Lifelong learning implementations in Virtual Communities: formal and informal approaches and their impact on learners

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Abstract—The work presents our experience as designers, developers and administrators of an e-Learning system (LMS) used by the Faculty of Economics of the University of Trento. The system started its work in the late 90s and was then rewritten under the increasing need of the users to promote new more collaboration-oriented forms of teaching / learning, compared to traditional ones. Currently we are managing the evolution of the system in the direction to provide a better support for cooperative activities among users. In the work we will describe the evolution of this system, showing why the cooperation in an educational environment requires coherent architectural choices.

Keywords: e-learning; lifelong learning; collaboration; web 2.0, formal and informal learning

I. INTRODUCTION

The Learning Management Systems (LMSs) are normally used by educational institutions to manage their training activities, and use the network to create different learning environments related to the learner needs (distance learning, blended training, back-end activities management relate to training processes, etc.). As any other type of management system, these applications are also connected to the management model that is represented in the software. In the case of e-learning applications, the represented model is the way by which the institution conceives its learning / teaching processes. The simplest model is the one used in distance learning, when the system becomes a container of learning objects, designed to be effective in the students self-learning processes, the remote control of the current level of learning, the certification of the results achieved and the management of the organizational / financial relations with the training institution.

Much more complex are the systems oriented towards a blended approach. In this case, the LMS offers a virtual space corresponding to what is carried out in the real didactical institution. In this way, the student learns not only in the traditional courses (in the classroom) but also using the virtual space as reinforcement to face-to-face lectures. This model is the most widely used by the academic institutions. More complex are the systems that tend to support innovative forms of learning such as learning by project, learning by problem and cooperative learning. In this case, the LMS must provide not just a virtual space associated with a course but also special virtual spaces able to work with other similar environments. The section 2 of this paper shows, referring to two systems that are designed, implemented and managed by our research group, how the shift from an LMS based on metaphor of the Course to one based on the metaphor of the Virtual Community can produce significant changes in the architecture of a LMS.

The LMS evolution from simply content container to real cooperation space is now in a phase of transition. The spread of Web 2.0 applications provides the possibility for these systems to evolve and support all those forms of learning excluded from the classical formal and institutional learning methodologies. It is banal to note that the interrelationship between formal and informal learning can increase a lot thanks to web 2.0 and social media, but this includes new challenges to the educational institutions and also to the change of the LMSs’ architectures. In this paper we present the solution that we have studied and implemented at the moment, that includes a technological integration between the e-learning processes and the current aspects of social networking.

One of the thoughts that arise from the discussion presented is that the extension of a learning management system towards a Web 2.0 approach is not simply a matter of adding some services (blog, wiki, friends etc.) to a LMS. We experimented the “long and winding road” of architectural choices, needed for taking full advantages from these tools. Moreover, coupling this web 2.0 tools with a virtual communities approach, rather than the traditional “course” metaphor, we obtained many advantages in the possible services provided to end users. In particular, it was evident that social applications are profoundly different from what is provided by traditional e-learning applications. Our system [1;2;3], originally followed a logic of blended learning, was also focused on the metaphor of the course. The evolution to a different metaphor (the community), has opened new perspectives, different from anything that can be seen as formal learning. Our new focus on the development of web 2.0 and social network services, increasingly common in the worldwide web, seemed to be quite naturally.
In fact, as stated from many authors like, the universities “must adapt, using technologies and models of understanding, in this case to reconcile teaching, research, IT, a changing environment, financial accountability and managerial models” and the Learning Management Systems could have an important role in this process, in particular to meet the needs of the learners in many different ways. A more complex LMS, traditional on one side and more “social” on the other, can consider a multi-faceted view of learning and a PLS could be one solution to cover the diverse learning needs of participants.

The paper is organized as follows: in the next section we will describe the current system in use at the Faculty of Economics in Trento, called Online Communities and the changes in the architecture of a LMS using the metaphor of Community than the Course one. 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.

II. COURSE AND COMMUNITIES: TWO DIFFERENT METAPHORS IN TWO DIFFERENT LMS

In the academic year 1999/2000 the Faculty of Economics of the University of Trento decided to have a software system able to enrich its traditional teaching as an extension on the Web. The first aim was to settle the increasing number of teachers’ personal web pages into a single platform. To pursue this result it was necessary to have a Learning Management System (LMS) or a software tool, able to create a virtual environment for the didactics of the Faculty. The resulting system, called On Line Courses, started to work from the second half of 2001.

On Line Courses was extremely simple but effective; it was based on the metaphor of course. Each course was associated to a virtual space called e-Course. As in a real courses held in the classroom, the teacher had the responsibility for the e-Course and could possibly be assisted by one or more tutors. Students interested in a subject were free to register themselves in the e-Course. An e-Course provided a series of electronic-communication services to teachers, tutors and students, but the rights to use them were rigidly fixed and substantially unbalanced in favour of teachers and tutors.

On Line Courses already offered tools to improve cooperation among participants in an e-Course but was not designed for this purpose. The basic idea was the creation of a virtual space to extend the communication level between teachers and students; nevertheless the pedagogical model remained the classical knowledge transfer from teacher to students.

The system replaced the existing virtual structures by virtual ones.

On Line Courses remained active since 2001; in mid-2005 gradually extended its use to other Faculties of our university. During this period, the system counted approximately 1,200,000 accesses and online satisfaction surveys showed a very high level of user satisfaction.

The trial period convinced us to change the metaphor: these are some observation:

- Models of teaching / learning (such as learning by problems, learning by projects, cooperative learning and their combinations) can hardly be connected to the e-Course, especially when the software directly represents the metaphor of traditional courses;
- The needs for cooperation within the academic environments is extending to all the activities that constitute the context in which didactic takes place;
- The organizational didactic scenario is changing under the effects of new regulations or decisions made by academic institutions, and these changes will inevitably reflect on the LMS functionalities. It is important to note that these types of changes are usually the result of a debate process in which both elements of cooperation and negotiation interact;
- The didactics of an university are not built only as a set of studies and tests, but these activities are inevitably intertwined with the university’s organization and its information system;
- In an academic context, not everything concerning teaching: for example, the entire faculty is more than a container of degree courses and a degree course is more than a container of lessons.

To answer these (and others) needs it was necessary to find another founding metaphor, which had at least three basic characteristics: to be general, suitable to support the cooperation processes and capable of modelling in an adequate way the organizational realities of an educational institution. This metaphor was found in the concept of virtual community. The system that arose, called Online Communities [21], was born in 2003 and runs in February 2005. It is still the platform in use at the Faculty of Economics and at other Faculties of our university.

The collaborative approach [4;5] is a very strong incentive for us for the development of Online Communities; the philosophy that led us to rebuild the system is to allow the exchange of users’ experiences within a virtual environment, and within well-defined areas known as “communities”. Our work started before the boom of web 2.0 [6], that has now invaded and changed the way people think and build services on the net.

The complexity of managing virtual communities is objectively quite different from that of a course. It requires a different approach also in the management of roles and permissions. There is an ever increasing need to provide, in the logics of integrating systems, a single moment of aggregation of the various services in order to enable subjects and systems
with different interests (if they are not divergent) to access the same object, acting according to their own competences.

The architecture of Online Communities is based on five fundamental classes: Person, Community, Role and Permission (Figure 1).

The combination of the roles and permissions defines the Profile for each user. The objective of the current version of Online Communities system was to create a collaboration space for people connected to the web, where it could be possible to widen the virtual space for relationships among the actors. The system is built around the metaphor of “virtual community”. The main characteristics of a community could be summed up as follows:

- Each Community avails itself of a certain number of services.
- The services are general applications that enable the users to communicate in synchronous and asynchronous way, to publish contents, to exchange files, to coordinate events, etc.
- The potential services of a community are activated by a manager of the community according to the needs, and the users of a community can use them with different rights and duties.
- The communities can be aggregated into larger communities with hierarchic mechanisms and infinite nesting levels.
- The communities can be aggregated in an arbitrary way into larger communities disregarding the possible position of a hierarchical structure.
- All users are recognized.

Therefore, the community is a container ready for didactic processes, but not only: research teams, recreation groups, friends, secretariats, board of directors, colleagues, anything that could be an aggregation of people around a scope using virtual spaces on the web. The core of the application is composed by some abstract entities, i.e., Virtual Communities as aggregation of People to which some communication services are available in order to obtain certain objectives. In detail, a virtual community [7;8], is a space on the web dedicated to a collaboration objective, populated by people who communicate among each other, using a series of communication systems. With this approach, it could be possible to represent all the hierarchical relationships between different types of communities (such as Faculties, Didactic Paths, Master Degrees, Courses, etc.).

Online Communities had been experienced with a limited number of users since 2003, and was released early in 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. At present the system has more than 1600 active communities, 10000 users and about 2 million unique accesses since November 2005 (see Figure 2).

### Figure 2. Online Communities access (November 2010)

#### III. THE INFLUENCE OF WEB 2.0 IN THE ARCHITECTURE OF ONLINE COMMUNITIES

A system such as Online Communities, that is to say a collaborative environment that wants to stimulate the participation and put to value cooperative work of the users, is an example of a computer support cooperative system dedicated to teaching/learning intended to extend its functionality to instruments of Web 2.0.

The term Web 2.0 [9] was used for the first time in 2003 during a brainstorming session between O’Reilly Radar and MediaLive International; in that occasion the term was coined following a reflexion on the evolution of the Web and the self-selection of the Web Applications after the collapse of dot.com companies. Error! Reference source not found. In contrast with what it may seem “Web 2.0” is not the definition of a neo-digital structure but only a label that identifies the evolution of the structure of the pre-existing global net in the “social” sense.

The advent of the Web 2.0 marked a clear shift from the mere “use” of the contents by the users, to the conscious and active new users involved even in the creation of the content. It has also changed the intrinsic characteristics of the users of the network; using the classification of Marc Prensky [10], the generations from the eighties are fully identified as Digital Natives [11] in opposition to Digital Immigrants. New users appear to be more demanding of online services and definitely geared to a lifestyle strongly connected to the network, citing Licklider [12] a vital symbiosis.

Around the idea of web 2.0 there is also the belief that this is the modern and digital expression of the concept of democracy. Classical LMSs used to manage normal didactics
of an academic institution, are seemingly at odds with the web 2.0 applications. In these systems the users do not have the same role, and the exchange of knowledge is not “democratic”. Nevertheless, web 2.0 approaches have recently received a greater attention in the field of e-learning applications; now it is very common to talk about “e-learning 2.0” [22]. The theoretical ideas behind this new approach are based, in many cases superficially, on educational theories that emphasize the social construction of knowledge; starting from the ideas of [13] (the learning as a phenomenon on proximity), through different interpretations of constructivism [14;15], the construction of Seymour Papert [16] to lead to the connectivism approaches of George Siemens [17], [18], [19]. It is not the purpose of this work to discuss the theoretical nature of learning; we are designers, developers and administrators of Technology-Enhanced Learning applications, and we want to concentrate on this context. We agree on the point that individual learning processes are not merely formal; they derive also from the phenomenon of “social learning” as well. But at the same time we believe that learning should be supported, or at least addressed, by a guide (e.g. a teacher, a tutor, etc.). Some differences exist between the cooperative approach connected to the web 2.0 logics and that one used by Online Communities. To overcome these differences requires a changing of the rules used in the virtual space is required, and these changes have a direct influence on the entire architecture of the system.

The cooperative virtual space of Online Communities is actually closed. Users participate in the system directly with their real identity. In fact a person who enters a virtual community of our system is authorized by the community administrator, and from that moment he/she is automatically in contact with the people inside the community. This is the pillar of the virtual community: I’m in the community because I share its scope. So I don’t have to declare, accept, or manage my contacts inside that community, and I’ll be connected to a friend of a friend of a friend. Of course, Online Communities allows the users to manage friends’ lists, but this is different from managing community members. The differences between “friends” and “community members” are much cut, and the user is allowed by the platform to manage these two different concepts. Given that the increase of the social interactions is not a negative aspect, but the risks deriving from the direct use of Facebook approach into an environment with different aims (something like “I’m a friend of a friend who was the friend of my friend…..”) is very high. The rethinking of the system with these ideas could change our community system to a sort of “community 2.0” system: we like to define it as a “Private community Environment” (PCE).

Those circumstances (lack of anonymity and control of the external accesses) have origin in two explicit requirements of our Faculty of Economics. The exclusion of anonymity is the result of a belief that normally indicates that the anonymity into virtual learning environment should be banned, so that the actors cannot shirk from their responsibilities. The second circumstance (accesses controls) stems from the will of a substantial number of teachers to block the publication on the network of their own courses’ Learning Objects. These choices made the system impermeable to the users’ social dynamics, or to the communities existing in the social networks.

To overcome these limits without affecting our Faculty requirements a radical change of the system architecture is required, that sees the person as a member of one or many more communities. On the other hand, in the web 2.0 applications the participants exist as individuals who, for example, can create themselves a specific community.

The difference between the two approaches is that the communities in our systems are created as an extension in the virtual space of real didactics, instead of web 2.0 approaches, where virtual communities emerge from the users’ interaction networks. We are aware of the clear phenomenon that is emerging from friends’ social network [20]; it is true that the action of adding a person to the friends’ list requires an approval, but it is also true that a user can see at any moment the people connected to his/her friends. On the one hand this opportunity could be positive, but on the other it can be critical within a learning context (within a university, but also within business contexts). On the other hand forcing web 2.0 services to become e-learning services in an e-learning platform is a hazardous operation: the result could be an evident loss of quality, confusion, workarounds and possibly users’ dissatisfaction.

Keeping the last observations into consideration, we decided to think about two different possible solutions, in order to achieve two fundamental goals:

- To make our system more permeable to all experiences that take place inside the web, including applications for social networking and Web 2.0 (very popular among users at this moment);
- Keep control, up to a certain level, of the actions taken by users of our system. In fact, the context within which we are connected to learning environments / or academic work, and not directly to leisure time.

IV. A POSSIBLE INTEGRATION BETWEEN COMMUNITY LEARNING AND SOCIAL NETWORKING

The problems connected to the evolution towards the web 2.0 environments are partly derived from the role given by the user to the system and the perceived purpose of the platform. This implies the need to reorganize the personal users’ virtual space; an evolution of the already existing personal spaces of Online Communities. In fact, the users now have a personal home page in which to access to their own communities, the subscription to others, the profile management, the events management and so on.
Following these approaches we need to drastically change the users’ personal home page and its services, building a Personal Learning Space.

As an example, when the user connects to the system, the user’s personal home page and its services are presented.

We are imagining the new users’ PLE as an aggregation of two distinct environments. The user will be free to decide what part of his/her relations and contents to import (into Online Communities) or export (to social networks applications). This solution required a strong review of many parts of Online Communities, and in particular the management of users’ roles and permissions.

This approach has different values, in particular regarding the teaching strategies; in fact exporting the contents outside an e-learning platform could accentuate the social role of the educational institution as a source of knowledge and of better didactic practices.

On one side, this solution gives to the user more freedom than into a classic LMS, but on the other side, it is more difficult for didactic institutions to be implemented. In fact, while the institutions are becoming a knowledge centre through the participation of its members, at the same time they are being exposed to the risk of the complexity and the personal relationships of its members.

According to this solution, it is important also to develop a new interface of the Personal Learning Space of each user; the metaphor of community makes possible to implement some interesting features, directly connected to the user and his/her list of contacts. In other words, this gives the possibility to the users to manage their own learning spaces. Each user has the opportunity to access to his/her personal page, which will contain personalized services. As a result, some interesting new services can be provided, for example:

1. access to communities where the user was registered;
2. view the most used services by each user;
3. access to contextual services for each community;
4. access to the personalized services;
5. add some services to the personal learning area.

The user can access to the list of communities where s/he is enrolled in, because this is the primary scope of this system. But together with this, the user finds a set of services that are typically connected to his/her own person, a sort of personal space within the system. The services are “general”, so in this condition the user will see services that are at “personal” level. This can be repeated and nested when the user enters inside a community: he will find (more or less) the same services, but this time these will be the services of that community, with different permissions, roles, list of contacts etc. A typical example is the Blog service: when I’m inside my PLS, the Blog is my blog, when I’m inside the community “workgroup XWZ”, the service Blog refers to the blog of that community: same service, totally different context and contents, totally different the role of the user could be. Finally, thanks to the inheritance mechanism among communities provided by the platform, the blog of that community can be merged with the blogs of parent community/ies, or with the child communities, or with sister communities (children of the same parent community).

V. WEB 2.0 AND COLLABORATIVE SERVICES INSIDE A LEARNING COMMUNITIES PLATFORM

Our system has a lifelong learning perspective: in fact, the objective is to provide a platform that could support the learning needs of each individual, from the first school experiences until the completion of work-cycle, and (why not) even further. The metaphor of VCs is sufficiently general to model different organizational contexts; at the same time, the use of the application in different context shows that different educational organizations can have different information needs.

For example, the users of the platform need to use a Learning Diary, a service that can list the entire mandatory (or not) activities inside a learning path. As in a Blog, the Learning Diary has the progression of time as building paradigm. As in the Blog, the Personal Diary should provide some mechanisms for content sharing (RSS, API, etc.) and a customizable interface (GUI aspects, content interface, etc.). The differences are in the purposes, functionalities and roles of each user. Definitely the difference lies in the organizational environment in which the diary is used. The first observation concerns the actors involved in the application. While in a social network context, all players have generally equal rights, in an educational space the equality does not exist. Online Communities has already a set of functions that are able to manage user’s rights/duties in a sophisticated way, in relation to their role in a specific community; this characteristic allows also the rights management of the "Personal Diary" service. There is an ever increasing need to provide, in the logics of integrating systems, a single moment of aggregation of the various services in order to enable subjects and systems with different interests (if they are not divergent) to access the same object, acting according to their own competences.

A second question concerns the rationale for writing a diary. In an academic context, a personal diary is the ideal tool used by a teacher to keep track of all topics covered during a
course. It is possible to enrich the service with the download of Learning Objects (LO) enriched with notes, comments, reports of websites and readings. What is essential is that the diary written by a teacher is useful to the work of students. In a high school, the context is more prescriptive. The usual claim is that students study at home what was discussed in the classroom. Normally it is required to perform a documented work, i.e., home works. The Personal Diary of a teacher should then be enriched with the assignments function.

A third question concerns the share level of the personal diary. In an academic context, a professor who uses the diary as a record of his/her activities normally has no cooperation ties with other professors. In high schools, the things are quite different: didactical activities are organized in different topics involving different teachers. In this context, the diary should be shared with the other teachers that have to collaborate on the same material.

These differences make the "Personal Diary" a service full of many facets. Fortunately, the autonomous development and management of the system allows us to implement services that can be adapted in a more “custom way” to the reality in which we are concentrating than other types of educational software. Personal Diary is exactly one of these cases: the main goal of this service is to allow to each user to manage a personal space inside the system where to annotate lecture notes, where to upload personal documents (slides, exercises etc.), being able to track activities performed by students. On the other side, the teacher has the possibility to create a personal diary connected to one community, inside which to be able to record the activities performed together with the respective material. The combination of these two approaches can be interesting and allowed us to develop new functionalities to our platform:

- Managing the delivery and execution of tests / homework;
- Managing the collaboration among different users of the community during the execution of homework;
- Verifying the results of homework supplied to users, proceeding to the evaluation.

In this context, particularly useful is the service that allows different collaboration services among users of a community, aimed to complete an assignment and combined with the inheritance mechanisms available in the platform. For example, different projects are assigned to different groups (sub-communities) of the course community. The different workgroups can organize their tasks inside the system, subdividing the tasks to fulfill and then reporting within the parent community. The personal diary service, thanks to inheritance and permissions, can aggregate the different personal diaries of the various subgroups, thus providing a unified view of material / activities to the responsible of the parent community.

We could classify this sharing mechanism as a “transversal” sharing: all the information are not closed inside a unique place (or service), but are more permeable along the entire platform. This mechanism is very useful also in other well-known services.

The wiki, for example, is a classic web 2.0 service that could increase its potentials when encapsulated into a virtual community’s paradigm. The opportunity offered by Online Communities to organize the communities into hierarchical structures, makes it possible to easily implement solutions in which several wikis, result of the collaboration internal to the community members, are to be integrated into a more complex structure of a superior level. In this case we are talking about the super-wiki of a father community, capable of collecting into a single shared container the wiki of the sub-communities (fig 4).

CONCLUSIONS

The paper discusses the role that social networks can play in educational settings, specifically the elements that in our opinion transform these virtual spaces in non-suitable environments for e-learning. For this, 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 experience in the university context and later (the last four years) also addressing our local public administration, allows us to make some comments on the most useful services for our users. In particular, it was observed that the needs of two users groups are, in some cases, radically different, and this is also tied to the habits of the two groups. In the case of the university’s users, in fact, what is required by students is primarily regarding:

- Download of course material of the lessons;
- easy access to all course content
- access to more social services and, in some cases, to services disconnected from the purely academic environment.

To answer to the third reported case we started the development described in this work; however this improvement is not restricted only to the university context. Even in the public administration there is an increasing need to make a personal professional (or learning) space available to its employees, in which store the teaching materials used in class, manage their time and their activities, communicate with the colleagues of the course to carry out projects or homework.

However, besides these features, during the experimentation carried out in recent years, public administration users have shown very clear some needs:

- Easy access to an online lesson. At the moment, we have realized the system as a SCORM-compliant platform, allowing the use of SCORM-compliant material. The “educational path” service has also being published, which allows the use of the course completely online with branches, questionnaires, integration with other students, and mostly with features that overcome the SCORM player weaknesses (like statistics collection).

- Access to the complete statistics of user activities. The platform allows the analysis of usage statistics about each service, including custom modes, with the aim to certify the activities of each participant during a course.

- Possibility, for the participant, to have a permanent tutorship by the teacher during the progress of the course, even in online mode.

In this case we are providing two services: the first is the teacher’s appointments management and receiving students (learning meetings) and the second (more related to the resolution of technical problems), is a service that supplies ticketing management system in order to manage the problems that the users of the platform could find.

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