Virtual Communities as a bridge between learning activities and the Information system

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Abstract—**The paper presents our experience as designers, developers and administrators of an e-Learning system (LMS) that has been created "against the current" of standardization and "normalization" of LMS platforms, in our opinion too flattened over these pre-defined, pre-design software platforms. By adopting the metaphor of virtual communities as aggregation space for participants, thus supporting cooperative activities among users instead of just learning activities, our platform has been created to be adapted and connected to the information system of the organization. Considering e-learning and collaboration platforms as external bodies, relegated to secondary roles inside the information system, is in our opinion losing an excellent opportunity to improve collaboration and open innovation inside an organization. In this work we will describe the evolution of our virtual community platform towards being a component of any organization's information system. We will show why didactic and cooperative activities in an educational environment require coherent architectural choices in the software platform, in order to facilitate the integration of the learning platform into the existent information system.**

Keywords: e-learning; lifelong learning; collaboration; information systems

1. INTRODUCTION

This work is derived from our experience in e-learning settings, particularly related with the idea of an e-learning platform as a component of the Information System of any organization. We will introduce our experience in developing a software platform for the management of virtual communities, called "Online Communities", to be extensively used inside our projects that aim at developing an educational and collaborative environment, Specifically, our main activities in this direction have been oriented towards two different settings:

a) Students of our university, mainly coming from our Faculty of Economics but also from other faculties of the University of Trento: at the moment, we have approximately 16.000 users enrolled in 5.000 different virtual communities
b) public employees of our provincial administration (Autonomous Province of Trento - P.A.T.- Italy). The name of the project, L3-lifelong learning, is clearly identifying target and objectives of the initiative. In this case, we are talking about potentially 20.000 users. The system has been just recently opened to all the public institutions of our province, so at the moment we have approximately 5.000 users, that will surely increase in the very near future.

Both use cases have clearly demonstrated, in our opinion, the need of a tight integration between our virtual communities platform and the information systems of the respective organizations (University and Province of Trento), and these facts are also confirmed by other installation of our platform by other users, private and public organizations that particularly need this integration.

Our research group has been involved for years in the design and development of e-learning applications; in the new L3 system we realized that the simple re-design of a traditional e-learning system was too limited respect to the needs, mainly

- users' active participation in a more "social" sense
- deep integration with the information systems of the public administration

We would like to demonstrated that having a virtual communities platform with a different approach to people aggregation is an advantage respect to traditional LMS. Finally, having built the software platform from scratch is probably the most interesting fact in the perspective we are presenting in this paper: having the source code of an open source software that has not been built from zero by the developers is not enough to be effective in complex and pervasive integrations with the information system of the organization.

The paper is organized as follows: in the next section we will describe the rationale behind our decision of developing a customized version of our "Communities online" platform, with a brief presentation of the platform itself, able to easily integrate into the existent information system and providing new services and new opportunities to participants, teachers and tutors.

In section three and four we will analyze the architectural differences and the critical points of the shift from the experience of our university to other types; in particular as how the Lifelong Learning project that involves us at the moment with the Autonomous Province of Trento or the adoption of other types of collaborative approaches typical of the so called "Web 2.0" could change the philosophy of an e-learning

system. We will present the discussion, currently active, of the possible transformation of Online Communities to meet the requirements defined in the previous sections. The last part will introduce some web 2.0 functionalities and the implications of their inclusion inside a learning community platform.

2. VIRTUAL COMMUNITIES: THE RATIONALE

On Line Communities is a dynamic web application that has been created for supporting blended learning activities by the University of Trento. In contrast with other LMS such as Moodle and Blackboard, the system is not based on the metaphor of "course" but that of "virtual community". On Line Communities enables to create, in a generalized way, different types of virtual spaces called Communities, to aggregate them into larger organizational structures and to endow them with generalized co-operational services.

This approach is slightly different respect to the proposal of some other authors, such as Beamish [1], that considers the virtual community as a group of people who communicate using computer mediated communication tools. Participant of these communities are physically in different places but however they can exchange information on common interest in a communitarian way. Virtual communities are considered by Rheingold [2], the original creator of the definition of VC, as emerging social phenomena. Our approach is conditioned more by the ideas of Jones [3],[4] in which the technological structure of VCs (named virtual settlement) is conceptually separated from the community itself. In our projects, normally we have a double role: designers and developers of the technological infrastructure, but on the other hand we are teachers and administrators of the platform and of several communities. In other words, we are at the same time managers and users of the platform. We therefore understand the need to separate what technologically the platform can do from how customers use it.

As stated, one of the starting points of this approach concerns the process of cooperation and exchange inside a VC. The concept of VC could be associated to what in this moment is commonly defined as Web2.0. The term Web2.0 [5] was coined following a reflection on the evolution of the Web and the self-selection of the Web Applications after the collapse of dot.com companies. In any case, "Web 2.0" is not the definition of a neo-digital structure, but just a label that identifies the evolution of the structure of the pre-existing global net in the "social" sense [10]. The user plays an active role both as author and as manipulator of the contents of others. It is not a new concept of web but a new way of using the web. We permeated our paradigm of VC, and integrated in our platform not only the participatory level but especially the collaboration among users of our system., removing those aspects of social network platforms that, in our opinion, are useless if not harmful in educational settings. We partially integrated some elements coming from web 2.0 and new e-learning approaches, but on the other side we considered and implemented inside the platform some new concepts to develop collaboration activities (the "virtual community" as a container of activities and collaboration, instead of the strict "classroom" concept), thus implementing an easier and deeper integration with the information system that the organization has in place. As mentioned, our best test bed has been, among others, the "L3-lifelong learning" project, conducted since 2007 together with the Department of Innovation of the Autonomous Province of Trento (PAT). We believe that this experience represents an interesting opportunity to understand the applicability of distance learning and virtual communities to the public sector [6], due to the number of subjects involved, the temporal extension of the project, the extension of topics faced during distance learning sessions and the involvement of the organization in all the activities of distance learning. This work presents the first results of the project, after approximately five years, and its future development towards a "*virtual Community Environment*". What clearly emerged from our experiments is an interesting perspective for virtual community systems like ours:

1) private and public institutions need virtual collaboration spaces, places on the web with collaboration and web 2.0 tools available for their employees / partners

2) traditional LMS, like Moodle™, are not suitable for many of these needs, mainly because they are oriented to e-learning, and their pillars are metaphors like "classroom", "class", "course", rather than other ideas more oriented to collaboration, like "community", "group", "team", "secretary", "board", "office", "department". A classroom is, of course, a community, where collaboration is oriented towards a specific target, i.e., training, but the opposite is not necessarily true. This is just one component of collaboration, very important of course, but is not the whole idea that companies / public administration need. A community, in fact, can be many other things than a classroom. It can be a virtual collaboration space for a faculty council, a board of directors, a recreational group, a research group, a temporary association that needs to share some services [12].

3) social networks and tools, like Facebook™, Myspace™, youtube channels™, Foursquare etc., if used in learning settings, are not suitable for large and rigid organizations like public administrations, because of social networks' business models, where numbers and objectives are not allowing small, "private" communities where collaboration can take place in a private, reserved, personalized space. The main objective is "the more we are, the more we will interact": this is not exactly what a public institution wants in most settings.

3. ONLINE COMMUNITIES: A BRIEF PRESENTATION

Business models are typical of any product / service that can aspire to success, and software systems are not excluded from this consideration. Every software system requires the presence of a model of how to perform the activities which that model aims to promote. In the case of an educational activities and Learning Management systems, the model below pertains to how a certain system hypothesizes that the teaching activities of an educational organization are performed. Therefore the use of a software platform imposes limits on how the task for which the LMS is designed will be conducted.

The system that is analyzed in this paper was developed at university for blended teaching almost 15 years ago. It has gone through the following stages.

1) In its first implementation named *"Corsi on Line"* (online courses) the system had only one business model which followed the traditional structure of academic teaching.
2) In its second implementation, the system, based on virtual communities, allowed to extend the traditional lecture-based model to other forms of academic teaching (cooperative learning, learning by project, etc.), thus favoring multiple "business models" related not only to pure training activities, but also supporting collaboration, document sharing, public discussion places etc.
3) At its current stage the system has been changed so as to allow the implementation of business models not involved in academia, but rather orientated towards projects of life-long learning and integration with the services already available in any information system: single sign-on, accounting system, ERP-HR services, time and project management etc.

In the year 1999-2000 the Faculty of Economics at the University of Trento decided to take up a software system enhancing its traditional educational activities by means of a web-based extension. It aimed to structure coherently the personal initiative taken by teachers who had activated autonomous web pages related to their courses. A Learning Management System was necessary to achieve this goal, i.e. software being able to manage as a whole the distance teaching that was put beside the academic courses. The Faculty was presented with three options: purchasing commercial software, using free software or building its own platform, although at that time free LMS platform were not available and the discussion was about adapting other academic software for LMS-like purposes.

The decision to build its own platform was a consequence of various reasons which we can summarize as follows. The use of commercial software would have been possible at too high a cost (acquisition, maintenance, management and training) when compared to budget limits. On the other hand free software was at that stage rather rudimentary. The substantial reasons for the choice of building a platform were more strategic than technical:

- The system did not have to replace traditional teaching. Rather, it had to broaden teacher-student communication (blended approach).
- The use of Computer Mediated Communication (CMC) techniques did not have to be imposed on teachers or students. In fact, there are teachers and students who do not find e-learning attractive and do not appreciate the system even at present. They must not be considered to be bad teachers or students.
- The system had to be a web dynamic application so it could be used by any computer connected to the Internet, and it had to be constructed following a developmental approach so as to keep a bond as strong as possible between developers and users.
- Following the usage of the LMS, educational or technical intermediaries did not have to intervene between the teacher and the students, in order to reproduce exactly what happens in our Faculty. Creating professional intermediaries would have generated two undesired effects: in the long run, it would have turned out to be financially unbearable and delayed the development of the ability of the teachers to perform their job in an innovative and autonomous way.
- In the virtual environment - created by means of software - of an educational institution, anonymity had to be banned so that the players could not abdicate responsibility.
- The system had to be neutral when compared to the Learning Object (LO) standards used by the professors in their teaching. In other words, the system had to allow teachers to use both standard LOs – e.g. SCORM – and non-standard LOs.

After the first 5-year trial conducted on the *Corsi Online* (online courses) system, our team focused on carrying out a platform based on the structure of the learning virtual communities. We consider a virtual community like a space on the web dedicated to a collaboration objective [7][8][9], populated by people who communicate among each other, using a series of communication systems.

According to our interpretation, a Virtual Community is not the result of a process of social networking. In fact, it is a virtual space shared by groups of people who have a common goal. A community's virtual space can be simple or complex; for example it can contain further virtual communities, thus establishing a hierarchical "father-son" relationship. The (virtual) community can be an open space accessible to anyone. However it can also be a restricted space, the access to which is reserved only for some people authorized by the community administrator. The users can have different roles with rights and duties which vary in the use of space and CMC services activated in a virtual community. The system maintains the consistency of the whole social environment of the virtual communities

which are active at a given time, in that it provides users of a community with a range of on-demand services that can be activated and used in accordance with the permissions granted and the roles assigned.
This structure has allowed us to shape the organizational structure of an educational institution easily. For example, the communities of the teaching courses are components of larger communities called "Degree courses", which are in turn part of the "Faculty" community. On the other hand the community "Faculty" also includes the community "Faculty council", a community restricted to the only members of the council, as well as other heterogeneous communities, such as the "chess circle" or "first year students" community, with its organizational structure, promoted by the Faculty Board to help new students settle down rapidly. Every community exists within a scope and with one or more goals, and according to these goals, different services provided by the platform can be activated. *On Line Communities* includes many services or functions that every user can use in his/her learning experience. Providing a detailed list is not the goal of this brief presentation. This said, the system is able to offer services such as:

- "traditional" asynchronous e-Learning (upload and download of learning material, newsgroups, forums, notice board, lecture schedule, management of lecture halls, management of the prospect of courses, management of users, etc.) and synchronous (chat room, audio/video streaming, etc.);
- "personalized" e-Learning, closer to aspects of Lifelong Learning (LLL) and training on the job (tutorship, training on demand, contextual search tools,FAQ, etc.);
- Integration with external information systems, such as the student service office (register of the lectures);
- use of offline courses, i.e. courses having already been taught by teachers. They are recorded, digitized and provided to communities of users (with the opportunity of synchronizing the videos with slides, podcasts, webcasts, SCORM modules, etc.);
- creation and use of self-assessment test to check learning, questionnaires, surveys, opinion polls;
- statistical analysis of users' behavior (*On Line* Communities collects figures in a data warehouse regarding the actions performed by users for subsequent statistical analysis).

Over the last few years the system has evolved into a platform for professional training orientated to lifelong learning outside academia. The new implementation of the system has retained certain basic features of earlier versions, while also extending its functions in order to allow business models which are typical of training within the company. Such evolution has brought about the need to develop previously neglected aspects, especially with the aim of controlling the students' activities more extensively.

The chronological description of the authors' path aims to highlight two aspects which we consider to be rather neglected in the debate over this type of software applications. The first deals with the connection between the development of the software and its applications. Our goal is to show the need to evolve from the unspecific idea of an LMS as a general purpose platform of an unspecified educational institution [11]. On the contrary, what should be highlighted is that such an effective technological tool should embrace the (social and technological) context where teaching and learning take place. This idea originates from the fact that the context of use should determine the services and instruments which the software should offer, not the other way round, as often happens.
The second aspect deals with the relation between LMS and more general information systems of the institutions. At the moment e-Learning platforms seem to be built to act in a restricted circle made up of only teachers, tutors and students. We would like to show that this idea is actually deceptive and the LMS should be designed to be a wider and more complex module of information systems.
The portal has the possibility of including a community into another, creating a tree of nested communities. It is also possible to aggregate the communities into a transversal super-community, so creating a mesh of connections composed by the different links among communities from different branches of the tree. With these types of mechanisms, it could be possible to model many types of collaborative structures, even of a high complexity. For example, hierarchical structures like Faculties, Didactic Paths, Master Degrees, Courses, Work Groups related to a course, all the hierarchical relationships between these communities can be easily represented. Most of all, this hierarchical structure allows to map the organizational chart into a tree of communities able to represent each unit in the company, facilitating the replication of dependency relationships inside the organization onto a structure of virtual collaboration spaces.
Online Communities had been experienced with limited number of users since 2003, and was finally released on early 2005. As from 2005 it was used by the whole faculty of Economics of our University in all its components (students, teachers, dean, secretaries, administrative staff, external partners) and others faculties are using the system in many courses.

4. INTEGRATING VIRTUAL COMMUNITIES AND INFORMATION SYSTEM SERVICES

Along the process of adopting the virtual communities platform inside its information systems, the main users of "Online communities" almost immediately asked for a strict integration of the two worlds, due to the characteristics and potentiality of this integration both for end-users and for the organization. We found, and are still finding, many resistances to this process of

integration: many different scenarios whose power position has been "attacked" by the generalization of the metaphor of "virtual communities" and its already-available, ready-to-use services. Just to mention the most evident:

- pre-existing applications colliding with "online communities" services (Document management systems, internal blogs, forum, time management tools, shared agendas…..)
- competitors already present with their specific offers
- off-the-shelf solutions already selected and therefore threatened by our multi-purpose, all-in-one solution,
- previous project still not concluded

More than this, it's been quite easy to integrate our platform with pre-existing services of datasource, through the usage of web services created on our side, or on the provider side to exchange data between the different platforms.

Here follows a simple list of some of the connections of the virtual communities system with the rest of the information systems. Some of them have already been created, some of them are on the way, some of them have been (not mysteriously) declined due to the above pressures or legitimate choices, others are in the future developments of the integration. We have classified them in several categories of integration services:

- Authentication services
- Authorization services
- Participants records alignment and exchange
- Attendance records (for HR department)
- attendance certifications
- Time management(agenda, doodle, task management)
- Ticketing, tutor and teacher requests
- Accounting and ERP integration
- Automatic membership to specific communities
- Payment management
- Questionnaires / polls
- Public tenders and concourses
- social media from e-learning to open innovation

Due to size limitations, in this paper we will present just four of these items.

A first important element, substantially requested in every of our installations, is the integration with the authentication and authorization system of the organization. This has been the first and most important (from the user perspective) integration we built also in the L3 project. Single-sign-on is an immediate need of integration between the educational system and the rest of the information system, but here we find a second problem of integration, i.e., the authorization schema of the employee. What are her permissions? Which courses can be attended? What material can be seen by this person depending on her permissions? Who can participate to which course / community? To these and many other issues, manual implementation and replication must be created. In general, any e-learning platform should provide it, but one thing is by far more difficult in traditional "classroom-based" platforms. Virtual communities, as said, have hierarchical relationship among them, while e-learning platforms don't have this. So, it has been straightforward to implement a direct mapping between communities and the organization chart of the institution, thus providing a structure of communities that perfectly re-create, with respective permissions and hierarchical relationships, the hierarchical relationships present in the organization.

This aspect is not only related with permissions on the communities that are part of a certain branch, but also (and particularly) with the objects included in these communities, specifically documents, forum posts, FAQ and wikis.

Last but not least, a deep integration is fundamental for another reason: when something changes into the original directory of the organization's information system, these changes must be immediately aligned into the educational system. For example, an unauthorized access to some material by an employee that recently changed workplace is not so relevant for pure educational activities, but could make a great difference when in this repository different types of documents are stores. So when the LMS is used as a document management system for e-learning activities, permissions on documents are dependent not only on the role of the participant in the course, but could also refer to the position of the person inside the organization. Virtual communities of scope allow to map the organization schema on the organization of communities, inheriting all the needed permissions for any organization member, and being immediately updated on changes in workplaces, job position and roles inside the company.

Going on in the selected examples of integration, the interaction with e-learning platform is very often characterized by the presence of a tutor. Tutors are crucial elements for the success of any e-learning initiative, because of their role of bridge between the participants and the institution or the teacher. How can we book, as participants, a virtual interaction with a tutor? How can we interact with the institution if we have a problem? Regarding this last point, in our experiences of managing considerable numbers of participants like in our university (16.000) or in PAT (20.000), the helpdesk created around and e-learning initiative is very important, but most of all, it is important in public settings. We are not necessarily dealing with high-level support (from the teacher, for example), but most of the time what is needed is a pure helpdesk-like service, that takes care about simple problems that prevent the user to use the learning resources. What we have done in this sense is using virtual communities specifically created for help-desk, and developing a ticketing system like many services of this type, where the user can book a slot with a "solution provider", could this be a specialist for hardware problem, a process tutor or even the teacher herself.

Last example regards a fundamental integration for institutions that manage courses for relevant number of people. When an online edition (full or blended) of a course is available in the offer of the institution, some activities are managed substantially by the LMS (or equivalent system), specifically those related with the educational part. However, together with these activities, many other tasks are needed before the beginning of the course delivery, and these activities are very often effort-driven activities for the administration of the institution. Among the others:

- Providing information to potential subscribers about the course
- Enrolling people to the course
- Providing different and specialized communication to the different actors (potential subscribers, teachers, tutors, administrative staff, etc.)
- Create the virtual community for the course
- Upload materials and documents to inform people about that course
- Organize time of subscribers (meetings, videoconferences, appointments, shared agenda etc.)
- Organize a forum for discussions before the beginning of the course

It should be clear that all the people involved in the above processes can be easily grouped together in a community, where they can receive and use communication and management services available for the members of the community. Once the community has been closed (registration is close) that virtual space can be transformed (or migrated) into a virtual learning community, without any other effort or procedure.

The above items are just some examples of needs of (deep) integration between different components of the information system and a (flexible) platform that could delivery educational contents (but not only). More than this, the integration should be transparent to the user and should not be limited to the pure educational aspects.

All these features have been implemented in Online Communities with a very limited effort, as we took advantage of the approach based on a community as a set of services available to users with a specific role to play inside the community itself.

5. CONCLUSIONS

The paper discusses the idea of integration between educational platforms and the information system of any institution involved in educational activities. In our opinion, a different metaphor is needed between typical LMS, bonded to the "classroom" metaphor, and social networks, where the main objectives of participants are different from learning. The paper describes the peculiarities of a "built-from-scratch" virtual community system, where some features are specifically devoted to collaboration (thus overcoming main problems found in web 2.0 tools), and other features are totally new and only feasible thanks to specific characteristics of our platform, like inheritance, polymorphism, permissions and roles granularity.

Our experiences in the university context and later (the last five years) also addressing some public administrations and private institutions, allow us to make some comments on the most useful services for our users. Even in the public administration there is an increasing need to make a personal professional (or learning) space available to its employees, based on a deep integration with the rest of the services that normally employees have at their disposal, not just to store the teaching materials used in class, but also to manage their time and their activities, communicate with the colleagues, carrying out projects or homework.

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