to all domains?
4. Are they more applicable for some scholarly functions than others e.g., teaching?
5. How is quality recognised?
6. Do they complement or replace existing channels?
7. Should they be rewarded through official routes such as tenure?
8. Should bloggers use institutional systems or separate out their blogging and formal identities?
9. What is their impact in academic communities?

It is the consideration of such issues that is at the heart of the dilemma facing many universities when they seek to engage with the digital culture. In the next section, the existing reward and tenure process will be examined, and then how this is brought into conflict with digital scholarship because of the types of issues listed above. Lastly, some of the approaches universities are adopting to deal with this are examined.

## The tenure process

Promotion and tenure is usually judged on a combination of three factors: research, teaching and service or management. Some universities expand on these to include factors such as contribution to society and academic esteem, but these three represent the main categories. These are supposedly weighted equally, often with candidates required to demonstrate outstanding achievement in at least two of the three. It is often rumoured that there is an unspoken rule that research is regarded as

more significant. As Harley et al. (2010) summarise it, "advancement in research universities is often described as a 'three-legged stool,' with a 'research' leg that is far more important."

In putting together a case for promotion, an academic then needs to provide evidence to support their case in these three areas (although not all three may be represented equally). For teaching, this is usually straightforward – a list of courses that have been taught (perhaps with student ratings). Service can equate to work on committees or to management responsibility, but can also be a little more nebulous, like making the case for external work with a professional body for example. Research is the most difficult to accurately represent, particularly to a committee whose members are unlikely to be experts in the subject area of the individual, and thus will require explanation and clarification on the nature of that individual's contribution to the field.

Across a university with many different niche subject areas, this generates a task of considerable complexity. Whereas teaching will usually conform to an understood and agreed curriculum, and service is predominantly represented by university committees, research is precisely the area of a scholar's activity where they are at their most individual and most specialised. It is the area that is thus most difficult for a general committee to assess. There is thus something of a conundrum around research in the promotion process – it is the most highly regarded of the three strands, and yet the most difficult to judge. It is this complexity in quantifying research combined with its significance that sits at the heart of many of the issues relating to digital scholarship and tenure.

## The digital scholarship barriers

Before examining some of the approaches institutions have taken to recognising and rewarding digital scholarship, it is worth considering the barriers and obstacles that many perceive in its recognition.

In a comprehensive study on scholarly communication, Harley et al. (ibid.) found that the strong lock-in with the published journal article and monograph was the overriding factor in consideration for promotion, commenting "enthusiasm for the development and adoption of technology should not be conflated with the hard reality of tenure and promotion requirements in highly competitive and complex professional environments. Experiments in new genres of scholarship and dissemination are occurring in every field, but they are taking place within the context of relatively conservative value and reward systems that have the practice of peer review at their core."

The first, and fundamental, barrier is the recognition of digital scholarship as activity that is worthy of appreciation. This is distinct from concerns around how best to represent and measure it. Cheverie et al. (2009) argue that there is a strong bias towards print, or traditional, publication: "While this community talks about 'publication', the language used implies that digital scholarship is of significantly lesser value, and word of mouth to younger colleagues discourages digital scholarship in the hiring, tenure and promotion process."

More significantly, the resistance to recognising digital scholarship reflects a more intractable problem – their benefits are often experiential in nature, so users have to engage with these technologies over a prolonged period to appreciate their value and the nature of interactions. Given

that many senior managers and professors in universities are not people who are disposed towards using these tools, then there is a lack of understanding about them at the level which is required to implement significant change in the institution. The membership of promotion committees is most likely to be drawn from senior academics, who have largely been successful with the traditional model of scholarship. Although these academics will have a wealth of experience, they come from a background that may have a limited understanding of the new forms of scholarly practice that utilise different media and technologies.

But, there does seem to be a move in many universities to recognise digital scholarship to some extent. This starts with the reasonably uncontroversial recognition that online journals have a similar standing to print ones, particularly when many major publishers are converting many existing titles to online only. Schonfield and Housewright (2010) report that there is a general move to online journals with most academics now content to see this shift happen, away from print.

In the arts, there has been a tradition of recognising a portfolio of work when considering promotion, and this has inevitably led to the inclusion of digital artefacts. In the sciences, other components have been recognised prior to more recent developments, including software and data.

A willingness to recognise new types of output and activity brings into focus the next significant barrier, which is how to measure or recognise quality in these widely varied formats. In order to overcome the problem highlighted above of dealing with complexity in research, evaluators have relied upon metrics such as the impact factors of journals. The peer-review process that leads to publication combined with a journal's impact factor acts as a quality filter, thus removing the necessity for the promotion committees to assess the quality of the outputs themselves. Journals have quality rankings, and therefore publication in any journal of sufficient standing is an indication of quality. As Waters (2000) puts it, "to a considerable degree people in departments stopped assessing for themselves the value of a candidate as a scholar and started waiting for the presses to decide."

Peer review is at the core of this practice and is seen as fundamental. Harley et al. stress that "The degree to which peer review, despite its perceived shortcomings, is considered to be an important filter of academic quality, cannot be overstated." This highlights the problem with recognising new types of output and activity. The power of many of the new forms of communication lies in the democratisation of the publishing process. They have removed the filter that the tenure process has come to rely on so heavily. Without this filter in place, promotion committees are back in the position of having to find a means of assessing the quality of an individual's research activity in a field they know little about. This is now confounded, as it may be in a format they know little about too.

## Recognising digital scholarship

Many universities have begun to acknowledge both a need to recognise digital scholarship, and also the existing limitations of their current systems in doing so. A number of different responses have

been implemented, some more radical than others. The approaches are summarised below and then examined in more detail:

- Recreating the existing model
- Finding digital equivalents
- Generating guidelines that include digital scholarship
- Using metrics
- Peer review
- Micro-credit

## Recreating the existing model

Recreating the existing recognition model is a reasonable first step. Methods of recreating the existing model in digital scholarship terms include adding in a layer of peer review to blog-like practices, or making conventional journals more open. For instance, several journals now operate a model where the author (or, more likely, the author's institution) pays to have an article made open access. Publishers charge between \$500 and \$3,000 for this model and, as Waltham (2009) reports, take-up has been limited, with 73% of publishers reporting 5% or less adoption of this model. This is hardly surprising, and highlights one of the problems with attempting to recreate current practice. Simply recreating the existing model, however, often fails to adequately address many of the issues raised at the start of this paper.

## Digital equivalents

An improvement on this is to seek digital equivalents for the types of evidence currently accepted in promotion cases. In making a case for excellence in one of the three main promotion criteria, the scholar is required to provide evidence. For example, a good track record in peer-review publication is seen as indicative of effective research as judged by the individual's peers, of impact upon their subject area and of effective scholarly communication. The publication record can be seen as a proxy for these scholarly activities, but is often interpreted as the artefact itself, rather than a representation.

If each of the accepted pieces of evidence are examined for what they are seen to represent, then it may be possible to find equivalents in an open, digital networked context that demonstrate the same qualities. For example, a keynote talk at a conference is often cited as a valid piece of evidence of esteem for an individual seeking promotion. The reasons are twofold: Reputation – it demonstrates that they have gained significant standing in their field to be asked regularly to give a keynote talk at a conference; Impact – if they are giving the keynote, then everyone at the conference hears it, and they can therefore claim a significant impact in their subject area.

The important element, then, is not the keynote itself, but what it *signifies*. What might a digital equivalent of this be, which meets the two criteria above? For example, if someone gives a talk and converts this to a slidecast of that presentation (a slideshow with synchronised audio), a certain number of views might equate to impact, often with numbers greater than those present at a live

performance. And if the presentation is retweeted, linked to, embedded, and shared in different means, then this might give an indication of reputation.

It would be overly simplistic to provide straightforward translations along the lines of 500 views + 5 embeds = 1 keynote, but by focusing on the existing criteria and considering what it is they are meant to demonstrate, it is then possible to consider online equivalents.

The New Media Department at the University of Maine have taken a similar approach in suggesting a number of "alternative recognition measures" (Blais, Ippolito & Smith, 2007):

- Invited / edited publications – if an individual is invited to publish in an online journal, then that is an indication of reputation.
- Live conferences – they suggest raising the profile of the conference (both face-to-face and virtual) to a par with peer-review publication, particularly in fast moving subjects.
- Citations – using Google and databases to find a better measure of citations and impact
- Download / visitor counts – downloads of articles or visits to an academic site can be seen as equivalent to citations.
- Impact in online discussions – forums, discussion lists and blogs are "the proving grounds of new media discourse" with significant impact and a high degree of scrutiny and peer evaluation.
- Impact in the real world – this might be in the form of newspaper references, but they also argue that Google search returns can be a measure of real-world impact.
- Net-native recognition metrics – online communities can have their own measures of value, and these represent a more appropriate measure than one imposed upon the contributor from outside.
- Reference letters – they suggest reference letters which may counteract some of the difficulty with traditional recognition systems.

The faculty of the Humanities at the University of Nebraska-Lincoln have similarly developed a set of specific equivalents for recognition, including links to the scholar's research, peer review of digital research sites and technical innovation ([http://cdrh.unl.edu/articles/promotion\\_and\\_tenure.php](http://cdrh.unl.edu/articles/promotion_and_tenure.php)).

## Digital scholarship guidelines

An approach being adopted by a number of universities is to produce general guidelines which set out broad criteria for assessing the quality of scholarly activity. These can include a catch-all term to accommodate new forms of outputs. For example, the Open University promotion guidelines state that "other appropriate outputs from scholarship can be taken into account including a demonstrable influence upon academic communication mediated through online and related web mediated technologies that influences the discipline."

The Committee on Information Technology within the Modern Languages Association (MLA) has developed its own guidelines for promotion committees to consider when dealing with digital media in the modern languages ([http://www.mla.org/guidelines\\_evaluation\\_digital](http://www.mla.org/guidelines_evaluation_digital)):

- Delineate and communicate responsibilities. When candidates wish to have work with digital media considered, then the expectations and responsibilities connected with such work and the recognition given to it should be clearly delineated and communicated to them at the point of employment.
- Engage qualified reviewers. Faculty members who work with digital media should have their work evaluated by persons knowledgeable about the use of these media in the candidate's field. At times this may be possible only by engaging qualified reviewers from other institutions.
- Review work in the medium in which it was produced. Since scholarly work is sometimes designed for presentation in a specific medium, evaluative bodies should review faculty members' work in the medium in which it was produced. For example, web-based projects should be viewed online, not in printed form.
- Seek interdisciplinary advice. If faculty members have used technology to collaborate with colleagues from other disciplines on the same campus or on different campuses, departments and institutions should seek the assistance of experts in those other disciplines to assess and evaluate such interdisciplinary work.
- Stay informed about accessibility issues. Search, reappointment, promotion, and tenure committees have a responsibility to comply with federal regulations and to become and remain informed of technological innovations that permit persons with disabilities to conduct research and carry out other professional responsibilities effectively.

Some of these will seem straightforward, like reviewing work in the medium in which it was produced for example, but even such a small step may come up against opposition when there is a strictly regulated promotion process which has been designed to suit the needs of print outputs.

## Metrics

One approach to overcoming, or at least easing, the complexity of judging individual cases is the use of metrics or statistical calculations to measure impact or influence. This has been an area of increasing interest even with traditional publications. This measure of impact is often represented by a statistical measure such as the 'h-index', which is based upon bibliometric calculations of citations using a specific set of publisher databases. This measure seeks to identify references to one publication within another giving "an estimate of the importance, significance, and broad impact of a scientist's cumulative research contributions" (Hirsch, 2005). Promising though this may sound, it is a system that can be cheated or gamed (Falagas & Alexiou, 2008), for instance by authors referencing previous papers or between groups, and so a continual cycle of detecting such behaviours and then eliminating them is entered into, rather akin to the battle fought between computer virus makers and anti-virus software.

There are at least three further degrees of separation from this walled garden approach to citations. The first is to use data outside of a proprietary database as a measure of an article's impact. This 'webometrics' approach was identified early on as offering potential to get richer information

about the use of an article, by analysing the links to an article, downloads from a server and citations across the web (e.g., Marek & Valauskas, 2002). Cronin et al. (1998) argue that this data could "give substance to modes of influence which have historically been backgrounded in narratives of science."

The next step is to broaden this webometrics approach to include the more social, Web 2.0 tools. This covers references to articles in social networks such as Twitter, blogs, social bookmarking tools such as CiteULike and recommendation tools such as Digg (Patterson, 2009). This recognises that a good deal of academic discourse now takes place outside of the formal journal and there is a wealth of data that can add to the overall representation of an article's influence.

The ease of participation, which is a key characteristic of these tools, also makes them even more subject to potential gaming. As Priem and Hemminger (2010) report, there are services which can attempt to increase the references from services such as Digg to a site (or article) for a fee. But they are reasonably optimistic that gaming can be controlled, proposing that "one particular virtue of an approach examining multiple social media ecosystems is that data from different sources could be cross-calibrated, exposing suspicious patterns invisible in single source."

A more radical move away from the citation work that has been conducted so far is to extend metrics to outputs beyond the academic article. A digital scholar is likely to have a distributed online identity, all of which can be seen to represent factors such as reputation, impact, influence and productivity. Establishing a digital scholar footprint across these services is problematic because people will use different tools, so the standard unit of the scholarly article is lacking. Nevertheless, a representation of scholarly activity could be established by analysing data from a number of sites, such as the individual's blog, Twitter, Slideshare and YouTube accounts, and then also using the webometrics approach to analyse the references to these outputs from elsewhere. A number of existing tools seeks to perform this function for blogs. For example, PostRank tracks the conversation around blog posts, including comments, Twitter links and Delicious bookmarks. These metrics are not without their problems, and achieving a robust measure is still some way off, but there is a wealth of data now available which can add to the overall case an individual makes.

## Peer review

The issue of gaming is even more prevalent with metrics, and this is confounded by the mix of personal and professional outputs that are evident in many of these tools. This is likely to increase the need for the effective use of peer assessment in evaluating work. When the filter of peer-review publication is removed, or lowered in significance, then arguably the significance of peer review in the tenure process increases. It will be necessary to determine that the output and activity is indeed scholarly (after all, one could have a popular blog on a subject which had no relevance to the academic case). It is also a response to the increased complexity of judging digital scholarship cases. The MLA guidelines above recommend using external experts to perform this peer review for tenure committees that may be unfamiliar with both the subject matter and the format.

Others have taken this approach further, soliciting commendations from their wider online network (e.g., Becker, 2009). There is obviously an issue around objectivity with this approach, but as

promotion committees seek to deal with a wider range of activity and outputs, then judging their impact will need to involve feedback from the community itself.

## Micro-credit

Another approach, related to that of finding digital scholarship equivalents, may be to shift to awarding 'micro-credit' for activity. So, for example, a blog post that attracts a number of comments and links can be recognised, but to a lesser degree than a fully peer-reviewed article. Finer granularity in the types of evidence produced would allow recognition of not just outputs, but also the type of network behaviour that is crucial to effective digital scholarship. Smith Rumsey (2010) suggests that "perhaps there should be different units of micro-credit depending on the type of contribution, from curating content to sustaining the social network to editing and managing the entire communication enterprise of a collaborative scholarly blogging operation."

## Alternative methods

All of the approaches above can be viewed as modifications of the existing practices, which have largely been determined by the practicalities necessitated by a print medium. Many of the attempts to gain recognition for digital scholarship seem to be focused around making it behave like traditional scholarship. For example, webometric data for journal article analysis still foregrounds the peer-reviewed article as the main form of evidence.

Bending new technology to fit existing practice is a common reaction, partly because we are unaware of its potential. Stephen Heppell (2001) declares that "we continually make the error of subjugating technology to our present practice rather than allowing it to free us from the tyranny of past mistakes." Arguably, this is the case with current methods for recognising digital scholarship.

Promotion committees can play a significant role in this, not only by recognising new forms of scholarship, but also by positively encouraging them, either through guidelines or specific projects. For example, a committee might seek to develop the sort of Web 2.0 metrics mentioned above or to encourage alternatives to the peer-review model. In analysing the peer-review process, Fitzpatrick (2010) makes a strong case that we need to move beyond merely seeking equivalence measures:

"What I am absolutely *not* arguing is that we need to ensure that peer-reviewed journals online are considered of equivalent value to peer-reviewed journals in print; in fact, I believe that such an equation is instead part of the problem I am addressing. Imposing traditional methods of peer review on digital publishing might help a transition to digital publishing in the short term, enabling more traditionally minded scholars to see electronic and print scholarship as equivalent in value; but it will hobble us in the long term, as we employ outdated methods in a public space that operates under radically different systems of authorization."

## Conclusion

Recognising and rewarding digital scholarship has a significance beyond the promotion of individuals. For universities, as they seek to manage change to a digital, networked society, it acts as a strong indicator and vehicle for change.

There are two main reasons for prioritising the recognition of digital scholarship. The first is the message it sends to individuals within the university. Because they operate in an open, digital, networked manner, digital scholars are often well known in their institution (for example, many of their colleagues will read their blogs). If a well-known digital scholar struggles to get their work recognised, then it sends a message to the rest of the university that this is not the type of activity that is likely to be rewarded, with a subsequent decline in its uptake. The reverse happens if that digital scholar is rewarded; it sends the positive message that academics should engage in this type of activity.

The second reason for recognising digital scholarship is to encourage institutional innovation. For example, universities are beginning to explore the use of Facebook to support students, or the use of blogs to disseminate research findings to the public, or new models of course development based on third-party content and crowdsourcing. There are very real benefits to the institution from these approaches, such as reaching new audiences, increasing the university profile without advertising, increasing student retention through improved peer support, lowering the costs of course production, developing new research methodology, etc. But it is difficult to realise any of these institutional approaches to new media if the university does not have a solid base of digital scholarship experience to draw upon. Having a range of digital scholarship experience amongst the faculty will be the key resource in realising the change required for many universities, and an appropriate reward and tenure process acts as a means of facilitating and encouraging this.

This is not to underestimate the complexity of the task however. The already difficult task of assessing research and scholarly activity in highly specialised fields is only going to be made more difficult by introducing digital scholarship. Previously, there has been an agreed set of evidence that could be seen as acting as a proxy for excellence in research. Not only does this list need to be expanded to include digital scholarship outputs, but it may be that no such definitive list can be provided anymore.

There are a number of ways in which promotion committees can begin to address digital scholarship. What they may be leading to is a more portfolio-based approach, perhaps more akin to that found in the arts. Anderson (2009) suggests that the sciences have an advantage in recognising digital scholarship because they are more ready to adopt new technology, but it may be that the arts, with their more individual assessment models, are well disposed towards incorporating different forms of output. Such a portfolio-based approach is likely to draw on a range of tools and pieces of evidence. These may include a range of digital outputs, metrics demonstrating impact, commendations from the community and recognised experts, and an overarching narrative making the case for the work as a whole.

It is worth emphasising that monetary reward and promotion are not the sole, or even main, driver for most scholarly activity. The reasons why scholars engage in research, disseminate their

findings and teach on courses are varied, but are primarily driven by intellectual curiosity. It is not, therefore, the suggestion of this paper that digital scholars should pursue any of the digital, networked and open approaches *because* they can lead to tenure. Rather, the purpose is to argue that if these approaches are achieving scholarly functions via a different means, that they should be recognised as such, and the tenure process acts as something of a proxy for this recognition. To ignore the context in which scholars operate within their institutions would be to disadvantage new practices compared with established ones.

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