1 Introduction

When Tim Berners-Lee, a scientist at CERN, implemented the first web server in 1990, he was possibly unaware of the enormous repercussions of his initiative. The basic idea was to develop a system that allowed the scientists at different research centres to share information. Thus, the first people to access this technology were researchers, including those belonging to university centres. In Spain, the first web servers were installed in centres connected to RedIris (the Spanish research network), for example, the website of the Jaume I University at Castellón [1]. The first Spanish web pages were created, thus, as the personal contributions of researchers and teachers, in relation to research, teaching or more general areas [2,3]. By means of courses taught at Universities, by the training of skilled users, the technology was transmitted to the rest of society [4].

A few years later the first Internet providers appeared, enabling private computers to access the Internet, and thus commercial websites were established; these quickly expanded the range of services available to users. At university level, however, most institutional servers are still limited to offering very basic facilities, which frequently consist of minimal information about the institution. Indeed, even this limited information is sometimes outdated, because of the absence of a serious policy of supervision and maintenance. The main reason for this is that many such centres lack specific financial resources to maintain and update their web pages, although they have sufficient technological resources and skilled personnel to do this work.

This paper lists and describes the services we believe all university centres should provide. Although some services are now being implemented in some centres, we consider their universal implantation to be long overdue.

2 Website content

The people that visit the website of a university centre can be classified into different profiles, depending on the information/services they are interested in:

- Students: study plans, timetables, exam grades, various functions.
- Teachers: timetables, publication of information bulletins, publication of exam grades, booking of technical facilities.
- Researchers: research groups and activities, departmental information, library services.
- Administrative staff: publication of announcements, reception of applications.
Occasional visitors: study plans, facilities, location of buildings, registration information, entrance requirements.

Regarding the contents, two main types can be distinguished:

- **Static sections**: these include all relevant information (location of the centre, administrative structures, study schedules, telephone numbers, departmental information, etc.) characterized by the fact that the contents do not vary greatly in time. These data, thus, require only sporadic updating. For example, we assume that timetables will not change during an academic year. Nevertheless, it is very important that these facts should be updated immediately if any change occurs, in order to avoid confusion.

- **Dynamic sections**: in which the contents change frequently, sometimes at every access. This category includes services such as a virtual notice board, discussion forums, exam schedules, interactive services, etc. Because their contents change, these sections are frequently visited by University staff and students for information about news and events, to make inquiries or to perform tasks.

Today, most Spanish universities give a higher priority to static information than to the dynamic sections, which, in many cases, do not even exist. It is important to note that a large proportion of static sections are of only occasional interest. For example, information about the location of university buildings is interesting for new students but it is not something that will be repeatedly accessed by the university community.

In some university websites, the information provided is adapted to the visitor type. For example, in the Universidad de Alcalá website (www.uah.es), the visitor can choose a profile and the site contents are then presented with some pages given a higher priority than others. Alternatively, such an adaptation may be immediate after an authentication process: a particular student would see the timetable for his/her registered subjects, his/her personal exam schedule, news of particular interest, etc.

### 3 Design of the website

The web pages of an institution comprise its introduction card to the outside world. The first-time visitor receives a favourable impression from a university offering attractive web pages. The up-to-date image of a university is strongly related to the quality of the services it offers via Internet, and well crafted design helps to achieve this positive image. For this purpose, it is necessary to follow a set of basic rules:

- **Simplicity**: avoid a proliferation of graphics and routines that consume a lot of memory or time.
- **Compatibility**: avoid routines that may produce failures in some navigators.
- **Clarity**: avoid long pages that need to be scrolled for all the information to be read.
- **Homogeneity**: all the pages should follow a coherent design that clearly identifies the website. Such a design could be established independently of the contents, by using style sheets. Thus, updating and future redesign processes are simplified.

### 4 Fundamental services

The implementation of the services considered in this section may be adapted according to the particular needs of the university. Some of these have already been implemented, partially or totally, in some universities, but their use should be extended to all such institutions. For reasons of space, only the most important services are described here.

Most website services involve the need to interact with diverse databases. In any case, it is important that using these services should be easy and that users do not need to learn HTML or other sophisticated technologies. Furthermore, it is necessary to use authentication strategies that:
- Provide a reliable security mechanism
- Guarantee the privacy of the website user with respect to personal data that can be consulted and/or modified
- Identify the profile of the visitor to determine the set of actions he/she is allowed to make.

4.1 Virtual notice board

In most centres, news, notices, lectures, exam calls, etc. are publicised by means of the traditional cork board or by a poster fixed on a wall, window or door. At other times, these notices may be included in an e-mail distribution list. These strategies should be replaced or, at least, complemented by a virtual notice board that can be accessed through web pages.

This board could be divided into different sections, such as ‘Events and conferences’, ‘Grants’, ‘Administration’, ‘Library’, ‘Exam calls’, ‘Teaching’ and ‘Work offers’. After identifying themselves, university personnel, depending on their status, would be able to publish notices directly in different sections. Thus, a teacher would be authorized to publish class notices, announce a lecture or exam dates, while in the ‘Administration’ section only authorised personnel would be allowed to modify the information provided. Students and other visitors could also post messages, but these should be supervised and approved before publication, a task that could be carried out by the website administrator. The Universia website (www.universia.es) offers an interesting example of the possibilities of such a system.

This service would offer the following features:
- Easy access and location of information
- Widespread diffusion of information
- Ease of use, with no need to physically visit the premises to find or to publish an announcement.

A virtual board with these characteristics has been functioning in the ETSI at Granada University (www.etsi2.ugr.es) since 1996.

4.2 Departmental management

4.2.1 Class-related topics

The maintenance of the web pages for each academic subject should be the responsibility of the individual teachers. Thus, syllabus changes and updates, the recommended bibliography, etc., shown on the web page will not depend on third parties. Given an adequate system design, the teacher will be able to perform these tasks in a straightforward way, and also specify tutorial times, announce exam dates, add interesting links, upload educational material, etc. This environment could be complemented with the applications described below, together with other services such as a notice board or topic-related discussion forums.

4.2.2 Electronic student records

Filling in and maintaining traditional student data record cards is a time-consuming task for both teacher and student. By means of an electronic record, however, each teacher would be able to access the necessary data (including students’ photos in a digital format), as all data are compiled in the registration process at the start of the academic year. If necessary, students would be able to modify personal data later (address, e-mail, phone number), these changes being immediately recorded on the corresponding file for each subject for which they are enrolled. Thus, students would not have to fill in multiple record cards nor would teachers have to compile them into folders, because the data could be accessed by Internet and saved in electronic form.
4.2.3 Exam results

The teacher could use a simple spreadsheet to manage fields configurable by means of labels (to distinguish between, for example, ‘Exam’, ‘Practical work’, ‘Arithmetic sum’ and ‘Final grade’). If these fields were published on the Internet, students would be able to access them by various means: by the web page of the subject after identity authentication, by receiving an e-mail or by a short message to the student’s mobile phone. The teacher could also send individual or general messages to the students. An environment similar to the one described has been functioning since 1999 and is described in [5]. Similar solutions are currently under development for the website of the University of Alcalá (www.uah.es).

4.3 Administrative tasks

Many of the forms used by the administration, such as ‘Application for exam validation’, ‘Degree certificate request’, etc., should be downloadable from the web so that the interested parties could obtain them without having to travel to the administration offices. Moreover, many of these forms should be available in an electronic format so that they could be filled in before being printed out or, if legally possible, sent to the university via the web (providing adequate security and authentication mechanisms are established).

Moreover, certain management tasks, such as booking audiovisual media, classrooms or individual Internet user facilities, could be implemented to enable administration and consultation by means of a web-based interface.

4.4 Student curricula

The university could maintain data provided by students regarding their abilities in areas related to their degree course and future employment. For example, in the case of a computer science student, he/she could fill in a web form detailing his/her level in basic areas such as ‘Programming in C’, ‘Linux administration’, ‘Database management’, etc. Similarly, a company interested in hiring staff could fill in a similar form detailing the skills required. The server could then supply the names and e-mail addresses of the students fitting the company’s specifications.

4.5 Other services

A complete list of possible services offered by a web-based system would be very long, but perhaps of most interest are the following:
- Supply of programs and applications of interest (always respecting copyright laws).
- Discussion forums: meeting point and debates on different subjects of interest.
- Hosting the web pages of departments, teachers and students, avoiding the need to use different servers.
- Web browsers to locate information provided by the university’s website.
- Webmail service.
- Library service: bibliographic inquiries, requests, new acquisitions, etc.
- On-line education services: virtual exams [6], reception and correction of practical work [7], etc.

5 Conclusions

A wide range of services can be offered by a university centre. The implementation and maintenance of such services require the employment of qualified personnel for the different areas involved (server administration, databases, programming, graphic design, HTML, etc.) and full-time dedication to these tasks, avoiding dependence on voluntary or sporadic contributions from other members of the university.
community. There exist commercial tools such as WebCT (www.webct.com) that provide some of the services described here, but in many cases it would be better to make a custom implementation, for best compatibility with the databases already used by a particular university and with its specific necessities.

The use of these services by the members of the university community should be encouraged, replacing many conventional mechanisms by those offered by modern technology. Most such services should be implemented by the central services of the university, and the individual faculties or schools could then use them after adaptation to their particular graphic and web designs.

Finally, the applications described do not require end-users to be experts in new technologies. There exist web page creation and editing tools that do not presuppose knowledge of HTML or need any new software to be installed on the user’s computer, for example, ‘Wiki’ (wiki.org) or HTML editors based on Javascript.

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References