LECO: AN INTERNAL VIRTUAL TOOL TO AID COLLABORATION IN THE CONTEXT OF A VIRTUAL UNIVERSITY

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ABSTRACT

It is a reality that most e-learning environments, like that of the virtual campus of the UOC, are only thought up to support learning processes and focused to meet the student requirements. The quality of the university not only relies on the quality of the learning processes, but also on the internal processes of the university. In order to improve these internal processes, it is necessary to support the needs of the university faculty and staff and such needs are mainly concerned with collaboration. An environment called LECO has been created in order to support the collaborative requirements of the Information, Multimedia and Telecommunication Studies department (IMTS) of the UOC. It is our belief that our experience may be useful to other companies that plan to use an integrated environment (or a set of tools) to improve the collaboration of their members.

KEY WORDS

Collaborative tools, collaborative environments, collaboration, communication, sharing, collaborative needs, virtual universities, experience.

1. Introduction

It is well known that collaboration is a key factor of those organizations where participation or teamwork is essential to be a success in business. In learning environments, concretely that of the virtual university, where face-to-face learning does not exist, a great deal of collaboration between their members is needed in order to perform their main functions. As their main activity is to provide services to lead the students to the achievement of learning objectives, most of the tools developed are oriented to this goal, however, only some of them are collaborative with the aim of helping in internal organizational processes, just like those which occur in business enterprises.

There are many definitions of collaboration, but it would be interesting to point out that one given by Roschelle [1]: "collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem". We have to understand the collaboration concept as related to other concepts such as those of negotiation, communication, sharing, synchronism and completion in order to solve a problem or to finish some activity. Collaboration implies a certain degree of teamwork in order to achieve an objective, therefore communication and negotiation between individuals is required together with taking into account the construction of new meanings and the considerations of all the individuals that are involved in the process and last but not least, the performing of some synchronized tasks.

Virtual collaboration will be discussed in such a way that information technologies (IT) will be the primary form of collaborative support. In such a case, as the medium used for communication should be capable of providing a common platform to share ideas and resources, this same platform should try to discuss different issues in both synchronous and asynchronous mode with the maximum level of interaction and the minimum technical effort. Furthermore, if the tool is oriented to support e-Learning, then it is called CSCL (computer-supported collaborative learning) [2]

Most of the virtual universities have developed collaborative learning tools in order to support distance education, hence they have taken into account those tools focused on generic enterprise environments but become applicable in the context of education. Some of these tools are Blackboard[1], Moodle[2] or Synergia[3] as virtual learning

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[1] http://www.blackboard.com/us/index.Bb
[2] http://moodle.org/

platforms; BSCW[5] or Teamwave[6] as tools for resource sharing; TopClass[7] or Firstclass[8] as communication tools and CollabNET[9] or VA Software[10] as collaboration tools, among others. Our proposal is to create a collaborative environment and not only a collaborative tool, since there is a need to integrate different tools to solve communication, resource sharing and other collaborative problems.

This paper presents a collaborative environment created to provide support for the communication among the members within a department of a virtual campus. The LECO project has been performed with the collaboration of the Microsoft Innovation Centre and Toshiba sponsors. Its main goals are: 1) to solve the communication problems due to the sharp increase of staff within the department (20% people in the last year), 2) to permit the mobility of the members of the department that are distributed geographically due to research or innovation needs, 3) the wish to improve performance taking advantage of the new technologies, 4) the creation of an integral collaborative environment and 5) a support to non formal communication.

With the aim of explaining our experience, the paper has been structured in the following parts: the first section sketches the motivation that led us to create this collaborative environment; the second section introduces the context of the UOC to understand its context; the third section sets out the problems of communication in a virtual university, concretely that of the UOC; the fourth presents the developed environment and the different stages of the project; the fifth section presents a discussion about both the technical and human problems that were experienced during the development and testing of the project, and finally the conclusions and future work are presented.

2. The context of the UOC

The UOC is the foremost Spanish virtual university, with 36,381 students enrolled during the 2006 academic course. In particular, only the Computer Science Department itself has more than 7,000 students enrolled in the different technical degrees. The UOC was founded in 1994 and the Computer Science Degree was opened in 1997. Since then, the virtual campus of the UOC is the communication medium which permits that communication between students and teachers is made possible. The nature of the Information Technology

studies is mainly practical and requires a lot of group work. This group work is only partially supported by the present campus. Apart from the learning activities supported by the campus, there are a lot of management and organizational activities that need to be carried out, such as the creation of courses, the formation and organization of groups, authoring and publication of contents, supervision of learning processes and activities, among others. The collaboration of around 50 people which includes academic and management staff, makes e-Leaning possible at the Information, Multimedia and Telecommunications Studies department (IMTS).

Thus, in order to understand the reasons that have led us to create the collaborative environment, it is important to know the different functions performed by the staff of the EIMT department. These functions go from strategic (department and degree directors), to teaching and research (lecturer) followed by teaching administration, marketing and external relations and secretarial functions. Hence, there are six different roles to perform such functions.

It is important to mention that these six kinds of stakeholders work in a collaborative way by means of the virtual campus. Sometimes, a face-to-face meeting is needed, but they are used to being in contact using virtual spaces and in an asynchronous mode. Recently, some of them are distributed physically around the world at different times, but they have to assume the learning responsibilities and to continue to work through teamwork with the rest of the group. Our experience in this panorama has shown that the campus and their resources are not sufficient to provide the desired flexibility, hence the need to create a new collaborative environment to support the internal organization of the IMTS department.

3. Collaborative Problems in the UOC

In the particular case of the UOC, the following collaborative problems which are not met by the current campus structure were detected:

Synchronization: since students are *virtual* and have a lot of schedule constraints to "attend" class, they need to work asynchronously. The campus is centered on the students and thus it does not provide any synchronous tool. Nevertheless, the IMTS staff need to meet to discuss teaching policies, take decisions and so on. Nowadays, the campus does not provide any tool with such features. Consequently, each member of the IMTS uses his/her preferred tool and thus a lot of incompatibilities crop up when they try to communicate with each other.

Sharing: the sharing requirements needed by the IMTS staff are not provided by the virtual campus. The only way to share ideas and discussions is using the campus

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[3] http://bscl.fit.fraunhofer.de/

[5] http://public.bscw.de/

[6] http://www.markroseman.com/teamwave/workplace.html

[7] http://www.wbtsystems.com/solutions/technology

[8] http://www.centrinity.com/

[9] http://www.collab.net/

[10] http://web.sourceforge.com/

through teamwork. The teamwork mechanism of the campus is poor and very limited due to the lack of searching facilities and its low usability. Furthermore, the way to share documents supported by the IMTS is through a remote file system. The functionalities of this file system are very limited because it lacks control version, traceability, a sophisticated concurrency control, search facilities, and so on.

Presence: There is a function in the current campus that allows one to know if a colleague is connected or not. However, it does not provide information of the current location of the colleague, or if he/she is in a meeting or busy at a particular time.

Time management: The campus does not provide any way to share the schedule of the IMTS staff making it really difficult to hold a meeting with a minimum level of quorum. Hence, this implies that each member of the IMTS has to individually inform the secretary and colleagues of their possible absences (trips, conferences, research stays…). One of the other problems is the difficulty in giving a response to the whereabouts of a colleague of the IMTS when he/he is traveling or working abroad.

Attendance at meetings: Due to the large number of staff, the attendance of all the members of the IMTS to a particular meeting is rather impossible. However, this attendance is mandatory if we want the staff to be informed of the latest news. This functionality is not met by the virtual campus.

In order to illustrate some of the problems that we have to deal with, the following is one that we are currently involved in; that is the upgrading of the curriculum degree. Such a problem today, extends to most European universities due to the Bologna Declaration. This law intends to both homogenize the university degrees and promote the mobility of professionals within Europe. To achieve such goals, universities have to redesign their curricula in order to prioritize the students' competences instead of the contents to be studied. Hence, the changes proposed in the new Declaration of Bologna makes it necessary to discuss and upgrade the degree contents to make them more professionally oriented. Due to such a fact, we are involved in a process that implies a lot of often face-to-face meetings. The planning and performing of such meetings successfully with the campus tools is extremely difficult. The problems that appear in such a case are: 1) Time management: the difficulty to find the date when most people can attend; 2) Sharing: it is necessary to have a shared space to store the documents to be discussed during the meetings. Note that these documents may also be updated after the meetings in order to write down any particular comments; 3) Presence: it is sometimes necessary to verify the attendance of the key speakers; 4) Attendance at meetings: the staff who can not attend physically at the

meeting will be unable to participate and be aware of the news. Note that the synchronization problems are embedded in points 1, 3 and 4 of the example.

4. Project Details
In order to overcome the problems presented, the IMTS department has conducted a project to develop a collaborative environment called LECO. This section describes the evolution of such a project, beginning with the previous phases (people involved, main design decisions and their motives), continuing with the analysis and design of the expected collaborative environment, the development of the project and finally presenting the main structure and functionalities of the obtained environment.

4.1 Prior Activities
Prior to the creation of the project, several interviews were performed with staff of the different roles within the IMTS department. The purpose of such interviews was to detect the main communication needs of the staff within the IMTS. Although some needs were detected, our aim in this project is to develop a collaborative tool that implements only the main necessities of our colleagues. The goal is that with the passing of time, the tool will evolve thereby including new capabilities and improving on the present ones.
Thinking in the problems to be addressed during the implantation of the system, the following design decisions have been made by us:

1) Incremental development: we observed that it is difficult for the computer scientists (mainly our staff) to know what they need before knowing what the tool can do. For that reason, we thought that an incremental development will help us to discover and correct any possible deviations on time.

2) Test group: we created a test group, whose members will be the responsible for testing the tool and suggest the needs they have or the functionalities they expect. We have chosen, at least, one member of each role within our department. Some members of the IMTS have aversion to some of the proprietary brands, such as *Microsoft*, *Macintosh*… Since our project will use the tools of *Microsoft*, we included the most-well known retractors of such a brand in the group.

3) Control group: this group is composed of: 1) specialists of the tools we are using which are those of the network and of the organization; 2) the DD of the IMTS department; and 3) the chief of technology of our university. The purpose of the group, as can be inferred from the list of participants, is to support the project, both professionally and technically, to control the progress of the project, and to find future directions to be taken.

4.2 Project Analysis / Requirements

Once the project had begun, we carried out several interviews with the different members of the working group, firstly all together and later by roles. After these interviews, we detected the functionalities we want to address in this project:

E-Meetings: the tool should provide facilities to attend the meetings virtually. That means a system that integrates: voice and video transmission for each user, shared blackboards, shared applications, feedback tools like questionnaires and chats, among others.
Three kinds of users may attend the meetings:
1) Speakers: they conduct the meeting and have permission to do everything: talk, invite users to the meeting and create shared elements.
2) Regular users: they can participate in the conversation but not modify the shared documents or applications.
3) Auditors, who can neither speak nor edit any shared document or application.
Another necessary feature is to record the meetings (or part of them) in order to share them thereafter.

Audio-visual messages: the tool should support the user in the creation and sending of short audio and video messages.

File sharing: the tool should provide a space to share documents. In this space, the user may choose to classify the documents by its content type. For each document (or content type) several tags may be specified. The tool must also provide support for the control version of the work-in-progress files.
Two new functionalities related to the shared space should be implemented: 1) the notification of the users about the new documents of the shared area that may be of their interest, and 2) the implementation of search facilities to find documents according to their name, content type, metadata, tags or content.

Shared Schedules: The tool should allow the storing and managing of the schedules of the IMTS staff either individually or by groups. Members of the department may be able to check their colleagues' availability by checking out their schedules. A security policy must be implemented to avoid users to access the information related with the personal calendar entries of their colleagues.

Presence: The tool should control presence by allowing the staff of the IMTS to check whether a colleague is connected and, in such a case, provide facilities to connect him/her. The tool must also mark the availability of the employees checking their schedule (meetings or trips for example).

Transversal functionalities: Some other functionalities that affect all the aforementioned elements were detected by us:
1) Syndication to the news of the different elements of the tool by using the RSS.
2) Traceability support.
3) Minimum client requirements: A simple device (such as a PDA, Blackberry or intelligent Cell-Phone) should be enough to access the tool.

4.3 Development of the project

Before presenting the different phases that have made the project a reality, we are going to mention the associated technology used in order to obtain a tool able to give a solution to the specific requirements. Figure 1 shows the technologies used in the implementation of the project.
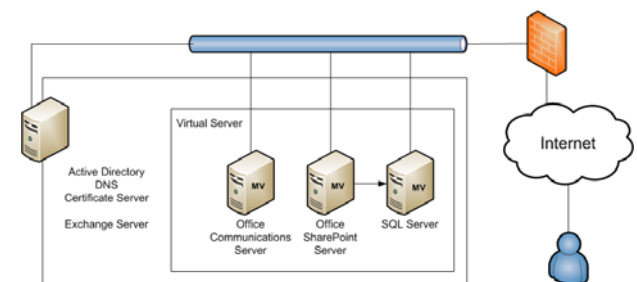

Figure 1: Architecture of the developed prototype

Basically, two kinds of technologies have been selected with the aim of achieving a smooth level of integration:

Communication technology: This technology has to provide the opportunity to offer synchronous and asynchronous communication.
1) Asynchronous communication like that of the e-mail has been covered by means of the *Microsoft Exchange Server 2007* product.
2) Asynchronous communication, and also like the presence information or the audio and video conference, has led us to select early versions of the Microsoft *Office Communications Server 2007* product.

Collaborative technology: The main piece selected to cover the collaboration needs has been the *Microsoft Office Sharepoint Server 2007* product. Since such a tool provides support for enterprise content management, work spaces, enterprise search, portal flexibility and workflow support, it has been considered suitable for our project. Furthermore, the *Microsoft Office Communication Server 2007* has been selected to satisfy the e-meeting functionalities.

The project has been divided in 5 phases:

1) The gathering of user requirements: The requirements have been collected from several meetings with the departmental staff.

2) Analysis of the required infrastructure: The technology has been selected taking into account the specific communication and collaboration needs and its integration capabilities.
3) Installation, configuration and tuning: The associated products have been installed and configured in the server. The collaborative spaces and functionalities have been implemented using the chosen services. Some programs have been installed in the control group users' computers in order to improve the usability of the tool.
4) Development of other requirements. Extra programming has been required to implement some functions which were not implemented in the installed products. For example, we have implemented a program that parses the documents of the practical activities in order to extract their metadata: author, subject, year, semester, weight …
5) Testing: The working group members have to test the environment during a couple of weeks just to detect errors, usability problems and suggest improvements.

The first, fourth and fifth phases have to be considered as being recurrent in the sense that they will be executed iteratively until the collaborative environment is close to the desired one.

4.4 Final Result

The implementation of the collaborative environment has already terminated. Today, the test group is working with the environment to find functionality weaknesses and usability improvements.

Due to the partners of the project, we have used *Microsoft* products to implement our environment.

Due to the security policy we have implemented, users need to authenticate before using any of the functionalities of the environment. From their perspective, the created environment is structured in four main parts:

Resource sharing part: A website that integrates all the required functionalities has been created. The website is classified in different spaces according to the different functions performed by the department members (strategic, teaching, research, administration and secretarial). Each of these spaces has its own calendar. The appointments related to each function can be created in the calendar by the person responsible for the space. The staff can embed any of these calendars to their own calendar. By default, the calendar of the IMTS is embedded in all its members because it contains the meetings and important events each one in the department must be aware of.
Other functionalities also created in the website are: 1) an advanced search function that looks for any kind of information contained in the shared spaces with independence of where such information is located (within a document, in a calendar, in a wiki, in the tag or in any other kind of shared resource); 2) a documentation center, which is a shared space where people can store files. These files can be searched by the aforementioned search facility and depending whether they are the final documents or not, they can be versioned; 3) the general information space contains knowledge related to the department which the staff members need to both know and access quickly, such as telephone numbers, staff location, general information, policies of the department and so on; 4) Workspace area: the members of the department can create new workspaces in this area to deal with any kind of project. The amount and kind of content of each workspace can be defined by its creator (documents, wikis, calendars…); and 5) e-Learning area, which includes the information needed to install, configure and learn to use the environment.

Presence part: The presence part has been implemented by using a commercial product called *Office Communicator*. This tool connects with the agenda of the people to check their availability at any moment. It also allows the making of conferences, with and without video, and to start a virtual meeting quickly. We implanted a web service to allow the accessing to the presence part from a web browser.

Schedule management part: this part uses *Microsoft Exchange* to manage the calendars, contacts and tasks to be carried out by the department staff. The calendars may be shared among the members of the department. It is worth noting that the calendars can be checked not only by using *Microsoft Exchange* but also by using a web browser.

e-Meetings part: it allows the holding of mixed e-meetings, meaning that not all the attendees of the meeting should be virtual. The meeting can be performed in a room with several people and use the e-meeting functionalities to connect all the attendees of the room, as one, to the virtual attendees. This part not only allows the basic functionalities of a virtual meeting but also some advanced features such as shared applications which share the control of the computer with other virtual attendees, answer questionnaires online, among others. To implement *e-meetings,* we used a *Microsoft* program called *Live Meeting*. Unfortunately, the version we are using, which is the latest, requires a client program installed in the attendee's computer.

5. Discussion

The execution of this project has been somewhat curious because at each stage, the results have been beyond our expectations. The project began with the main goal of supporting communication and the creation and management of work groups, wikis and blogs. After the interviews conducted by us, it was possible to realize that the requirements of the staff of the department were

totally different than the foretold ones. Therefore, we conducted more interviews to identify the real necessities of the staff.

After identifying the needs and stating the requirements to be achieved, we realized that the tools we were using to create the environment were more powerful than expected. Hence, this had two effects; one positive and the other negative. We were able to create a more powerful and complete prototype and with more functionalities than expected, but some people of the test group reacted negatively when they saw its magnitude. They saw too many changes, and the resistance of employees to change is well known [3]. From then onwards, we have measured each step just to reach a level of equilibrium between the main functionalities to be provided which are usability of the environment and acceptance of users.

Another problem we experimented which was complimentary to the resistance of change is the fact that some members of the department are free-source code followers, and in consequence, *Microsoft* detractors. We tried to put them on our side through including them in the test group and focus the project more on the people and functions than on the tools.

As aforesaid, the final result covers most of the requirements specified beforehand. However, there is a functionality we have not been able to implement due to the limitations of the tools that were used: e-meetings cannot be accessed by a web browser. That fact reduces drastically the usefulness of the e-meeting functionalities and should be solved in the near future.

6. Conclusion

It is a reality that most e-learning environments, such as the virtual campus of the UOC, are conceived through only thinking in supporting the learning processes and focused to implement the requirements needed by the students. We believe that in order to improve the university internal processes, it is necessary to support the necessities of its faculty and staff, which are mainly related to collaboration.

In this paper, we present our experiences in the *eLECO* project. In this project, the collaborative necessities of the members of the IMTS department were identified and a collaborative environment was created that satisfies most of them. We believe our experiences may be useful to other companies (with technical members among their staff) that plan to use a tool (or a set of them) to improve the level of collaboration of their members. We trust that the result will help to improve the internal processes of the department both in time and efficiency. That is not only the particular opinion of the authors; some members of the university believe that the presented project may

the basis on which the future intranet of the university can be created. Nevertheless, some more issues need to be answered before assessing the viability of such a process. The foremost are: 1) whether the requirements of other departments are the same as ours; 2) the scalability of the environment; and 3) the compatibility with other systems.

As soon as the testing process is finished, the prototype will be modified according to the comments of the test group members. After making these changes, we will use qualitative techniques to assess the usefulness of the collaborative environment due to the lack of previous quantitative measures regarding the internal processes of the department.

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