

HyBook: A LifeLong Learning Management System in Higher Education

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Abstract—This paper presents HyBook, an ad-hoc tool which was designed and implemented with the objective of improving the workflow management, and to allow the possibility of automatically generating e-books regarding educational courses at the Instituto de Ciencias de la Educación (ICE) of the Universidad de Zaragoza (UZ). So far, when the ICE of the UZ wanted to start a new educational initiative, the usual elaboration process of the informative resources was performed manually. Now, by using our application the ICE will be able to centralize the information collection process, and automatically create the two leaflets that the ICE publishes each year in a more simply and conveniently way.

Keywords—Topic Maps; XTM; FOAF; lifelong learning; e-book

I. INTRODUCTION

In Spain, the practical totality of Universities have a specific Department or Division specially dedicated to propel, develop, and control the different initiatives proposed in order to enhance the teaching skills of their professors.

In the University of Zaragoza (UZ), these issues are delegated to the Instituto de Ciencias de la Educación (ICE). Currently, this institute has to improve the teaching quality of the professors following the European Space for Higher Education (ESHE) guidelines. According to this, the ICE has the following duties: (i) Training and advice tasks focused on the available teaching staff, (ii) Collaboration and motivation of pedagogical innovation and educational research, as well as the improvement of teaching in higher education courses, (iii) Act as a consultant of the Consejo de Dirección de la Universidad, and the different educational centers and departments in the updating processes in which the current degrees are involved, and (iv) The coordination of the internal and external communications regarding the evolution of the different teaching methodologies, highlighting the good practice initiatives.

The project herein presented introduces HyBook, an application specially designed to be used by the ICE of the UZ. Its mission is to offer teaching training to novel university professors, improve the skills of teaching staff, and support teaching innovation projects and initiatives. The project has two objectives within this context: (i) it focuses on improving workflow management to elaborate the specific course curriculum for lifelong teacher training, and (ii) it provides a digital library available where the e-books generated from

different course editions, are stored and centralized. E-books are not only becoming an important part in the development of digital library collections, but also in the management of lifelong learning systems. The project which we hereby detail has been dedicated to both tasks.

In this paper we present a novel approach where software engineering and semantics are applied to education. All the information, which is stored, processed and recovered manually, will also be collected in an ad-hoc hybrid database by using semantics [1]. This means that the classical Relational Model (RM) offered by commonly used Relational Database Management Systems (RDBMS) such as Oracle [2], MySQL [3], FireBird [4], or SQL-Server [5], has to be extended with semantics using both the Topic Maps (TM) paradigm [6] and the Friend of a Friend (FOAF) Project [7]). This new repository of hybrid information makes it possible that the information collected in the database does not remain static, as its description may increase in real time with data which might not have been contemplated when it was initially designed [8]. The system can also automatically generate electronic books, in various formats, according to the needs of the ICE.

HyBook was developed during one of the authors Final Year Project (FYP), in collaboration with a multidisciplinary group including University Administration and Services Personnel as well as Research/Teaching Staff. As HyBook is mainly an internal management application, it is practically impossible to make a comparison of our tool with other similar tools, since they are not publicly accessible. However, as far as we know, the rest of universities are not provided with such kind of application, i.e. an application with a hybrid database able to generate, store, and retrieval e-books.

This paper is organized as follows: Section II presents the limitations of the current process followed by the ICE when gathering information about the different courses to be given. Section III presents our proposal in detail. Finally, Section IV concludes this paper.

II. LIMITATIONS OF THE CURRENT PROCESS

So far, when the ICE of the UZ wanted to start a new educational initiative, the usual elaboration process of the informative resources was performed manually, as follows:

1. To talk and reach a consensus with the people responsible of the different campus of the

University (Huesca, Zaragoza and Teruel) on what type of courses (didactical, technological or both) they may be interested in and which teachers may wish to give these courses.

2. Selection of the courses to start up. This step is taken by the ICE staff.
3. Once the selection has been made, the professors who are designated to give the courses receive a Word format document template by e-mail; they fill and return it to the ICE. Figure 1 shows an example of a course template.
4. Once the ICE has received all the templates, they combine them into a single document, and sent it to the printing press. A leaflet is delivered to all the teaching staff of the UZ. Two leaflets are printed each year, one that contains all the activities oriented to improve the pedagogical and teaching skills of the teaching staff, and another one which contains all the activities focused on improving the skills related to the use of new technologies in the class.

2	Diseño y edición de documentos digitales en el ámbito académico (curso avanzado)
Profesorado Piedad Garrido Picazo Departamento de Informática e Ingeniería de Sistemas EU Politécnica de Teruel. Universidad de Zaragoza	
Destinatarios y requisitos Profesores que hayan realizado en años anteriores a 2011 cursos de iniciación al Anillo Digital Docente, de Internet como recurso para la docencia y la investigación o de Diseño y publicación de la web docente de una asignatura.	
Objetivos Aprender a editar digitalmente documentos de una forma avanzada, teniendo en cuenta aspectos que no se ven en cursos de iniciación. Conocer las características básicas de las imágenes que se suelen adjuntar a los documentos digitales, así como aprender algunos aspectos sobre su edición. Creación y manejo de libros electrónicos, haciendo uso de un conjunto de herramientas específicas.	
Contenidos <ul style="list-style-type: none"> • Uso avanzado de la herramienta Adobe Acrobat (Conversión de documentos desde, y a otras aplicaciones PageMaker, QuarkXpress, PostScript..., diseño y uso de formularios, configuración avanzada, protección de documentos pdf, captura de webs, etc.) • Manejo, edición y retoque de imágenes • Libros electrónicos (Técnicas de producción y diseño de libros digitales, software utilizado, dispositivos, etc.) • Preparación de materiales para libros electrónicos. 	
Metodología <ul style="list-style-type: none"> • Las sesiones se desarrollarán en un aula informática. En cada sesión se hará la exposición y debate de los contenidos y se realizarán tareas prácticas. • Los participantes también realizarán actividades en su puesto de trabajo y con sus propios equipos. Las actividades estarán relacionadas con el uso de algunas técnicas avanzadas para la realización de material docente, contando con el apoyo tutorial a través de correo electrónico. 	
Datos de la actividad Duración: 12 horas Fechas: 7, 8, 14 y 15 de junio de 2011 Horario: De 10 a 13 h. Lugar: Aula de Informática (A3) del CEUT Número de asistentes: 20 Inscripción: Hasta el 14 de marzo, en la Secretaría del ICE, de 9 a 14 h.	

Figure 1. Example of a course template filled by the professor

5. The Research/Teaching staff should register in those activities they are interested via the ICE web site or through the secretary's office of their Centers.

Due to the fact that the aforementioned process is carried out manually by telephone or e-mail, our idea is to automate the training activities management, i.e., use HyBook to centralize the information collection process to create the two leaflets that the ICE publishes each year in a more simply and conveniently way.

Figure 2. How to generate an e-book

III. OUR PROPOSAL

As previously commented, we are interested on designing a system able to store and manage all the information related to the educational initiatives endorsed by the ICE. Our aim is to carry out a proper documentary management of this process, which combines various documents and files formats, and different tools and applications. Moreover, our system will propel the collaborative work among the different departments involved.

To accomplish these requirements, the development of a personalized workflow-based solution was chosen. Hence, the ICE would support an automated management of all the tasks that the process involves.

Another important feature of the system is the publication of e-books. They are generated in both formats Microsoft Reader compatible, and portable document format (pdf). These documents are classified as the resources of a topic, and they are also converted into elements that provide enormous value added to the future historic compilation of this electronic documentation. Subsequently, they may be merged with other external topics with similar characteristics, and may even establish an internal semantic network with similar internal resources.

All the information is stored, processed and recovered from a specially designed information repository. This information was stored in a hybrid database since its description is based on the Topic Maps paradigm. Therefore, the relational model not only had to be extended, but also the conceptual design had to be accompanied by the following metadata: topic, topic type, association, association type, occurrence, occurrence type (see Figure 4).

This repository of hybrid information allows that the information stored in the database does not remain static as its description may increase in real time with data which might not have been contemplated when it was initially designed. A clear example of this situation was that the technological and didactic courses did not necessarily have to be only given by teaching staff belonging to the academia, in fact, it may be given by external professionals, etc.

Although this characteristic was not contemplated in the initial design, its inclusion was not a problem thanks to the XML for Topic Maps (XTM) [11] specification used in our hybrid information repository.

Moreover, our system was enriched by FOAF project which is a key factor in this type of project, and allows us to create machine-readable documents describing the people involved in the different courses organized by the ICE. Using FOAF, we define an open, decentralized technology for connecting the courses similar to the social networks, where users can choose the courses and tools they like, without being cut off from friends who made different choices.

FOAF lets us share and inter-connect information from diverse sources, move it around, and use it for our interests. For example, different editions of a course do not necessarily have to be given by the same member of teaching staff, although these people may possibly have projects in common, share information, etc. The idea is to establish a virtual community with a clearly defined objective: to be a form of support to the ICE at the UZ as a strategic and distinguishing element when it comes to establishing a training offer for teaching staff which completely covers their needs. Figure 5 shows an example of a FOAF richer description of a teacher who takes part in the courses.

Another important issue to account for is to preserve the information resources generated by the institution. Hence, our system allows to protect its contents by using different licenses such as Creative Commons, ColorIURIS, or GNU FDL. Table I shows some of the different licenses supported by HyBook.

B. Workflow improvements

Thanks to HyBook, users can: (i) control from their desktop the state and evolution of the publishing process in real time, (ii) archive and organize the contents of historic interest for their preservation, and in the future, (iii) they will have at their disposal an automatic module of statistical data and reports management.

Using the Topic Maps paradigm and the FOAF project to make the description of part of the attributes of the information resources, we could automate the workflow management,

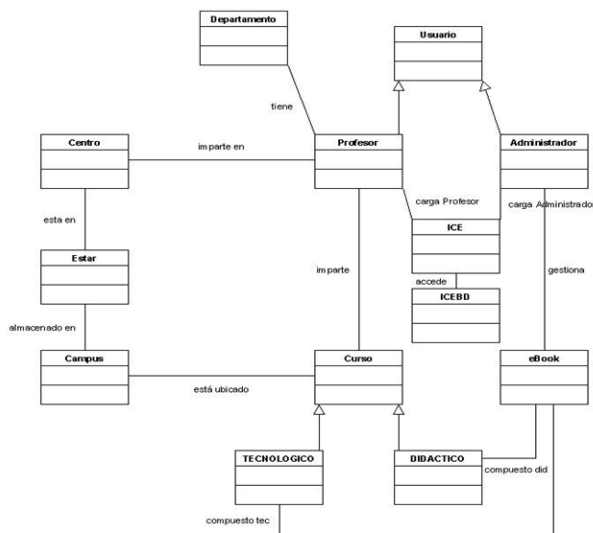


Figure 3. UML class diagram

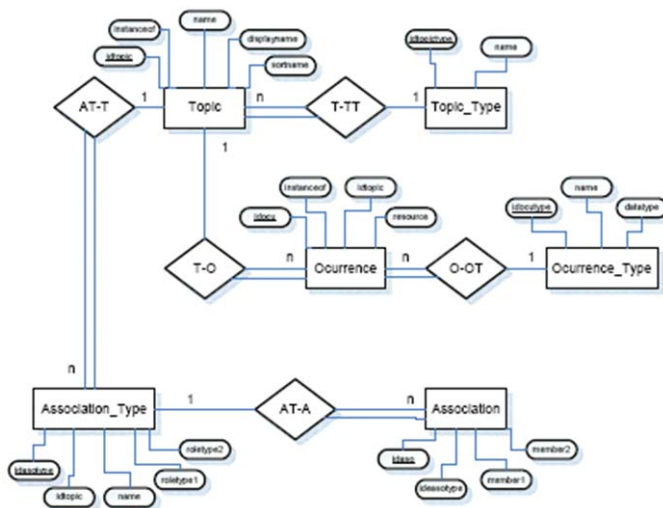


Figure 4. Hybrid Database description based on Topic Maps

```
<foaf:Person>
  <foaf:name>Jesús Tramullas</foaf:name>
  <foaf:gender>Male</foaf:gender>
  <foaf:title>Mr</foaf:title>
  <foaf:givenname>Jesús</foaf:givenname>
  <foaf:homepage rdf:resource="http://tramullas.com/>
  <foaf:weblog rdf:resource="http://tramullas.com/ansible/>
</foaf:Person>
```

Figure 5. A FOAF richer description of a teacher

A. Design of the application

After several meetings with the client, i.e. the ICE staff, we defined the Software Requirements Specification (SRS) [9] and the corresponding Unified Modelling Language (UML) diagrams [10] in order to complete the analysis and design phases of the software lifecycle. Figure 3 shows the UML class diagram.

provide self-contained semantic information, and so improving the information retrieval process.

Preliminary results obtained, allow us to conclude that this workflow system has increased production capacity. Moreover, although the objective of this system only covers the training courses that ICE offers, the idea is to include the processes of development and production of all the activities offered to the students, and meet the needs of other educational institutions of the UZ (i.e. research institutes, departments, students' unions, etc.).

The observed benefits are derived from: (i) the integration of a workflow technology, whose purpose is to improve the design of Information Systems (IS), (ii) the use of standards, such as UML, IEEE 830 or ISO 13250, and (iii) the integration of semantics by means of FOAF and XTM. Using a customized workflow solution has enabled to optimize the content production and focus the efforts of users only in creative tasks that support value added to the editorial product, without wasting time on mechanical or repetitive tasks which can be automated.

TABLE I. SOME OF THE DIFFERENT LICENSES SUPPORTED BY HYBOOK

License	Characteristics
Creative Commons [12]	The Creative Commons copyright licenses and tools forge a balance inside the traditional "all rights reserved" setting that copyright law creates. These tools give everyone from individual creators to large companies and institutions a simple, standardized way to grant copyright permissions to their creative work. The combination of these tools and users is a vast and growing digital commons, a pool of content that can be copied, distributed, edited, remixed, and built upon, all within the boundaries of copyright law.
ColorIURIS [13]	ColorIURIS is a solution that has been developed in order to define the copyright policy for online content using the continental model and in accordance with the Berne Agreement and the E.U. directive legally binding in the following countries. ColorIURIS is for the creators of content (literary, musical, audiovisual and photographic) that use the world wide web for spreading, publishing and/or making their work available to others and who wish to assign the patrimonial rights of their creations both within and outside the Net. The owner of the rights may decide how long the assignment is to be for and its territorial limits when choosing the contract, provided the exclusive rights have not been previously granted to a third party; there are some exceptions imposed by the internal legislation of some countries which you will be notified of when the form is being filled in.
GNU Free Documentation License [14]	The GNU Free Documentation License (GNU FDL or simply GFDL) is a copyleft license for free documentation, designed by the Free Software Foundation (FSF) for the GNU Project. It is similar to the GNU General Public License, giving readers the rights to copy, redistribute, and modify a work and requires all copies and derivatives to be available under the same license. Copies may also be sold commercially, but, if produced in larger quantities (greater than 100), the original document or source code must be made available to the work's recipient. The GFDL was designed for manuals, textbooks, other reference and instructional materials, and documentation which often accompanies GNU software. However, it can be used for any text-based work, regardless of subject matter.

IV. CONCLUSIONS AND FUTURE WORK

In this paper, we present HyBook an application to be used by the Instituto de Ciencias de la Educacion of the University of Zaragoza.

Of course, the introduction of this particular application of workflow management tool will be not easy. However, there are many factors that make us to be optimistic. For example, the users think that this tool will provide value added. In this sense, we think that this tool can make the current print leaflets disappear, since with this initiative users can access information from the courses anytime and anywhere through the e-books generated, and so the institution can save a lot of money invested in printing leaflets.

Finally, it is important to highlight that although each workflow system must be adapted to the specific characteristics of the organization in which it will be deployed, its purpose is based in information traceability and management, so we think that these systems must follow our proposed philosophy, i.e. to use descriptive languages to add semantics.

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