Summary of an experience of designing, carrying out and managing a Learning Management System

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Extended Abstract

The paper presents our team's almost 15-year-long research experience on LMS design, implementation and management. Every software system requires a so-called "business model". In other words, 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 LMS 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 system imposes limits on how the task for which the LMS is designed will be conducted.

The system that is analyzed in this contribution was developed at university for blended teaching some 15 years ago. 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. 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.

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. 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.

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*, 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 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 entities: *Person*, *Community*, *Role* and *Permission*. 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.

Over the last few years the system has evolved into a platform for professional training orientated to LLL 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 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. 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 thextende 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 educational 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. 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 5.000 active communities, 16000 users and more than 2.5 million unique accesses since November 2005 (see Figure 1), with an increasing trend.

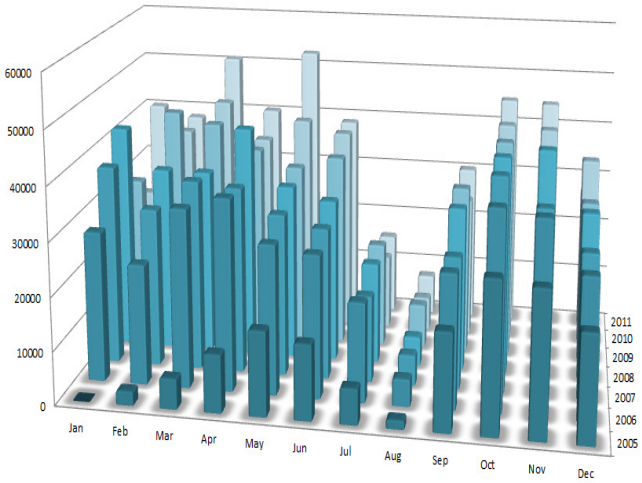

Figure 1. Online Communities access (19th december 2011)

The evolution that Online Communities is going through implies an increased implementation complexities respect to "simple" LMS settings, considering that the differences between the two approaches according at least four dimensions:

1. *Temporal*: the concept is amplified on larger spectrum, that is to say, the life of the subject, not necessarily dependent on schooling or university studies.
2. *social*: the platform could be used in social contexts of totally diverse life-long learning, even in conflict with each other. Let us take as example subjects who, while interested in continuous learning, change the country of their residence, company where they work, training needs, etc.
3. *spatial*: the place where the learner is conditions the modality of the supply of training iter and situated learning. Let us think, for instance, at the various learning needs of a person responsible for maintenance, or a medical doctor when facing an emergency case, or a tourist in front of a work of art in a museum.
4. *anthropological:* the subject uses the platform in completely different life periods; starting with pre-school age until the end of working activity and, not to be excluded, even beyond. The problems linked to these aspects represent something extremely stimulating and as yet unexplored, as it is clear (and first evidences are emerging) that our social and even mental behaviors are affected by technologies in general, and social media in particular.

Considering these observations linked to the approach of lifelong learning, meaning that, if the prospect of e-Learning offered by continuous training is extended on the temporal horizon, the architectural choices and the services supplied by the new platform are in need of complete re-engineering, in quantitative terms (dimension of personal space) as well as in organizational terms (services supplied, utility of management, updating and erasing, historical change of context, etc.); the changes must follow a careful analysis that takes into consideration various aspects:

- The system will operate on a territorial basis and in a context characterised by solid co-operation among the citizens.
- The system should be able to guarantee temporal continuity of the training experience which goes beyond the single case of training and ideally is extended to at least many years.

There is also another delicate problem be taken care of, that could be called "persistence of digital data"; reasoning along very long temporal scales, the moment a user utilizes several platforms in the course of his/her life, starting with compulsory school up to the last training activity in a working environment, a series of digital information will be stored inside very different systems:

- the unique identification of the subject through the different systems: this is particularly compelling, and is a hot topic today followed mainly in the Semantic Web field, with initiatives like OpenID (http://openid.net) or Okkam (http://www.okkam.org) projects
- the unique identification of the different systems and institutions where the subject followed teaching or collaboration activities: here we have the problem of mortality of educational institutions, that change name, site, mission etc.:
- the accounting system concerning the various taxes, enrolments, records etc.,
- the system of making public diploma or degree assignees, and in general the system of issuing certifications related with training
- Information concerning not only learning in the strictest sense, but intrinsically correlated to the learning environments consulted by the user during his/her career, that are a wide source of information.