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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 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.

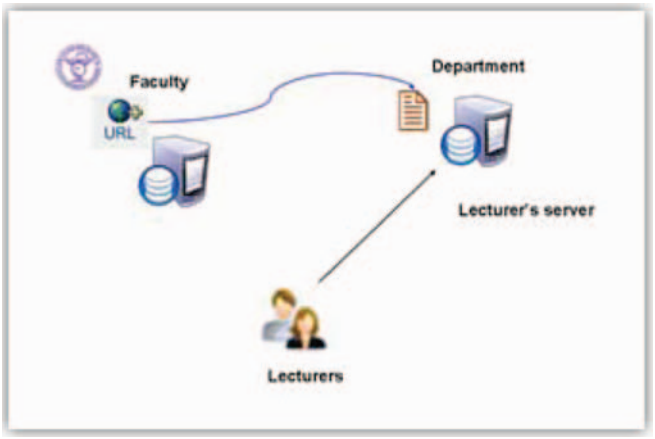

Figure 1. Diagram of the decision on which the new document management model is based. Only the hyperlinks for teaching documents are stored; their associated files can be found on the websites chosen by their authors (lecturer's server, department's server, etc.).

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.

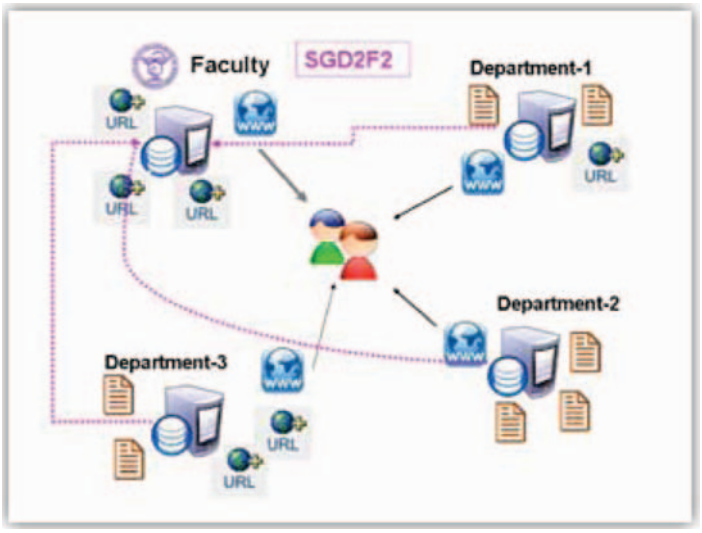

Figure 2. Diagram of how the new model for the management of teaching documents functions. Access to a teaching document via the UGR's Faculty of Pharmacy's website directs to the file specified by the lecturer on the Internet.

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.

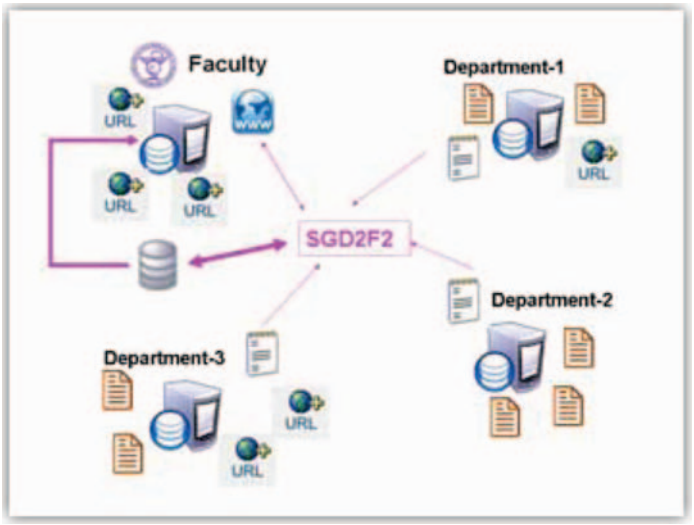

Figure 3. Diagram of SGD2F2 data processing and its interaction with web pages on which teaching documents are made available on the Faculty's website.

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.

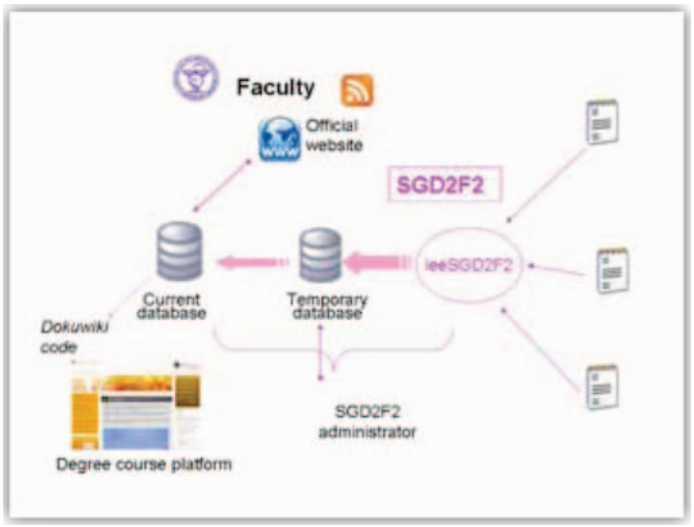

Figure 4. Diagram of the internal functioning of the SGD2F2 software package, as well as the additional functionalities available for the current academic year (information export in DokuWiki code and RSS feed).

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.

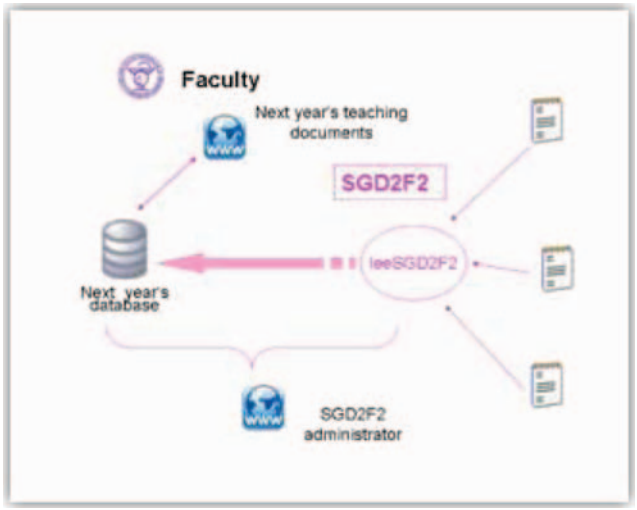

Figure 5. Diagram of the internal functioning of the SGD2F2 software package for the management of the next academic year's teaching documents.

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).
– 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). 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 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 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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