

Social Network Featuring Entertainment, Culture and Technology in Spanish Universities: The Infocampus Project

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Abstract: This paper presents the development of the Infocampus project (www.infocampus.es), the free and Open University social network featuring entertainment, culture and technology, developed at the University of Alicante for all Spanish universities by "Plan Avanza" of the Ministry of Industry, Tourism and Trade (Kingdom of Spain). The paper will discuss the contents of this social network, its applications, and the technology used for their development.

Keywords: Web 2.0, social networks, Plan Avanza, University, open source.

INTRODUCTION

Recent years there has been an increase in the number of Web 2.0 applications [1], in which users no longer represent a passive element. Web 2.0 websites allow users to do more than just retrieve information. They can build on the interactive facilities of "Web 1.0" to provide "Network as platform" computing, allowing users to run software-applications entirely through a browser.

Social networks [2] are an example of such applications which focus on building online communities of people with common interests and/or activities, or who are interested in exploring the interests and activities of others. Today there are many social networks, although none of these are particularly significant at the university level. The aim of the Infocampus project (www.infocampus.es) is to create a social network that will allow all university community members to promote technological, cultural and leisure matters. It is an open system, with the Web 2.0 philosophy, which is not restricted to students but is also open to teachers, researchers, administrators and service providers, and anyone involved with the educational community and / or university (business, institutions, governments and others).

The project aims to encourage the participation of all members of the educational community, using new technologies, ensuring full accessibility and promoting values of equality, solidarity, cooperation and intercultural activity.

INFOCAMPUS SOCIAL NETWORK

The project aims to create a virtual area providing opportunities for users to promote cultural and leisure activities, as well as providing information on new technologies, videoCVs, and classified adverts for the rental market, sales, job vacancies, as well as cultural blogs or specialised search engines with cultural or educational content. We propose to discuss each application and its technical aspects.

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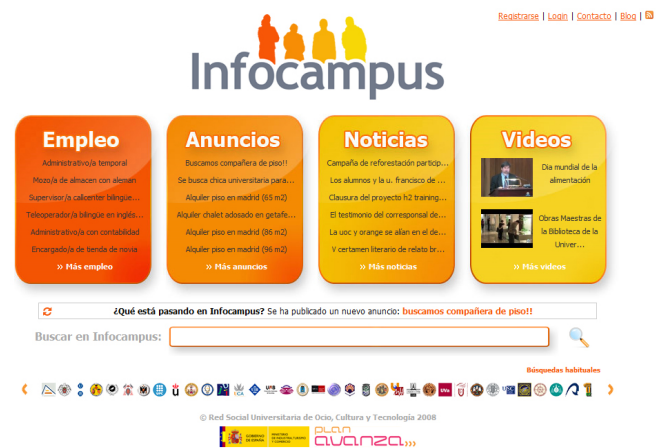


Fig. (1). Home of the social network.

Classified Adverts

The classifieds portal offers various types of adverts: houses, employment, buying and selling, studies and leisure, focused primarily on the needs of the university community.

Due to the Infocampus publication system and automatic review, the user can publish adverts immediately without having to wait for approval by a moderator. If an advert does not comply with the conditions imposed by Infocampus, it is immediately deleted. Even other users of the social network can inform us about an inappropriate advert.

One of the great advantages of Infocampus compared to other systems for classified adverts is that each advert can be enriched with various multimedia elements: images, videos, interactive maps and virtual views.

- Images. The user can post pictures related to the advertisement. Each image is scaled to the appropriate size and then a watermark is added.
- Videos. Videos may be published, both local and from YouTube™, using their API for developers [3].
- Interactive maps. These are especially useful in advertisements for houses; the system is capable of con-

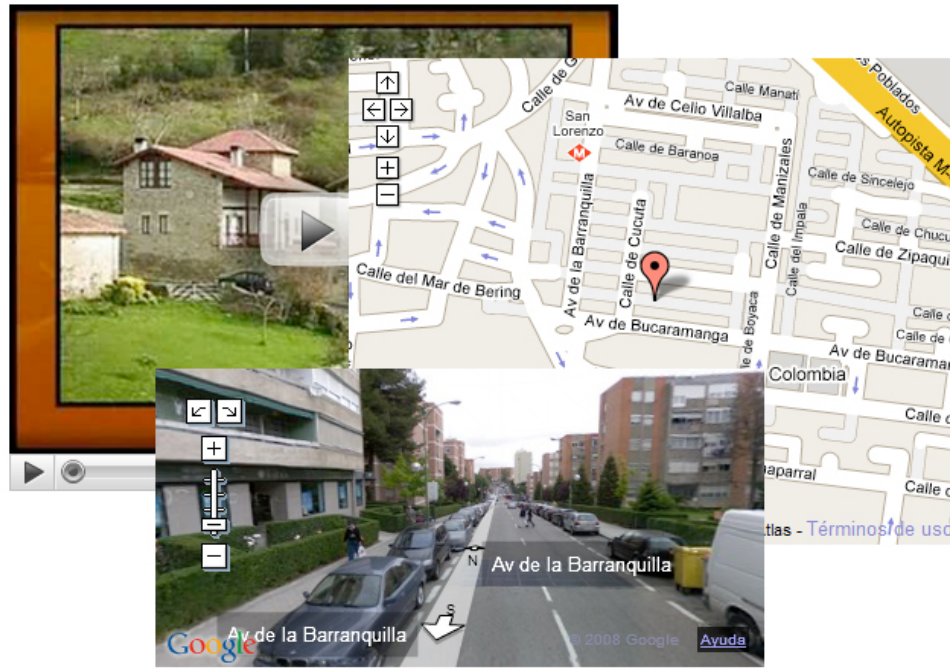


Fig. (2). Multimedia elements that can be added to an advert.

verting an address into a pair of coordinates (latitude, longitude). Using these coordinates, and thanks to the Google Maps API [4], it is possible to add interactive maps to the advert. Using this information, a KML [5] file is created, which can be displayed on Google Earth / Maps.

- Virtual Views. In those adverts with a map, and in some cities, the user can view the neighbouring streets in three dimensions, using the Google Street View technology [6], (as we can see in Fig. 2).

Another important issue is the classification of adverts at different levels, thus making the search much easier. Each advert belongs to a category and subcategory (allowing adverts to be filtered by type), to a university or province (allowing adverts to be filtered by geographic location) and is tagged with keywords (allowing adverts to be filtered by their labels). Finally, the system automatically obtains content from various sources. For example, there are several weekly housing adverts from the Public Rental Organisation (Ministry of Housing).

Employment

The employment portal incorporates the videoCVs system, which allows users to record and edit their own curriculum on video (Fig. 3). In addition to the video, the usual text curriculum may be added. Anyone can create a videoCV, the user only has to make a record summarising his/her experience and knowledge, in the same way as if it were an ordinary curriculum.

Any user of the social network can vote and comment on the videoCV, providing its author with excellent feedback for further improvements to the video.

The other part of the portal is used to publish job offers by companies. These companies receive videoCVs from interested candidates.



Fig. (3). Example of videoCV.

The classification of job vacancies and videos, takes place at different levels:

- By category. A videoCV / job offer belongs to a category, and optionally, to a subcategory.
- By geographical location. A videoCV / job offer will be displayed in one or more locations, depending on the interests and mobility of the author's videoCV / job offer. Using this information, a KML file is created, which can be displayed on Google Earth / Maps.
- By labels: each videoCV / job offer will be tagged with a series of keywords.

Finally, as in the classifieds portal, external content is automatically obtained. For example, there are numerous job offers from the company management staff selection Synerquia, as well as from some employment departments of several universities.

News and Video

The news and video collaborative tool allows users of the social network to publish news related with technology, culture and leisure, with text or multimedia content.

The system is not just an arena where anyone can post news, it is also a promotional system in which users are the players, deciding through their votes which news will be put first and which will not. For this there are two categories "Outstanding" and "Awaiting".

In addition to the users being able to post news, we get news from universities, as most of them syndicate their news through RSS [7] standard (an xml-based [8] language). Users can vote, comment, recommend to a friend, share, etc.

Taking advantage of the many options free software [9] offers, we have been able to adapt it to our needs.

SYSTEM DEVELOPMENT

We now present the development, methodology, and the logical-physical architecture of the Infocampus system. Our design model is based on previous experience of project development. In particular, we employ the MVC model (Model, View & Controller) [10]. By using this development model we are able to complete the three independent layers that make up the development of Infocampus. This architecture ensures that the application to be fully scalable.

Logical Architecture

The logical structure of the university social network is similar to most Web applications today. Due to the structure of social networks, and the need for different sites (adverts, employment, news and videos) to communicate with each other in order to share information on users, a REST API, has been created which allows the essential functions of the social network to be performed using XML calls (Fig. 4).

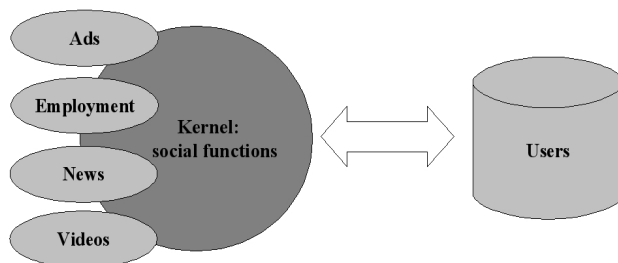


Fig. (4). Infocampus logical architecture.

Some of the benefits of using the REST API:

- Provides improved response time and reduced server load due to its support for the caching of representations.
- Improves server scalability by reducing the need to maintain session status. This means that different servers can be used to handle different requests in one session.
- Requires less client-side software to be written than other approaches, as a single browser can access any application and any resource.

- Depends less on vendor software and mechanisms which layer additional messaging frameworks on top of HTTP.
- Provides equivalent functionality when compared to alternative approaches to communication.
- Does not require a separate resource discovery mechanism, due to the use of hyperlinks in representations.

Physical Architecture

In terms of hardware, the project is located on dedicated GNU / Linux servers, since high-powered computing is needed to process all transactions, a good bandwidth in order to serve each of the requests in a minimum amount of time and due to the volume of data (images, videos, etc.) with several wide discs for mass storage.

The primary and secondary server has support for PHP 5, which allows the creation and management of MySQL databases. In addition to PHP, this server also provides support for CGI-BIN, Perl, Python, SSI and Java.

By making use of load balancing, the secondary server is able to receive requests when the primary server is inactive or is receiving too many requests. Some features of the load balancing software in Infocampus include:

- Asymmetric load: it causes some backend servers to get a greater share of the workload than others. In Infocampus, the main server gets more requests than the secondary server.
- Distributed Denial of Service (DDoS) attack protection: load balancers provide features such as SYN cookies and delayed-binding (the back-end servers do not see the client until it finishes its TCP handshake) to mitigate SYN flood attacks and generally offload work from the servers to a more efficient platform.
- HTTP compression: reduces amount of data to be transferred for HTTP objects by utilizing gzip compression available in all modern web browsers
- HTTP caching: the load balancer can store static (such as images, stylesheets and javascript scripts) content so that some requests can be handled without contacting the web servers.

Infocampus Technology

The proposed software has been developed to fulfil all the recommendations of the social web or Web 2.0. We have developed the applications with the end user in mind. International standards have been followed in fulfilling this aspect. In addition, it makes it easy to navigate, offering the user a lightweight, simple and clear visual interface, as recommended by the W3C, XHTML, CSS, W3C, CSS2, W3C-WAI and RSS2.0. All of this contributes to facilitating access of the most popular Internet search engines to all applications of the social network.

With regard to accessibility, one of our priorities is to satisfy the Royal Decree 1494/2007, November 12, by approving the Regulation on the basic conditions for access for disabled people, products and services relating to informa-

tion society and media. In this way, we show our deep commitment to the principles that inspired the decree, established in the Law 51/2003 of December 2, essentially, accessibility and universal design for all.

Accessibility criteria applicable to the Internet pages, is collected at an international level in the Web Accessibility Initiative of the World Wide Web Consortium, which provides guidelines commonly accepted by the entire Internet community, such as the reference specifications when it comes to making the Internet accessible to disabled people. The aim of our platform is to satisfy the standards of the W3C-WAI.

With regard to software (social software), the system has been developed using standardised language, in particular PHP and XHTML, using the database management system MySQL. To implement an actual social network to satisfy the recommendations of Web 2.0, we use the most advanced technology to date, making use of the AJAX (Asynchronous JavaScript and XML) technology to provide more interactivity to the user. In this way, lightweight web interfaces for multimedia services have been developed, optimising transactions between the browser and the server. The social software provides interaction between users and support for social feedback (the user can assess the contributions of other users).

At the server, compression techniques have been used to speed-up page loading, the transfer and bandwidth of visitors, as well as caching techniques for the same purpose and to save CPU computation time.

Network security is a main priority, following a pattern of three levels: First, at the network level, by making use of the TCP/IP packets filter of Linux kernel with module Netfilter and its application user-space Iptables; at the second level, robust configurations have been applied to network services making use of technologies such as modsecurity for the web server or chroot to implement security measures in Internet services; and finally, within the application level the source code is audited. We have implemented prevention measures and make use of logs.

Just as important as security is our commitment to respecting the rights of user privacy.

The project has been developed, keeping in mind policies of version control and distribution, making it easily scalable as well as adaptable to change. The design (CSS, images, etc) is separated from the code, which in turn is properly structured: core, libraries, class, styles, etc.

Proper management of the social network allows access to users and administrators through social software, all supported by technology hardware / web, as we have illustrated in Fig. (5):

Development Methodology

Extreme Programming (XP) has been the development methodology used to create Infocampus. Extreme Programming is a software engineering methodology (and a form of agile software development) prescribing a set of daily stakeholder practices that embody and encourage particular XP values: communication, simplicity, feedback, courage and respect.

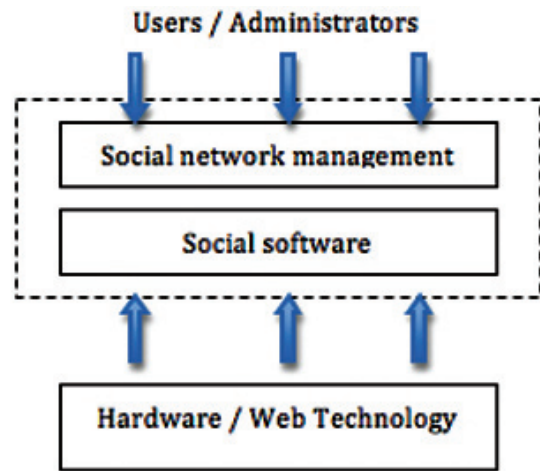


Fig. (5). Technological interaction of the social network.

The most important reason for choosing XP in the development of Infocampus was that developers could make specific commitments about what they would accomplish, show concrete progress in the form of deployable software, and when a milestone is reached they would describe exactly what they did and how and why that differed from the plan. This allows business-oriented people to make their own business commitments with confidence, to take advantage of opportunities as they arise, and eliminate dead-ends quickly and cheaply.

Geocoding

Geocoding [11] is the process of finding associated geographic coordinates (often expressed as latitude and longitude) from other geographic data, such as street addresses, or zip codes (postal codes). In Infocampus, these geographic coordinates are then used for various functions on the websites of classified adverts and employment:

- Classified adverts can have an interactive map using Google Maps (Fig. 6).
- In certain classified adverts, the user can also make a virtual tour of the nearby streets, using the technology of Google Street View.
- KML files are generated from the classified adverts, job offers and videoCVs, which can then be displayed in programs like Google Earth.

In order to implement all these functions, we have used some of the tools for developers that Google offers (Google Maps API, Google GData API and KML).

Obtaining Content from External Sources

We have used several methods for obtaining external content (adverts of the Society of Public Rental, job offers, news on universities etc.), although the main methods used are:

Asynchronous Method: when the author has new content, an HTTP POST request is made, enclosing an XML file with a defined structure, which indicates the type of operation to be performed (insertion, deletion or modification) and includes other necessary information.

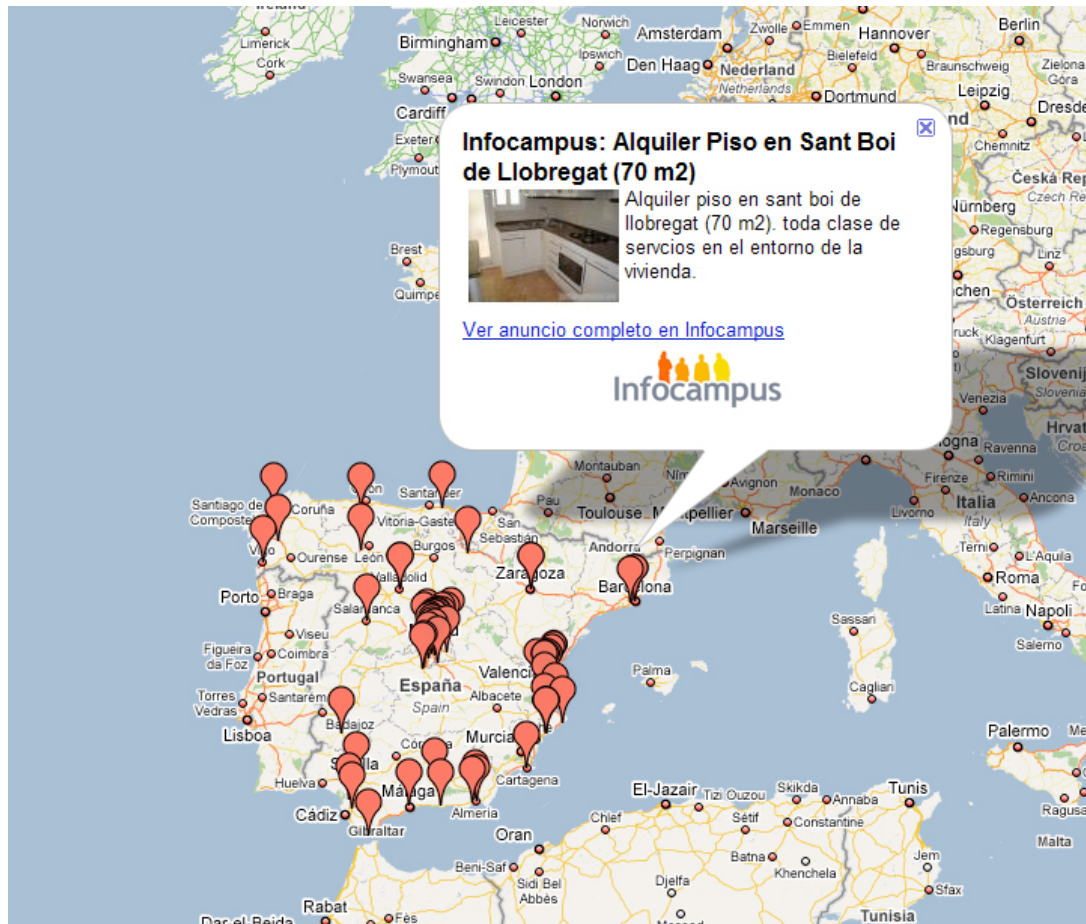


Fig. (6). Geocoding for Infocampus adverts on Google Maps.

Synchronous Method: the system automatically (e.g. every hour) reads an XML file previously generated by the author of the content, and checks for new elements to insert. The more content, the more frequently the reading will take place.

In the first case, there could be a problem as anyone can send content *via* an HTTP POST request. To avoid this, an IP filter has been created which will only accept requests from a particular IP, and also makes a hash [12] check of the content, to verify that the sender has correctly coded the content using a string known only by the sender and Infocampus.

Self-Management of the System

In order to maintain the project over time without external dependence we have applied various techniques so that tasks are automated as far as possible. First, the content of the social network is ensured by the users themselves [13], thanks to the platform offered to them for that purpose. There might be problems associated with not having absolute control over this data.

One of the most important problems facing us is spam, unsolicited messages, sent in bulk, affecting the quality of content. Specifically, this mainly affects the news application, as we must avoid repeated publication of a message or

similar messages. As the processing for publishing news is really simple, it might be a popular target for spammers.

In the same way, both classified adverts and blogs, which are currently booming, have become widely used by spammers, leaving a comment in a post, which usually has nothing to do with the original, even with links to commercial sites. There are different plugins to detect and block spam, such as Akismet, which is a plugin for Wordpress.

These systems can operate either with heuristics, or with the "blacklist" method, that is, maintaining lists, which are updated with any addresses that are denied publication. The systems which work best are those that combine both techniques, and this is what we have implemented.

To ensure content quality and avoid any unwanted content, we have applied techniques in the code filtering the messages. For example, several messages cannot be published over a very short period of time (which indicates that it is automated software), as well as many other checks. In the same way, it checks that the visitor who is about to add content to the network is not on our blacklist or any of the other public lists.

In the case of any content that could be categorized as spam, we use the "Captcha" technology [14]. CAPTCHA is an acronym for Completely Automated Public Turing test to tell Computers and Humans Apart.

It is a challenge-response test used in computing to determine whether the user is human or not. The usual test consists of asking the user to enter a set of characters that are displayed in a distorted image, unrecognisable for a machine. In this way we prevent robots (or "bots") from using the service in an uncontrolled manner.

Just as there are visual Captchas, using the distorted letters technique, these techniques may also be complemented with the use of Captcha in audio format, so that the test is available to people with visual disabilities. These are the techniques used to block spam on the social network and prevent the publication of automated junk content.

On the other hand, to ensure the quality of content, we offer tools that allow visitors to vote or mark the content as inappropriate, so that only the best content will be displayed on the main pages.

Finally, in order to detect any unusual events, we have very detailed statistics on the evolution of the network and published content, permitting easy analysis and audits on these data and a thorough monitoring of the applications that may receive unwanted content in the social network at all levels.

CONCLUSION

Infocampus is a free and open social network, which promotes culture, entertainment and technology. Its advantages include:

- Encouraging the exchange of information between universities.
- Organising the scattered information provided by the universities, offering a common site for them all.

Infocampus is growing, and we are working hard to overcome the current limitations of the system, such as adverts from outside Spain, translation of the website into other languages etc.

Other possible uses of Infocampus, include:

- Replacing the current classifieds portals of universities, for a common portal, which could promote exchange.
- It is a valuable source of information for the media, as they can find news highlights related to the university community.
- It can be used as a complement to the usual employment portals, adding a videoCV hosted in Infocampus.

For the future, we have planned to improve the systems that have been developed so far, and add social applications

to complement the social network in areas such as art, graphic design and research. These can be summarised by the creation of a virtual system for promoting scientific content, which would create an actual social technology network, an area of creation for artistic and multimedia content with the aim of encouraging artistic creation: photologs, photo galleries, and similarly provide mail and redirection of domains ".es" to the entire university community.

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