

Contributions of Online Social Networks for E-Learning

October 2010



Filipe Miguel Ribeiro Sabino

Contributions of Online Social Networks for E-Learning

DISSERTATION

regarding the research work leading to
the degree of

MASTER OF SCIENCE

in

INFORMATION SYSTEMS AND TECHNOLOGIES

by

Filipe Miguel Ribeiro Sabino



NetGNA - Next Generation Networks and Applications Group
Department of Informatics
University of Beira Interior
Covilhã, Portugal
www.di.ubi.pt

Copyright © 2010 by Filipe Miguel Ribeiro Sabino. *All right reserved. No part of this publication can be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the previous written permission of the author.*

Picture on the cover: University of Beira Interior Heraldry.

Contributions of Online Social Networks for E-Learning

Author: Filipe Miguel Ribeiro Sabino
Student N^o: m2975
Email: fsabino@gmail.com

Abstract

The emergence of Web 2.0 offers users the opportunity to not only see but also introduce new content and interact with the authors of original content and other users. The structure of the Web 2.0 offers an online space for groups of people with common interests to share experiences and information. Today, websites such as online social networks are extremely well known worldwide, with more users each day. The concept of Web 2.0 is based on these sites, encouraging the creation of collaborative environments of sharing among its users. Such concepts are extremely interesting when applied in an academic environment. The use of e-learning platforms have become widespread, however, such systems tend to be mostly mere repositories of content and are not stimulant systems for students. Concepts such as community, relationship and sharing, present in online social networks will be important in shaping the learning process of the student, making him an active element in this process by encouraging his critical spirit and his ability to solve problems.

Jury:

President: Prof. Dr. Pedro J. G. Araújo, D. I., University of Beira Interior
Supervisor: Prof. Dr. Joel J. P. C. Rodrigues, D. I., University of Beira Interior
Examiner: Prof. Dr. António Manuel Duarte Nogueira, D. E. T. I. , University of Aveiro

Acknowledgments

In the course of this work many were the people who stood out for their support. My thanks to Professor Dr. Joel Rodrigues for the support and guidance during the course of work. I also would like to thank my colleagues at NetGNA, especially Tiago Simões for his collaboration and help provided. To my friends, thank you for your patience and help, particularly Mariana Damasceno and Rui Paulo. And finally a special thanks to my parents and family, always present at all times.

Filipe Miguel Ribeiro Sabino
Covilhã, Portugal
October 2010

Contents

Acknowledgments	iii
Contents	v
List of Figures	vii
List of Tables	ix
Acronyms	xi
1 Introduction	1
1.1 Online Social Networks and E-Learning	1
1.2 Thesis Motivation	1
1.3 Objectives	2
1.4 Main Contributions	3
1.5 Document Organization	3
2 Related Work	5
2.1 Introduction	5
2.2 E-Learning	6
2.3 Personal Learning Environments	7
2.4 Social Media	8
2.5 Online Social Networks	8
2.5.1 Online Social Networks in Schools	12
2.5.2 Contributions of Online Social Networks for E-Learning	14
2.6 Integration of Online Social Networks in E-Learning Platforms	17
2.7 Interoperability - Communication Between Systems	18
2.8 Self-Regulated Learning	19
2.9 Personalization - Manipulation of Learning Contents	21

3	Analysis and Construction of Share&Learn	23
3.1	Benefits of Collaborative Learning	23
3.2	Requirements Analysis	24
3.3	Technologies Used	25
3.4	Use Case Diagrams	28
3.5	Class Diagrams	31
3.6	Database Model Diagram	34
4	System Demonstration and Validation	37
4.1	PLEBOX - Personal Learning Environment Box	37
4.2	Share&Learn	39
4.2.1	Wall	40
4.2.2	Groups	41
4.2.3	Links	42
4.2.4	RSS - Really Simple Syndication	43
4.2.5	Chat	44
5	Conclusions and Future Work	47
5.1	Conclusions	47
5.2	Future Work	48
	References	51

List of Figures

2.1	Interaction between the e-learning platform and online social networks.	6
2.2	The Web 2.0 community.	9
2.3	Online social networks, blogs and wikis functionalities.	15
2.4	Collaborative e-learning environment with online social networks.	16
3.1	Microsoft Visual Studio 2008 start page.	26
3.2	Microsoft SQL Server management studio express.	28
3.3	Wall use case diagram.	29
3.4	Groups use case diagram.	29
3.5	Links use case diagram.	30
3.6	RSS use case diagram.	30
3.7	Chat use case diagram.	31
3.8	Class diagram - Classes that inherit from the object class.	31
3.9	Class diagram - Classes that inherit from the page class.	33
3.10	Class diagram - Classes that inherit from the datacontext class.	33
3.11	Database model diagram.	34
4.1	Environment of the PLEBOX.	38
4.2	PLEBOX modules management.	39
4.3	Ilustration of the wall.	40
4.4	Selecting a group to filter the visible posts.	41
4.5	Ilustration of the groups module.	42
4.6	Ilustration of the links module.	42
4.7	Ilustration of the RSS feeds module.	43
4.8	Ilustration of the chat module.	44

List of Tables

2.1	Summary of e-learning platforms main characteristics and contributions from online social networks.	18
-----	--	----

Acronyms

ANSI: American National Standards Institute

ASP: Active Server Pages

CEIL: Collaborative Inquiry and Experimental Learning

CLR: Common Language Runtime

CMC: Computer Mediated Communication

CSCL: Computer Supported Collaborative Learning

CSS: Cascading Style Sheets

DWP: WebPart Definition File

HTML: Hypertext Markup Language

HTTP: Hypertext Transfer Protocol

IDE: Integrated Development Environment

LCMS: Learning Contents Management Systems

LMS: Learning Management Systems

OSN: Online Social Networks

PDA: Personal Digital Assistant

PLE: Personal Learning Environment

PLEBOX: Personal Learning Environment Box

RIA: Rich Internet Application

RSS: Really Simple Syndication

SAIL: Scalable Architecture for Interactive Learning

SMS: Short Message Service

SOAP: Simple Object Access Protocol

SQL: Structured Query Language

SRL: Self-Regulated Learning

T-SQL: Transact-SQL

TDS: Tabular Data Stream

URL: Uniform Resource Locator

VLC: Virtual Learning Communities

XAML: eXtensible Application Markup Language

XHTML: eXtensible HyperText Markup Language

XML: eXtensible Markup Language

XSLT: Extensible Stylesheet Language Transformations

WPF: Windows Presentation Foundation

WWW: Worl Wide Web

Chapter 1

Introduction

This chapter is an introduction to the topic under study. The objectives to be achieved with the completion of this work are presented and also the main contributions that resulted of its construction. Finally the organization of the document its presented.

1.1 Online Social Networks and E-Learning

The emergence of Web 2.0 has transformed the web into a more dynamic and interactive environment, offering a set of tools that enhance contact and collaboration between users. Several applications, such as online social networks (OSN), wikis and blogs, support such Web vision. This paper elaborates on the tremendous potential of OSN to enhance e-learning experience, creating an atmosphere of cooperation and easy interaction among users (teachers and students). A traditional learning content management system is rigid in nature, limiting the student learning process. As a result, the concepts of community, relationship, and interaction among users are needed to overcome its limitations. This contribution addresses the evolution from the traditional learning management systems to a new conceptual learning approach, using personal learning environments.

In recent years technology dedicated to learning in various forms, has emerged as one of the largest applications of the world wide web. Learning technologies and tools from educational simulators to discussion forums or intelligent tutoring systems have changed the way of learning and introduced new opportunities to develop the learning process. Learning networks and social learning in the context of web 2.0 supports new forms of collaboration and communication and integration of learning.

1.2 Thesis Motivation

This work is part of a project aimed at constructing a new e-learning platform. This platform should meet the standard features currently available on similar platforms, necessary for the development and management of the learning process, but also bring new ideas and concepts such applications to reflect current trends in Web 2.0 and provide a more collaborative and

active type of teaching, reflecting the evolution that the world wide web has undergone in recent years.

Several phases of work were drawn starting with the analysis and assessment of the project needs. Survey the main existing platforms in order to identify and meet their key features. This analysis will make a survey of the best formats to be integrated into the new platform. Review the technical requirements necessary for integration of mobile technology in the project, as well as recommendations for Web content accessibility defined in the Web Content Accessibility Guidelines 1.0 from the consortium for the web W3C, so as to gradually implement the accessibility of the system to blind people. Analysis of the recent technologies of Digital TV in order to be integrated into the system as outputs.

This analysis will examine the characteristics needed to improve the communication between the user and system to make it as close as possible to the real needs of users in terms of learning. Also, identify the best potential mechanisms of collaborative learning and exploring the points defined in the improvement of component-sharing knowledge and information, identifying the strengths and weaknesses of systems in terms of usability, based on concepts of human-computer interface.

So it's intended to create a platform with the following modules: communication with technology and digital TV; import and export data from other tools CMS; intelligent tutoring, communication with mobile technology: PDAs and smartphones, import and export of data with human resources management tools; integrating tools of for stimulating collaborative learning; integration with mechanisms for voice transmission and web-conference.

The term e-learning is seen normally as learning through the computer. To support this type of learning, in recent years, have been built several tools, commonly known as Learning Management Systems (LMS). An LMS is an application system dedicated primarily to the management of students and their learning activities, with collection of data on its progress along the learning process. Normally that process occurs at the distance using the Internet. Some LMS changed and added many features of management of learning content (LCMS - Learning Contents Management Systems) that are used to manage electronic content for courses.

Recently in the context of what is known as Web 2.0 some applications have emerged that allow to maintain contact and communication between people, like Twitter or Facebook. Such applications are a growing group known as OSN.

This proposal aims to study the contributions of existing OSN for the LCMS and create a tool that would show these contributions on a platform of e-learning.

1.3 Objectives

The overall objective of this work is to study the contributions of existing applications, known as OSN for the LCMS. Thus, it is intended to achieve the following objectives listed below.

- Identify and conduct a review of applications of existing OSN and identify their contributions to the e-learning systems

- Identify the tools and build a system that allows to demonstrate these contributions in a LCMS
- Create an application that allows users to share information in a collaborative environment in order to enhance their knowledge and provide means for them to better manage their learning process.

1.4 Main Contributions

This work, which aims to identify the potential contributions that the current OSN can have on e-learning systems, carried out a survey and study of these networks and identification of its main features. This analysis identified a group of features of the OSN that due to its characteristics which foster the creation of collaborative environments, that are optimal for the development of the student learning process.

The constructed application has as contribution encourage communication and collaboration between students and teachers on the platform. It is encouraged to share knowledge with colleagues. It made possible the sharing of information in OSN, thus reaching a much wider range of people, many different occupations and different academic, which potentiates the acquisition of eclectic points of view.

The main contributions are the creation of a space for sharing information among students in a e-learning platform. This space is mainly intended to encourage interaction and sharing of information between users, thereby enhancing the development of the learning process and encouraging the use of collaborative working environments. Other contribution is to establish the bridge between the e-learning platform, an area normally closed to its group of users and the users of OSN. This link allows users to share information with a much larger group of people, thereby enhancing their educational experience.

1.5 Document Organization

The document is organized as follows. Chapter 2 describes the concept of e-learning and makes an analysis on major OSN that currently exist. A reflection is made on the potential that these networks may have in the current educational system. Are also presented some concepts such as personal learning environments and self-regulated learning. Chapter 3 presents the analysis for the application construction. It lists the system requirements, the use-case diagrams, class diagrams and the database model diagram. In chapter 4 the PLEBOX platform is presented and explained the integration of new modules. Then the developed modules for the platform are presented and its validation is demonstrated. Finally chapter 5 presents the conclusions and some suggestions for future work.

Chapter 2

Related Work

This chapter reviews the literature on e-learning and OSN. Some of the major OSN that currently exist are described, enhancing its main characteristics, that may be of interest for the development of the learning process of a student using a e-learning platform.

2.1 Introduction

The traditional World Wide Web (WWW), proposed by Tim Berners Lee in 1989, was based on static websites, where information was available for browsing without user interaction. The creation of Web 2.0, came to break with that paradigm, offering users not only the opportunity to consult, but also introduce new content and opinions on existing ones, as well as having a direct interaction with the authors of original content and other users. The structure of Web 2.0 provided online spaces to groups of people with common interests, whether personal or professional, where they share information, opinions and experiences on a variety of issues [28]. These new types of services enhance the relationship between individuals and information sharing in an environment of mutual collaboration [1]. In terms of e-learning, characteristics offered by Web 2.0 are very important because students no longer have a passive role. The possibility of editing and posting new content, as well as participate in discussions with other students (learners) and teachers about subjects under study pushing them to have a more active role in their learning process.

The use of the available telecommunications networks, and the information and communication technologies in education is a key element in the process of changing the current school and education system have undertaken. The school needs to maintain a harmonious connection with the society in which it operates, and adopt teaching and learning approaches that follow the new social reality. The new information systems should be able to adapt to these changes, answering the needs of the new school community contributing to the promotion of learning environments that are richer in information content and in situations of interaction and collaborative learning [35]. Communication and information technology and more specifically, the Internet, play a key role in the innovation process. It occurs, not only as a form of entertainment and information searching (management or teaching)

but also in the process of management, and to the level of public disclosure of information through web pages, which begin to be very common in many schools.

The Web 2.0 is the most powerful information technology that exists today. It will bring into the classroom experiences such as interactivity, interdisciplinarity, social interaction, a cultural perspective, a certain kind of experience otherwise unavailable but necessary for active construction and harmonious knowledge. By allowing access to vast amounts of information in various formats, in other way materially impossible to gather in one place, the Internet becomes a global resource center, at the distance of a mouse click. This new technology will thus facilitate the processes of teaching and learning, fostering educational success, stimulating knowledge sharing and reflection, developing and expanding the educational system Facebook. Figure 2.1 shows the potential of Web 2.0 and, more specifically, the online social networking for e-learning.

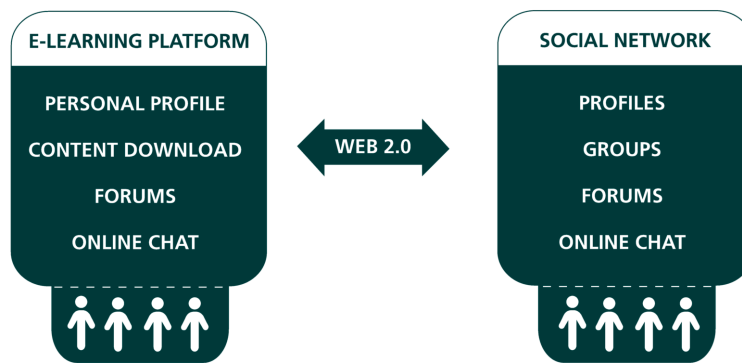


Figure 2.1: Interaction between the e-learning platform and online social networks.

2.2 E-Learning

E-Learning may be defined as the use of Internet technologies to provide, at the distance, a set of solutions for the improvement or the acquisition of knowledge and practical applicability of the same [3]. The teaching-learning process is being more supported by technological resources that offer different ways of communication between persons, using sophisticated educational software applications. The main advantage of e-learning is that it can be used regardless of time and location.

One of the main problem on e-learning is the lack of ability to stimulate student participation continues until the end of the course. This fact is the main reason why today's forms of e-learning are more oriented towards communication and collaboration between students and teachers in the learning process [4].

Many teachers and researchers have proposed designs for e-learning platforms, described its implementation and shared experiences in different e-learning environments. There are some differences between e-learning environments and traditional classrooms. The different e-learning environments must be tailored to different uses. In [17] it's pre-

sented an e-learning environment that attempts to solve the problem that most e-learning environments have, lack of interaction between students. The interaction and collaboration among students plays an important role in e-learning. Collaborative and interactive functionality should be available to students to improve learning effects [39].

Currently, we have a rapid evolution of Internet connections and a significant improvement of information and communication technologies. These factors turn the Internet an extremely important way of conveying information to students [2]. As a result, the development of software platforms to aid and assist the learning process has become a necessity and plays a key role e-learning. These applications are referred to as learning management systems.

A learning management system is an application software dedicated to the management of all the tasks of online courseware. They are engineered to help teachers delivering course content and tracking student's progress. In such a platform, a student can download course material, interact with his teacher, participate in discussions, and submit homework assignments. One of the main problems of learning management systems is the lack of high quality systems specifically designed to the needs of both teachers and groups of students [5, 30].

A virtual learning environment that integrates the features of Web 2.0 has great potential to innovate and improve the existing e-learning platforms, fostering social interaction and knowledge sharing among their users. However, it is needed to adapt the structure of informal knowledge sharing of existing social networks to a formal system of education with the definition of curricula, content development, and objectives to be achieved [6].

2.3 Personal Learning Environments

The concept of personal learning environment (PLE) is based on the development of social software applications. A PLE is a tool that allows the user to insert him/her in a set of networks, services and resources in a distributed environment, populated by those applications that define Web 2.0. A PLE seeks to provide tools to support education as a continuous learning process [10, 38].

A PLE is not an application but the description of the learning process through the tools and resources used by the student. Throughout the process of learning a student will have at its disposal a variety of resources according to their needs, resources, which he/she must manage in order to enhance his/her learning by using all available educational technology [10].

Web 2.0 includes applications such as OSN, wikis and blog environments that foster sharing and collaboration between users. It provides the student with the means to gather information and communicate with others who share the same interests. All these tools and capabilities allow students to build their own PLE, managed by themselves, in order to improve and facilitate their learning process [29]. Each user can define a PLE as the set of all Web services that allow students to produce, store, and access information about their learning process and share that information with others.

2.4 Social Media

Web 2.0 is composed of a set of applications used to create, deliver and share online content, whether is text, images or video. The set of contents and applications it's called social media. The set of applications and content that can be understood as social media are listed below.

- A category of sites that is based on user participation and user generated content. They include, for example, social networking sites like Facebook and MySpace.
- User created text, photos or multimedia content that are published and shared in a social environment.
- Software tools that allow users to generate content and engage in peer-to-peer conversations and exchange of content

There is a wide variety of social media, ranging from social sharing sites such as youtube and Flickr through OSN such as Facebook and LinkedIn. There are a set of principles that define social media [19] and set it apart from other form of communication and collaboration, they are listed as follows.

- Participation - The participation of the community is essential to benefit from social media. Without user participation there is no social media.
- Collective - Instead of creating and sharing content, with social media, people collect around a unifying entity to contribute with more content.
- Transparency - social media content is visible to all users in order to be seen, shared, used and augmented by all of them, in a collaborative environment.
- Independence - Users may create and share content everywhere and any time no matter whomever else is also posting content.
- Persistence - The content shared by users is available to other in a persistence state so they may view, share and augment it.
- Emergence - It is impossible to predict and control all human collaborative interactions and optimize them. One of the benefits of social media is the emergence of an environment for social structure which may be organizational structures, work processes, content organization and more.

2.5 Online Social Networks

Nowadays, websites such as Facebook, MySpace and Twitter are well known worldwide and used on a daily bases by millions of people. They contribute to this new vision of Web

2.0, a new conceptual Web approach, based on software platforms with the enhancement of concepts, such as, community, relationship, and interaction among users. In Web 2.0 a user acts as a content contributor. This contribution is made in an atmosphere of trust and collaboration with other users. Web 2.0 is composed with small applications that allow interconnecting with each other, thus promoting sharing and socialization [1]. Figure 2.2 illustrates an example of people's distribution by some websites that make up the Web 2.0.

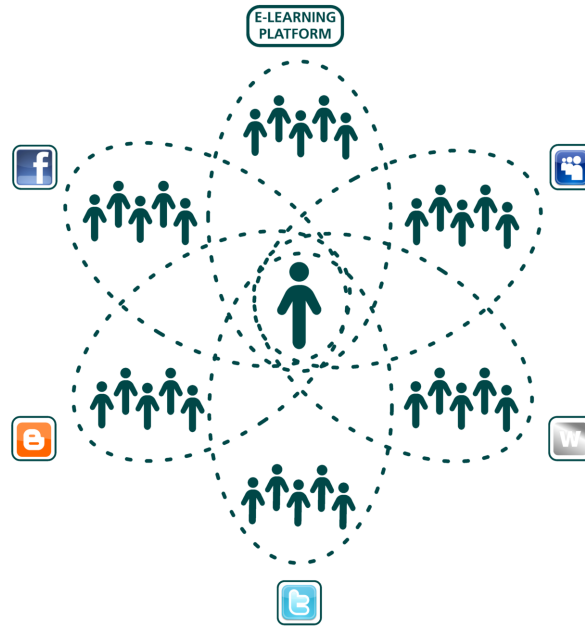


Figure 2.2: The Web 2.0 community.

Among the principal functionalities of social networks stands out the following: networks of friends, profile visiting, private messaging, communities and discussion forums, events management, blogging and media uploading. These main features help to improve the connectivity between people for social and professional purposes [7].

Online social networking appears as an approach to support emotional and professional relationships of human beings among themselves or between their groups of mutual interests [40, 41]. The network is responsible for ideas sharing among people who have common interests and objectives as well as similar values to be shared. Thus, a discussion group is composed of individuals who have related identities. These social networks are mainly located on the Internet because they provide an excellent communication channel for ideas being circulated and absorption of new elements in search of something in common.

Despite all these features, most users use OSN as a list of contacts. Then, this characteristic became its main feature. Usually, users accept connections, often from unknown people, just to increase their list of friends, but having no more interaction with these people. This behaviour turns the existing networks with little use to something more productive, and

the daily usage is very low. OSN are excellent to connect people to each other, but offer no reasons for these connections rather than others. Thus, many connections became meaningless. Another problem related with social networks is its inherent characteristic for working alone, without connections to others, forcing users to redefine their profile and build their contacts list again when they register in a new network.

OSN have become an important tool of aggregation of people with common interests. However, there is also the negative side of such networks as privacy issues and moral integrity of certain users. Some people hide behind false identities and exploit this fact to spread racist and xenophobic ideas and to contact potential victims for their crimes.

Nowadays, there are numerous OSN. The choice for the user is quite extensive. The most common are generalist networks and their main features include personal profile creation, uploading of photos and videos, participation in groups and message sending. They attract millions of people around the world, resulting in the creation of networks with an atmosphere of sharing and collaboration. Some of the best known are the following: Facebook, MySpace, Friendster, badoo, bebo, hi5, Hyves (Netherlands), ibibo, Kaixin001 (China), Meetup, Mixi (Japan), Multiply, NaszaKlasa (Poland), Netlog, Odnoklassniki (Russia), Qzone (China), Renren (China), Skyrock (France), Brazil (Latin America), StudiVZ (Germany), Tagged, Taringa! (Argentina), Tuenti (Spain), V Kontakte (Russia), and Windows Live Spaces.

There are also other networks with more specific character such as Buzznet and Last.fm dedicated to music, devianART dedicated to the dissemination of art, LinkedIn and Xing as dissemination networks of professional profiles, YouTube and Metacafe networks, for video sharing, and Flickr and Fotolog networks as photo sharing sites. Furthermore, there are others to create blogs like Blogger, LiveJournal, My Opera, and Xanga, and microblogging websites such as Twitter and Tumblr, and even a website called Ning that allows users to create their own social network. Following, we describe with detail some of the most relevant OSN taking into account their huge number of users and their contributions to enhance e-learning experience.

Facebook

Facebook is a social networking site launched on February 4, 2004. It was founded by Mark Zuckerberg, a former student of Harvard University. It was initially designed only for students of that university. However, the list of members quickly spread to other universities. It is currently one of the most visited sites around the world. Facebook users have the main following features available: the creation of a personal profile with their personal data; the possibility of uploading photos; creation of lists of personal interests; private and public messaging; and participation in groups of friends. All these features have a common requirement - to have friends. Users can import their lists of contacts from an eMail account in order to invite their friends to join them in their network of friends.

Applications are one of the most interesting features of Facebook where user can execute a program in his/her user's area. There are many types of applications available, but the most popular are games and quizzes. All of them are designed to enhance the sharing between friends, whether by posting comments, comparing results or sending gifts. Users

of Facebook develop many of these applications. For this purpose, Facebook team as made available a development kit for anyone who wants to give wings to their imagination and create applications for the Facebook.

Facebook and E-Learning

Due to the current large expansion of Facebook and its threaded discussion capability, Facebook as a lot of potential as an application to included in an e-learning platform. It allows user to access and comment friend's posts in almost real time. The user home page is constantly being updated with information related to his/her list of friends, such as, profile updating, new photos uploading, adding new friends, or comment posting. This allows the users to keep up to date on their friends, depending of course, the information provided by them. This feature can be very useful in an e-learning environment, allowing students to keep updated on a particular course.

Twitter

Twitter is a social network that was established in 2006 by Jack Dorsey. Until today it is gaining an extensive prominence and popularity, and now, it is one of the 20 most used sites in the world.

It is social network of microblogging that allows its users to publish text, up to 140 characters, and read updates from other contacts. Updates are published in real time on the user's profiles, getting immediately available to their followers. These messages can be found on the official website or via Really Simple Syndication (RSS) or short message service (SMS). The users manage the visibility of these messages, and either may be available only for their personal network of contacts, or for the entire network of Twitter.

Currently, companies also use this resource as a means to advertise their products, through constant updates and providing links to external pages where people can find detailed information about the product. Twitter allows a close proximity between users and, therefore, it is an excellent mean of advertising dissemination.

MySpace

MySpace is a social network very similar to other networks such as hi5 and Facebook. It provides basic functionalities such as profile creation, creating or joining interest groups, upload photos, participate in discussion forums, private messaging, among others. However, it stood out from the others by being able to upload music files. This feature has made MySpace very popular among musical artists, who began using MySpace to create their personal page. Another important feature is the ability to edit the hypertext markup language (HTML) of the page. Thus, for users with minimal technical skills, the customization of their space is allowed. There are two types of profiles, the normal and the musician profile, that allows uploading several songs. This feature greatly helped to increase his popularity, becoming a well-known platform for artists' promotion.

YouTube

YouTube is a website for sharing video, which allows users to upload and share videos in several formats. In addition to the display, users can add comments and ratings on the watched videos. The contents of the website cannot be download, however, it is available a feature that allows the embedding of a YouTube video on an external website. Then, it allows the video watching from that site. YouTube has revolutionized the Web and the Internet, because prior to its emergence, there were no easy ways to share videos. With an easy and intuitive interface, YouTube allows anyone to upload his/her own content online.

Blogs

A blog is a website that provides content related to a particular topic, where content can be placed by one or more users. This website is managed by the user who decides what may be published and make available the content presented. The site is accessible to anyone, who can see and write individual comments for each post provided by the blog administrator. These comments will be approved or not by the administrator. Once approved, they are visible to all visitors who may add more comments to those already existing. The contents are usually arranged in chronological order, with the comments accessible from each post. This type of architecture allows interaction between users, managed by the blog administrator.

Wikis

A wiki can be defined as software that allows editing documents or pages in a collaborative environment between users. A wiki can also be defined as a set of pages. The wiki users can edit pages and it does not require approval by a third person to be published. The editing and consultation is done through a common Web browser. One of the main features of wikis is the ease pages creation and modification, allowing users a high degree of interaction between them. What distinguishes wikis from other websites is that all users who require it can edit Web pages. This characteristic makes wikis ideal for use as a learning tool, since it encourages collaboration and sharing of information between users in a collaborative environment.

2.5.1 Online Social Networks in Schools

Nowadays the use of OSN are largely embedded in the lifestyles of teenagers and young people around the world [34]. Time spent with the web 2.0 applications already rivals the time spent watching television per week. Between the main occupations of users with such applications we have online chatting, text messaging, blogging and visiting online communities like myspace or facebook. According to [18] a large majority of young students who use such services, said that one of the most common topics of conversation in the context of social networks is education. These networks of friends, allow young students to discuss issues related with education and more specifically with their homework. However most schools today have rather restrictive access policies in relation to the use of OSN during school hours. Although both teachers and parents accept that OSN can have a positive role

in developing the learning process of students, in a time when teachers often request homework which requires the use of online resources to be developed and completed. Thus, schools should reconsider their policies and explore ways to use the potential of Web 2.0 for educational uses.

In recent years there has been an enormous growth of content created by students in OSN. Through text, music, photos and video, students express themselves by creating and sharing content online. While the use of OSN is very important in the lives of students, schools are much more cautious with this issue. Mostly, schools have a very restrictive set of rules about the use of OSN. However, it begins to exist some openness to this type of functionality from schools, both in the use of these resources in some activities performed by students during school time, either in the teachers' participation in activities of professional content such as online communities for teachers.

The school policies regarding the use of OSN indicate that they still are not convinced about the usefulness of networks as tools for communication and education. However, the expectations are great. Many schools as parents, have strong expectations regarding the role that these resources can have on the lives of students. For these expectations are realized, it will be necessary to have an educational purpose and value in use of OSN in schools.

Parents and communities expect schools to take advantage of all the potential of educational tools, including new technologies, in the developing of the learning process. The use of online social networking can be one of those tools, since using reasonable parameters of use and character compatible with the school's pedagogical view.

OSN are increasingly being used in business and higher education as tools for communication and collaboration. Thus, the schools, given their role in preparing students for the transition to adulthood, should recognize this fact and provide its students the ideal preparation for this transition be handled in the most effective and beneficial way to them. Thus are listed below some ways for schools to protect their students and provide a 21st-century education.

- Explore the OSN sites. Many adults, including teachers, are not so accustomed to this new reality as their students. In order to create policies for proper and profitable use, they must first have contact with the networks in question so that their perception of these tools is based on real experiences.
- Use OSN for communication between teachers and professional development. This type of use will lead teachers to identify the added value of these tools and adapt them to their use for the education of their students.
- Find ways to leverage the value of OSN in support of education. The use of chat-rooms, instant messaging, blogs and wikis to help on homework can encourage students to participate in collaborative work environments.
- Watching the students who stand out in the use of such networks. Students who live more intensely the use of OSN tend to influence others in these activities, and are also less dedicated to traditional homework. By reaching these students and their interests, the teachers get a double benefit, be familiar with the possible new trends in network usage by other students and improve their academic performance.

- Reevaluate policies for OSN use. Many schools restrict the access to such resources. Security policies remains very important, as well as teaching students about online safety practices, however, the students learn these lessons better if they use OSN.
- Encourage companies responsible for networks to increase their educational content. The educational institutions should work together with businesses companies liable for OSN for the establishment of educational services and features explicitly in order to increase offer in this field and encourage its use.

2.5.2 Contributions of Online Social Networks for E-Learning

Nowadays, it is common to use learning management systems in universities around the world. However, these platforms are used mainly for administrative purposes and its educational impact has little relevance. Tasks such as accounting and users management, courses management and their content program belong to the main functions of e-learning platforms. For the educational perspective, students have the availability to check the content and they can interact with their classmates and teachers. However, the rigid structure of the common learning management systems, fail to stimulate the student's proactive participation in the development of the learning process and the subsequent resolution of problems.

There are several tools available to support e-learning. They comprise blogs, discussion fora, chats, file sharing, video conferences, e-Portfolios, and wikis. All of them can be used to support activities that involve the learning process. Some of these tools are integrated in several e-learning platforms under use. Figure 2.3 shows some of the biggest social networks today and its main features.

The use of social applications and OSN provides a different approach to e-learning than that provided by the use of learning management systems. The former enhances the student's personal definition of the learning process, as well as contact with a larger number of people sharing the same interests and goals [8].

Although most of OSN that currently exist have not been designed for educational purposes, they have certain features that may prove to be very interesting and important when applied in an educational context. The great social contacts that come from the use of an OSN enhance interaction and information sharing among its users [33]. Such sharing might encourage people to learn together, sharing views and content relating to the matters in question.

The use of OSN to support e-learning is part of an active and social type of education in which students are oriented to solve problems. The main points of the learning process are the self-regulated activities of problem solving. This takes an approach of social constructivism in which the student must steer his/her own learning process. This type of learning means that it is not possible to structure and pre-define the activities of the student through the learning process. Activities should start with a problem or a project, and it provides tools and resources that will support the student through the process to solve the problem [31].

The use of social software and OSN enable the student to the self-governed activities. Using its features as tools to access to a wide range of possible contacts and a flexible struc-

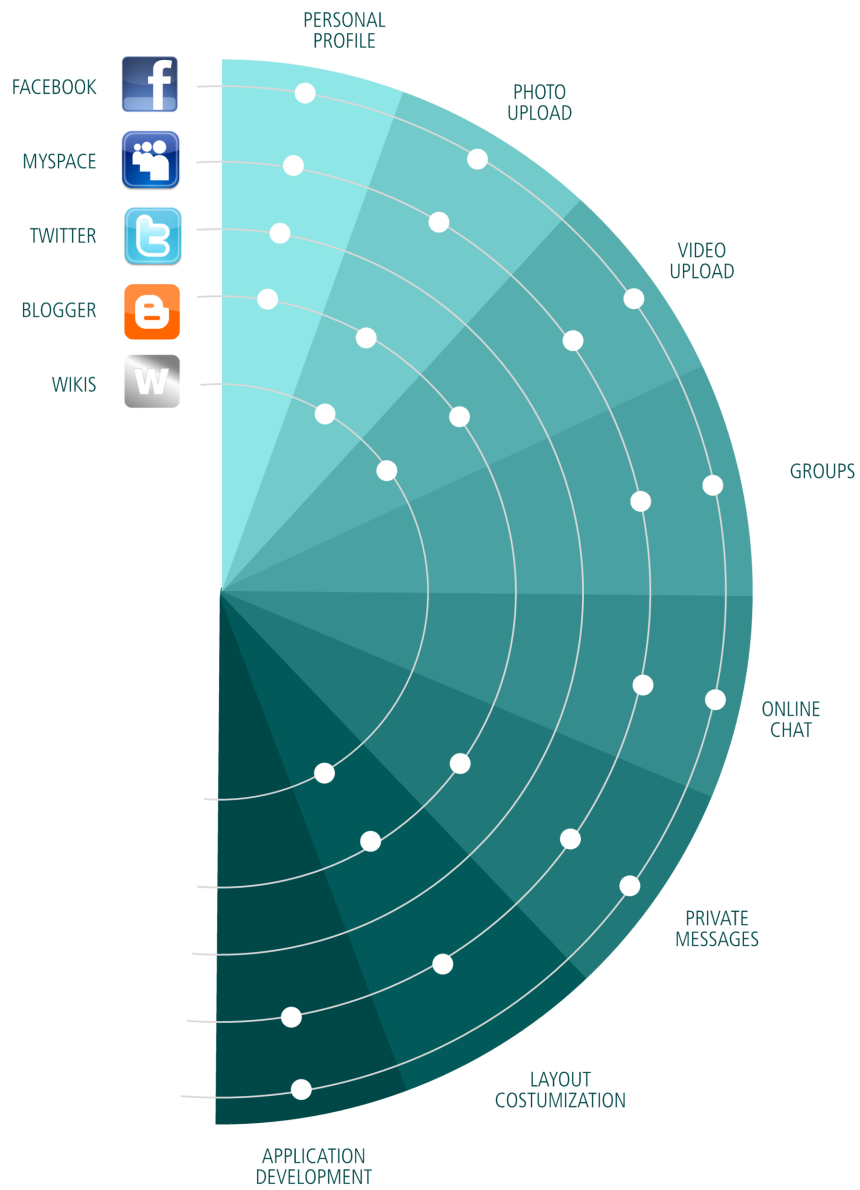


Figure 2.3: Online social networks, blogs and wikis functionalities.

ture for collaboration, students can take the process of problem solving in a collaborative atmosphere improved with possibility of enriching their learning.

The increased visibility of student work is very relevant through the use of OSN. This increased visibility will improve and strengthen social relationships with other contacts and teachers, enhancing information sharing and discussion around the topic under study. This kind of discussion is different from those available in a forum included in a learning man-

agement system. These discussions are originated by personal entries of each student and the players will discuss a personal content provided by students, with benefits for the concerned student.

Throughout the learning process the student will be confronted with questions and doubts that need clarification. The easy access to OSN will allow contact with several people. While different people do not work in the same problems they share common interests and backgrounds, thereby facilitating the sharing of information with one or both parties. This insertion in OSN and the contact with other people also enhances the contact with new perspectives and viewpoints that can enrich the work in progress by the student. Figure 2.4 depicts this sharing and collaborative environment through the use of OSN and other Web 2.0 services such as wikis and blogs.

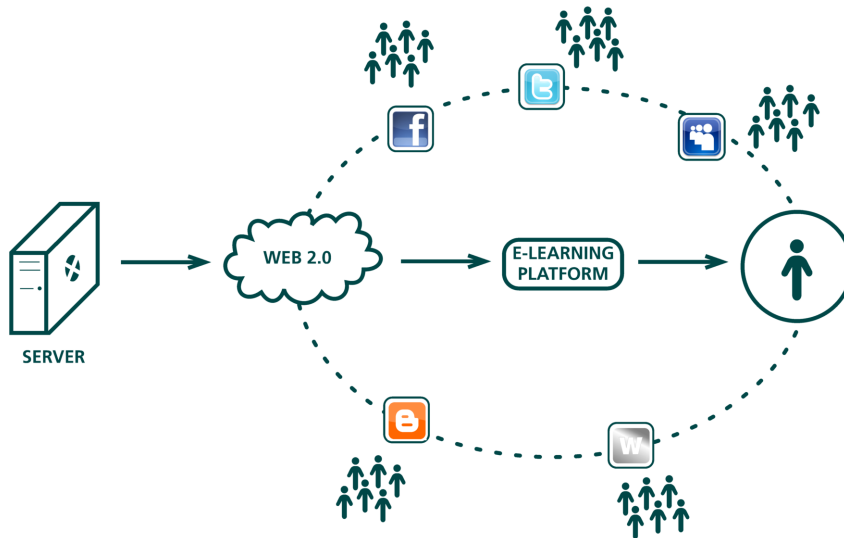


Figure 2.4: Collaborative e-learning environment with online social networks.

OSN appear as an important tool for the development of the student learning process that will enable him/her to have a posture of self-government for activities that he/she will develop to solve a given problem. This approach contrasts with the rigid structure of a learning management system, where content is made available for student use, and where there is only interaction between students and teachers, greatly limiting the exchange of opinions and point of views. The OSN provide an atmosphere of collaboration between users ideal for a student to work on solving problems and progress in their learning process [9].

Learning comes from sharing knowledge. Someone in possession of knowledge shares it with others in order to disseminate and promote the creation of more knowledge. In this context, OSN can play a major role in disseminating and creating knowledge. E-Learning platforms are by definition closed to its group of users. Allowing the connection between e-learning platforms and OSN, the number of potential participants in the sharing of infor-

mation increases exponentially. This link enables information previously restricted to the group of users of the platform, to be released over to the network of friends in one or more of these users OSN. In addition, one of the main characteristics of OSN is the sharing and contact with others, either through posts, groups, applications, etc. This atmosphere of sharing and social interaction creates an environment highly appealing for information sharing in an academic context.

It can therefore be concluded that the two strengths of OSN are the huge range they have in terms of contacts and sharing environment and social contact they provide. Taking into account that today a majority of the population uses one or more social networks, particularly younger people, it is safe to say that OSN are an important resource to the definition of the learning process of a student and hard to ignore. Thus, the e-learning platform in addition to gaining relevance among the students with the incorporation of features present in OSN, are somehow obliged to make the bridge with these in order to motivate students to use it more productively and often.

2.6 Integration of Online Social Networks in E-Learning Platforms

As previously stated, e-learning platforms tend to be closed and inflexible for users. Its use is restricted to settings created and defined by their administrators. The role of the student is passive, passing often by consulting content provided by the teachers responsible for the materials under study. In addition, many times, its main features are used for administration purposes, such as registration of users, courses, etc. This leads to the creation of environments, little exciting for students who do not enjoy the full potential of the platforms. The inherent characteristics of OSN, such as collaboration, content sharing and reviews catalyze the creation of active and stimulating environments for students [25], who are encouraged to share and communicate among them. These characteristics are very important for the improvement of learning environments [26].

The ability to stimulate the student interaction with learning contents and their creators is essential for him/her to take a critical stance in relation to these contents and also receive his/her contributions for their improvements. The development of critical thinking and pro-activity of students is enhanced in an environment of sharing lived in an online social network.

Make a student as an active agent able to define the learning process and solving problems, rather than just a receiver of knowledge, will be very advantageous in order to prepare him for his/her future career. We live in an age where the Internet is dominated by social tools [27], which take the user to interact and share content with users of many different environments. The trend increasingly visible is to integrate and establish points of connection in the most varied existing platforms that make up the Web 2.0.

The creation of modules inside e-learning platforms to provide services similar to those available in the Web 2.0 and allow access to OSN is a requisite and a great asset. Then, it settles the bridge between two worlds that is completed with a view to improving the

environment for student learning. This vision of global integration could bring a host of advantages for improving the living environment on a traditional e-learning platform.

Students can easily share content and communicate with a much wider group of contacts with access to their favourite OSN. This centralization of functions in an e-learning platform allows learners to organize and lead their learning process the best way that they approves. Table 2.1 summarizes the main characteristics of e-learning platforms and important contributions from OSN.

Table 2.1: Summary of e-learning platforms main characteristics and contributions from online social networks.

	E-Learning Platforms	Online Social Networks
Community	Restricted environment for users of the platform.	It covers the entire network of friends and friends of friends, depending on the degree of privacy used.
Pro-activity	The student has passive role. Access the content provided by the teacher.	The student has an active role. Takes initiative in shaping their learning processes.
Content creation and sharing	Contents are designed by the teacher and used by the student.	The student creates and shares contents.
Communication	Communication takes place mostly in one direction: teacher -> student.	Communication takes place in both directions.
Critical sense	The learner is a recipient of knowledge. His critical sense is not stimulated.	It stimulates the critical sense of the student. Interaction with different people and opinions leads the student to develop his critical sense.

2.7 Interoperability - Communication Between Systems

There have been several attempts in recent years to link different learning environments in the field of educational technology. This interconnection is essential in defining the learning objectives in the long term [37].

In the process of monitoring and student assessment, the possibility of integration between different tools is very important. Throughout their learning process the student will use various tools in carrying out certain tasks. It will be essential at some point, tell the teacher their progress, and make it necessary for data exchange between different tools. The use of integration tools for integration and unified generation of reports of activities the students will be very important.

In the field of collaborative learning, interoperability and data exchange between different learning environments is a crucial requisite [36]. This is because the information transacted in group learning environments tends to be more complex and there is a greater number of different tools to contribute to these information flows. Many collaborative software tools need to provide mechanisms to export information to enable users to share this information with their colleagues. However, in the field of educational technology, there are not many tools that provide interoperability. There are projects that aim to achieve this objective as the Collaborative Inquiry and Experimental Learning (CEIL), and Scalable Architecture for Interactive Learning (SAIL) [12].

CEIL is a European development team whose primary objective is to integrate existing approaches dedicated to computer supported collaborative learning. To achieve this goal, CEIL brings together the leading institutes in Europe that have developed environments for them and which have done research in this area. CEIL's main objectives are listed below.

- Design an integrative theoretical approach for collaborative, inquiry and experiential learning.
- Exchange and integration of methodological approaches for the design and evaluation of CIEL environments.
- Join forces on the development of a common architecture and integrated platform for CIEL.
- Test this platform in a multi-modal way for use across multiple research laboratories, by means of a common application.
- Consolidate and extend the common framework and platform in future joint research projects.

With this objectives in mind, the standards that will be developed in CIEL are aimed to set the stage for future integrated development of support for collaborative and experiential learning [13].

SAIL stands for Scalable Architecture for Interactive Learning and is a platform with Learning Content Management System and digital library supports. One of the main goals of this project is to create an open source community of developers who have different interests and opinions, but all benefit from the access to the same core technology platform [14].

2.8 Self-Regulated Learning

Computer Supported Collaborative Learning (CSCL) is a form of learning that has gained importance and visibility in recent decades. This way of learning should grow and expand in the near future due to the continuous improvement of web technologies and the increased attention to social practices induced by the diffusion of Web 2.0 applications. Analysing

learning in such environments is a very important issue for educational research, in current technological contexts, cultural and social.

Self-regulated learning is a process directed by the student that turns their mental skills in operational capabilities in relation to a particular task in a certain context. Self-regulated students deliberately dominate and control their own learning defining their own goals, choosing and applying different learning strategies for their objectives and evaluating their progress and adjusting their plans accordingly. They are often motivated, have a good level of efficiency and are learning as a proactive activity. It is therefore not surprising that the self-regulated learning has quickly gained attention in the educational field, as evidenced as a key component in academic success and as an effective means to meet the needs of lifelong learning.

Such a diversity of skills obviously need time and attention to develop. Some aspects of SRL as meta-cognitive knowledge and skills generally improve as students get older. The acquisition of skills in the SRL are not automatic or spontaneous, but need appropriate education and training. It must be in the classroom that students should be encouraged to practice this type of learning. This can be done by creating flexible learning environments, learner-centered, promoting active learning, providing students with adequate feedback on their activities and encouraging them to assess their own results. In order to make students self-regulating, both the experiences of individual and social learning seems necessary [15].

Virtual Learning Communities (VLC) and Computer Supported Collaborative Learning (CSCL) both depend on Computer Mediated Communication (CMC) to support group interaction distance between students, with guidance from tutors. In such environments, the communication takes place in a textual and asynchronous mode. This has important consequences in how learning takes place and is encouraged. In a written communication, time of interaction between participants is higher than an oral communication, and thereby provide them time to reflect before sharing their ideas. Furthermore, the participations, which are available on blogs or forums, or applications of similar structure to those, are available for all participants, thereby facilitating a possible reference to these communications as well as future revisions. Finally, a chance to participate in various discussions in parallel allows all actors to actively contribute to them. These three characteristics make a lot more to facilitate implementation of activities on socio-constructivist learning than in traditional learning environments as a classroom with a greater number of students.

Computer Supported Collaborative Learning (CSCL) and Self-Regulated Learning (SRL)

The relationship between CSCL and SRL is somewhat complex because the use of CSCL environments require and improves the ability of students to self-regulate their learning activities.

There are several reasons why the CSCL promotes certain SRL skills. First, because SRL skills and meta-cognitive skills in particular are usually among the objectives of the learning activities in CSCL. This is due to the fact that new students to this kind of method usually lack the meta-cognitive skills and self orientation needed to take full advantage of this approach to teaching. Courses well designed try to encourage students in these skills.

Furthermore, learning with CMC is heavily based on textual interaction which supports not only reflection on the content but also in the learning process itself. As a consequence of such learning environments promote the practice of SRL, highlighting certain skills involved in the SRL to the point of being considered promising for their development. At the same time, some SRL skills are required to make good use of learning experience within the VLC, not only because students need to control the timing and pace of their learning process, but also because the activities involve collaborative negotiating objectives, strategies and concepts with their colleagues [15].

2.9 Personalization - Manipulation of Learning Contents

Today the number of learning resources available is ever increasing, creating difficulty for the student to choose those that best suit their needs and preferences. The personalization of online learning thus becomes an increasingly important issue as the resources and learning systems increase. Personalization can serve several purposes including the definition of how information is presented and help in finding it. This latter objective becomes even more relevant now that learning becomes more and more an activity to perform throughout life. The community of lifelong learners is very varied, and a variety of educational resources are available, ranging from courses for specific groups to self-regulating activities of home study using online materials. Moreover, due to other obligations, both professional and personal, students may have constraints with regard to workload, location and time of implementation of educational tasks. Since different students have different preferences of these types, is a challenge to consider all these features in the personalization process [16].

Chapter 3

Analysis and Construction of Share&Learn

This chapter describes the analysis carried out before starting the application construction. It presents an analysis of requirements, divided into user requirements and system requirements. The document then presents the technologies used. Finally it is shown and described the use-case diagrams, class diagrams and the database model diagram.

3.1 Benefits of Collaborative Learning

Today, educators recognize the need for a more active and collaborative learning. By creating tools for an integrated teaching, should be considered a learning model constructed according to the following principles listed below.

- In this type of education the teachers act as facilitator rather than transmitters of knowledge. This means that knowledge should be actively created by students and not passively transmitted by teachers.
- To motivate students and keep them actively involved in the construction of knowledge, learning activities should be focused around a set of problems and motivating examples that are applicable in the real world.
- Learning should take place in a collaborative environment.
- The evaluation procedures should be incorporated in the learning process and should take into account the personal guidance of students.

The use of learning models based on these principles not only improves the performance of students and improves their motivation to participate actively in the learning process of the materials in question, and seek more knowledge for themselves.

The chat integrated into the tool is designed to support online collaboration among students regardless of location or platform they are using. This tool allows students to exchange questions, answers and discuss ideas for solving exercises.

The benefits of collaborative learning are listed below.

- developing higher level thinking skills in learners.
- Increasing knowledge retention by students.
- Building self-esteem in students.
- Increased student satisfaction with learning experience.
- Promoting a positive attitude in the matter under study.

The main ideas behind the construction of a learning environment represent new possibilities for enhancing the quality and variety of teaching and learning within a context of e-learning. They are listed as follows.

- The first main idea on building a learning environment is that people learn best when they are actively involved in the implementation of something;
- The second idea is that learning activities can be sequenced or otherwise structured carefully and deliberately in a workflow to promote more effective learning;
- The third idea is that it would be useful to record the learning design for sharing and future use;

With the latest and vast technological advances the traditional lecture-oriented teaching is giving way to a more active environment where students have access to a variety of interactive resources [11].

3.2 Requirements Analysis

With the aim of developing an application that provides the user with an environment of information sharing and interaction with other users, providing functionalities similar to those present in OSN, a survey was made of the requisites that the application should have in order to provide users with features that enable them to take advantage of this collaborative environment.

User requirements

The system should provide the user with the following features listed below.

- Create groups to which you can associate information. These groups should be of a public nature, being available to all users. The creator of a group should be able to delete it or change its name.
- Publish information of varying size that should be available for consultation to other users of the system. It should also be possible to change or remove information posted by the user. A post should be available to be commented by any of the users of the system. A comment should be associated with a single post and should be changed or deleted by its creator.

- Post links, with an associated description that should be available to other users. It should be possible to remove or modify links posted by the user. This operations should only be available to the creator of the data.
- Insert in the system RSS feeds. these feeds should be consulted by other users. Only the creator of the record should be able to delete it
- Use chat to communicate with all users of the system. Should be possible to have a private conversation with the online users.
- It should be possible to share all information available in the OSN and send emails from the system.

System Requirements

- Groups - Creation, deletion and modification of groups. The definition of a group should done by name.
- Posts - Creation, modification and deletion of posts. A post may be linked to a group. A post has unlimited size. A post should be available to be shared in a OSN or be sent by email.
- Links - Creating, deleting and changing links. The definition of a link should be made by entering the URL and description. A link should be available to be shared in a OSN or be sent by email.
- Feeds - Creation, deletion and modification of feeds. The definition of a feed should be made by introducing the corresponding URL. The information provided by a feed should be available to be shared in a OSN or be sent by email
- Chat - Chat among all users and private chat between two users.

3.3 Technologies Used

Microsoft Visual Studio 2008

Microsoft visual studio is an integrated development environment (IDE) that can be used to develop console and graphical user interface applications, web applications, web sites and web services. For building all this kind of applications visual studio supports several programming languages. Built-in languages include visual basic, visual C# and visual C++. Is also supports XML/XSLT, HTML/XHTML, JavaScript and CSS. It's also possible to install other language services separately. Visual studio start page can be viewed in Figure 3.1.

Among its prime IDE characteristics visual studio has a code editor supporting IntelliSense, which is Microsoft implementation of autocompletion, a very useful functionality for every software developer. IntelliSense is a convenient way to access descriptions of

functions, particularly their parameter lists. It speeds up software development by reducing the amount of name memorization needed and keyboard input required. It also allows for less reference to external documentation as interactive documentation on many symbols (i.e. variables and functions) in the active scope appears dynamically in the form of tooltips while programming.

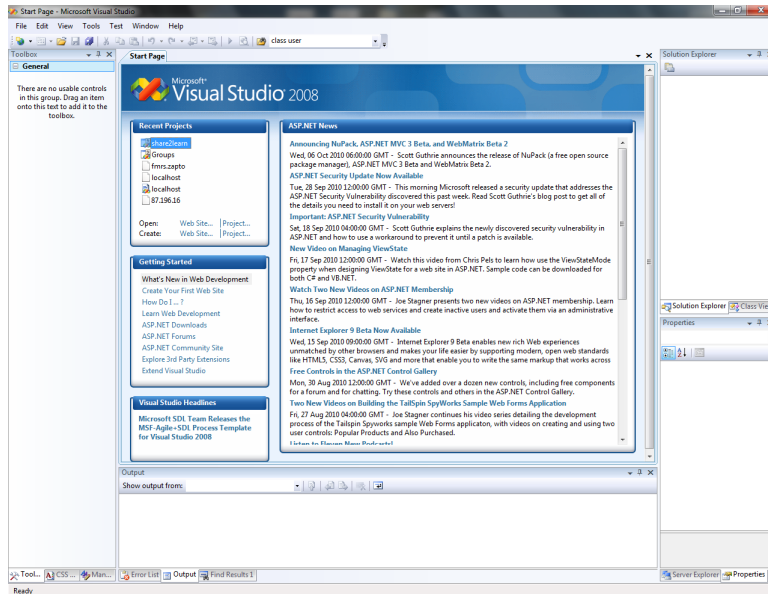


Figure 3.1: Microsoft Visual Studio 2008 start page.

Visual studio also has code refactoring which is a powerful tool that enables programmers to change their source code without changing its output. Refactoring improves code readability and reduces its complexity improving maintainability as well as making the architecture of the application more expressive providing a more easy way to future changes and upgrades [20]. With refactoring source code becomes more readable and understandable but maintains its behavior.

A debugger it's also present in visual studio, both at source-level and at machine-level, and can be used in all supported languages. If the source code is available, it displays the code as it is being run as well as the values of all objects and variables. It's also possible to create memory dumps as well as load them later for debugging. It allows setting breakpoint throughout the source code, which allows execution to be stopped temporarily at a certain point, allowing checking the values of variables at that given point. Breakpoints can also be conditional, meaning they can be triggered when the condition is met. It's also possible to edit the source-code while it's being debugged.

Visual studio has a set of visual designers to help in the development of the different kinds of applications. There is a windows forms designer to build graphics user interfaces applications using windows forms. It includes a set of controls which can be placed in the form using the drag and drop functionality. These controls can be linked with the code using

an event driven programming model. There is also a WPF (Windows Presentation Foundation) designer, which was introduced in visual studio 2008, and has similar behaviour to windows forms. It supports all WPF functionality including databinding and automatic layout management. It generates XAML code for the user interface which is compatible with Microsoft expression design. There is also the web designer that allows the creation of web pages. It is used for developing ASP.NET applications and supports HTML, CSS and JavaScript. Besides these three design environments there are also a class, data and a mapping designers that are complementary to the others.

Microsoft Visual C# 2008

Microsoft visual studio supports a visual C# an implementation of the C# programming language. Visual C# targets the .NET framework along with the language services that lets the visual studio IDE support C# projects. The compiler is available separately as a part of .NET framework. C# is a multi-paradigm programming language encompassing imperative, functional, generic, object oriented and component oriented programming disciplines. C# is intended to be a simple, modern, general purpose, object oriented programming language [21]. C# is intended to be suitable for writing applications for both hosted and embedded systems, ranging from the very large that use sophisticated operating systems, down to the very small having dedicated functions.

C# is a new programming language that has been designed specifically to work with .NET. Using C# one can, for example, write a dynamic web page, an XML web service, a component of a distributed application, a database access component, a classic windows desktop application, or even a new smart client application that allows online/offline capabilities. It provides a means to code up almost any type of software or component that one might need to write for the windows platform [22].

ASP.NET 3.0

ASP.NET is a web application framework to help programmers to build dynamic web sites, web applications and web services. ASP.NET is built on the common language runtime (CLR), allowing programmers to write ASP.NET code using any supported .NET language.

ASP.NET features a new set of controls that simplify web-based data access and includes functionality that facilitates user interaction, code reuse, and design-time development and even improves the aesthetic experience.

ASP.NET provides an abstraction layer on top of HTTP with which developers build web sites. Thanks to ASP.NET, developers use high-level entities such as classes and components within the object-oriented paradigm. Development tools assist developers during the work and make programming with the ASP.NET framework as seamless and quick as possible. Development tools are ultimately responsible for the application being created and deployed to users. They offer a programming paradigm and force developers to play by the rules of that paradigm [23]. The key development tool for building ASP.NET applications is Microsoft visual studio.

Microsoft SQL Server 2005

Microsoft SQL Server is a relational modal database server and was Microsoft entry to the enterprise level database market. Its primary query languages are T-SQL and ANSI SQL. Microsoft SQL server 2005 was released in October of 2005 and includes native support for managing XML data, in addition to relational data, as one of its biggest improvements. Other main feature was the CLR integration where one could write SQL code as Managed Code. SQL server 2005 also allows a database server to be exposed over web services using TDS packets encapsulated within SOAP requests. When the data is accessed over web services, results are returned as XML.

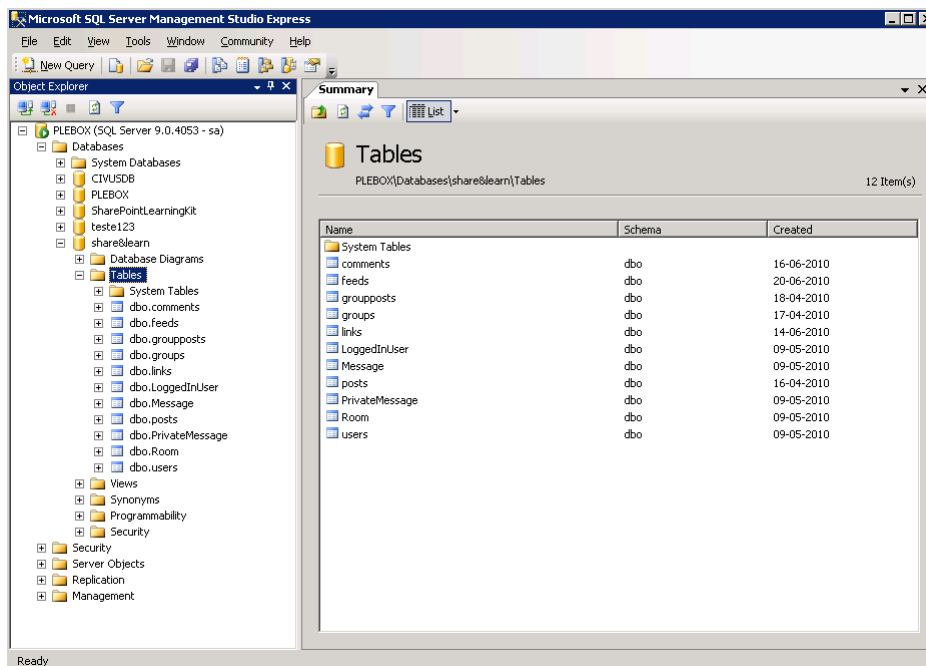


Figure 3.2: Microsoft SQL Server management studio express.

Microsoft SQL Server gives developers new and enhanced tools for writing better Transact-SQL (T-SQL) code, and brings many improvements for the developer, from incorporation of common language runtime (CLR) coding to some simple yet powerful enhancements to the T-SQL language [24].

3.4 Use Case Diagrams

The Use Case diagrams represent the user interaction with the features offered by the developed application. These diagrams are typically directed to actors. An actor can be a human being or a machine that will interact with the system to perform a given operation. Are presented below several use case diagrams that represent the functionalities of the system.

Wall

Figure 3.3 shows the features available to the user in managing posts and comment. A user can insert, delete and edit a post of his own, and comment on any post or share it in an OSN. It is also possible to filter the posts available per group, allowing the user to access the available information in a more organized way.

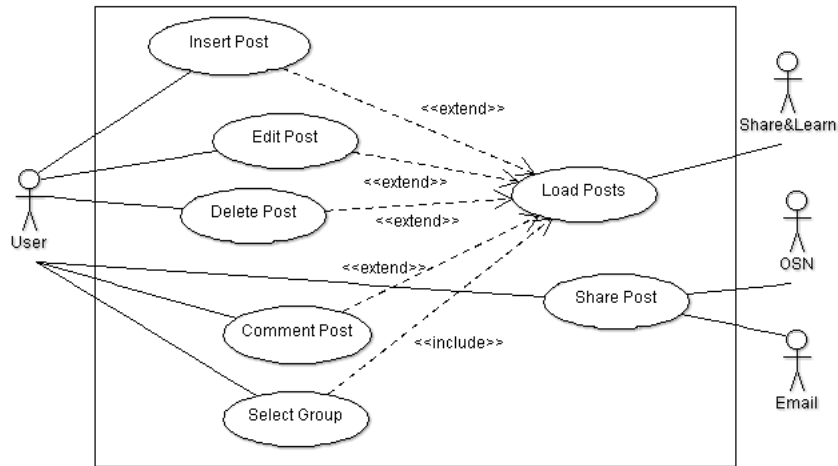


Figure 3.3: Wall use case diagram.

Groups

Figure 3.4 presents the features available on the management of groups. These groups will serve to filter the posts available on the wall. The user can create, edit and delete a group and share its information in a OSN.

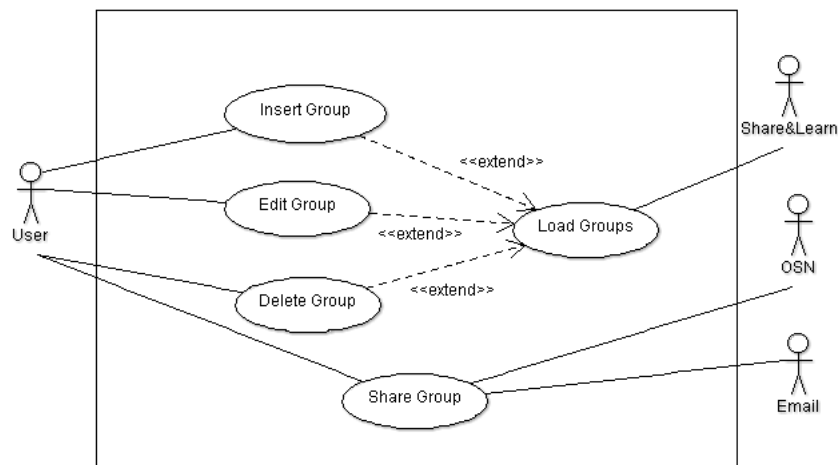


Figure 3.4: Groups use case diagram.

Links

Figure 3.5 shows the features available for managing links. A user can create, edit and delete information on a link. In addition, this information may be shared on OSN. It is also possible to open the link.

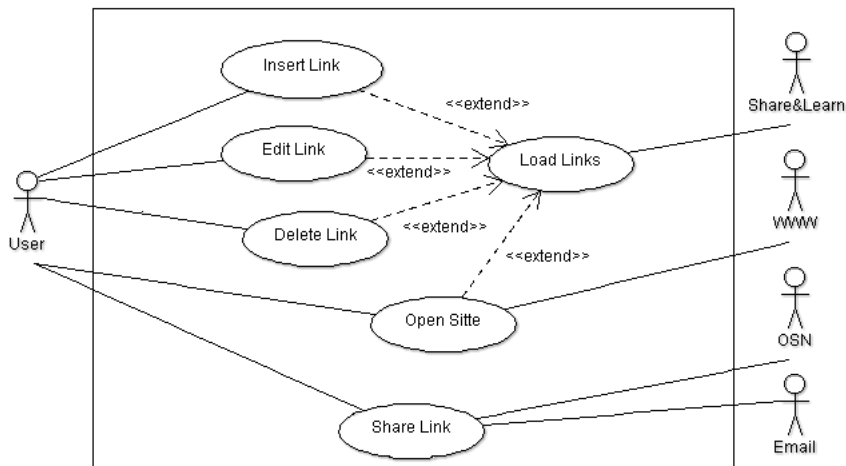


Figure 3.5: Links use case diagram.

RSS

In Figure 3.6 are shown the features of RSS management. The user can insert, delete and edit RSS feeds. In addition, it is possible to see the detail of a feed and share it in an OSN.

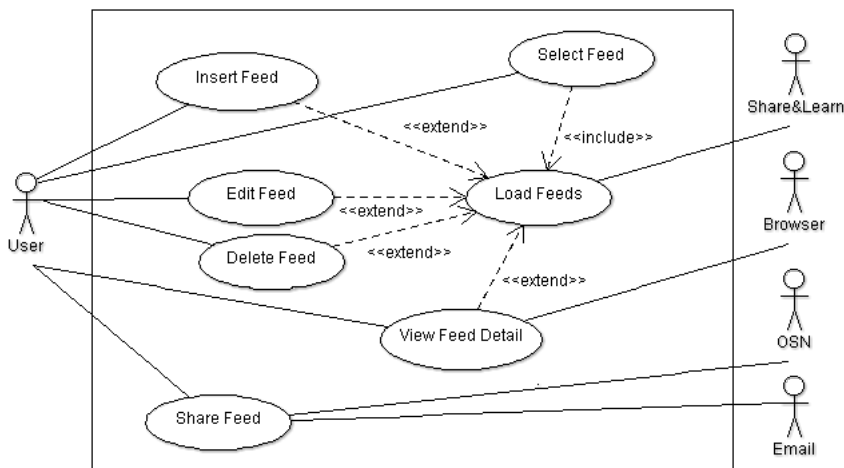


Figure 3.6: RSS use case diagram.

Chat

In Figure 3.7 are shown the features available in chat module. The user can participate in public chat, or invite an online user to a private chat.

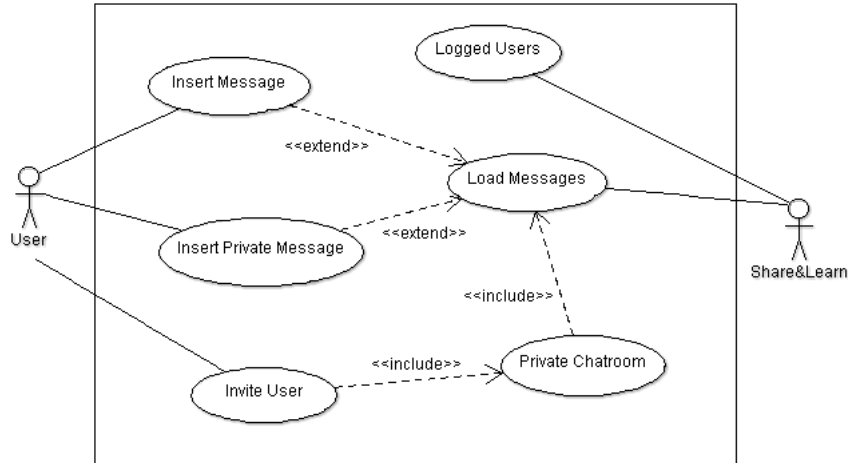


Figure 3.7: Chat use case diagram.

3.5 Class Diagrams

In order to project a solid application and increase its performance, and facilitate the development of the software itself, the application was divided into several classes. Each of these classes has specific objectives that relate to each other, so fluid and organized. Next, the used classes are presented and is made a short description of its contents.

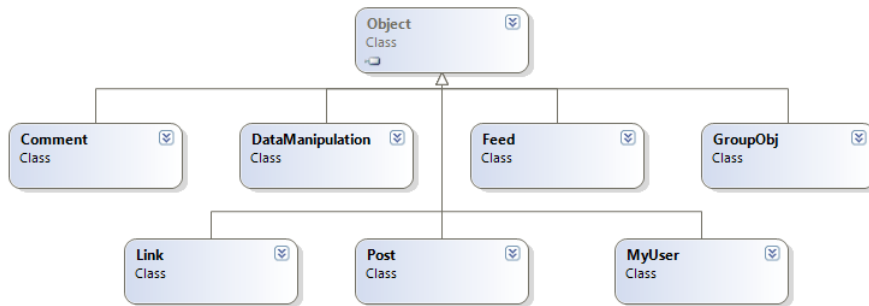


Figure 3.8: Class diagram - Classes that inherit from the object class.

The classes that inherit from the Object class, as shown in Figure 3.8 are listed below.

- **Comment** - Class that defines the object comment. This object has the following fields: commentid, commentbody, date, nameuser, userid and postid. For this object

were defined two constructors, one that takes no parameters and another that initializes all fields. For each field there is a property.

- **DataManipulation** - Class that has all the methods to access the database. In this class are defined methods such as creating a connection to the database and closing that connection. Here are also all the methods used to insert, change or delete data from the database.
- **Feed** - Class that defines the object Feed. This object has the following fields: feedId, feedtitle, feedurl, nameuser, date and userid. For this object were defined two constructors, one that takes no parameters and another that initializes all fields. For each field there is a property.
- **GroupObj** - Class that defines the object GroupObj. This object has the following fields: groupid, groupname, GroupDescription, nameuser, date, userid. For this object were defined two constructors, one that takes no parameters and another that initializes all fields. For each field there is a property.
- **Link** - Class that defines the object link. This object has the following fields: linkid, LinkUrl, linkdescription, nameuser, date and userid. For this object were defined two constructors, one that takes no parameters and another that initializes all fields. For each field there is a property set.
- **MyUser** - Class that defines the object MyUser. This object has two fields, the userid and username that identifies the user. The constructor of the object receives these two parameters. For each field there is a property with the Get and Set accessors defined.
- **Post** - Class that defines the object post. This object has the following fields: postid, postbody, groupid, nameuser, date and userid. There are two constructors defined, one that takes no parameters, ie, will create an empty object, and another that receives all the fields as parameter. For each field there is a property set to encapsulate the data.

The classes that inherit from the Page class, as shown in Figure 3.9 are listed below.

- **Chatroom** - Class that defines the web form chatroom. In this class are defined all the methods required for the implementation of existing features in the chatroom module. It's also where the form markup language is set. This class implements the interface ICallbackEventHandler, used to indicate that a control can be the target of a callback event on the server. Thus the methods GetCallbackResult and RaiseCallbackEvent are implemented in this class.
- **ChatWindow** - Class that defines the web form chatwindow. In this class are defined all the methods required for the implementation of existing features in the form chatwindow. This class as the class chatroom implements the interface ICallbackEventHandler.

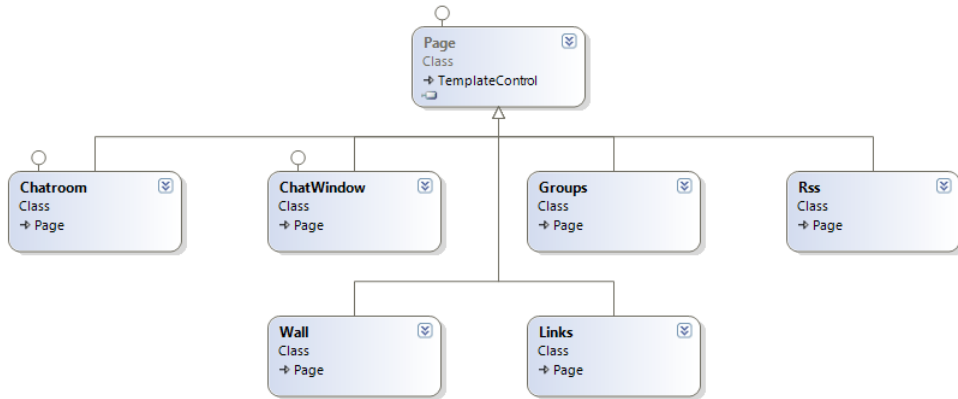


Figure 3.9: Class diagram - Classes that inherit from the page class.

- Groups - Class that defines the web form groups. In this class are defined all the methods required for the implementation of existing features in the module groups. It's also where the form markup language is set.
- Links - Class that defines the web form links. In this class are defined all the methods required for the implementation of existing features in module links. It's also where the form markup language is set.
- RSS - Class that defines the RSS web form. In this class are defined all the methods required for the implementation of existing features in the RSS module such as the connection and loading of selected RSS feeds. It's also where the form markup language is set.
- Wall - Class that defines the web form wall. In this class are defined all the methods required for the implementation of existing features in the module wall. The management of the posts and comments from users and managed in this class. It's also where the form markup language is set.

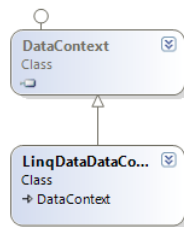


Figure 3.10: Class diagram - Classes that inherit from the datacontext class.

The class that inherits from the DataContext class, as shown in Figure 3.10 is listed below.

- LinqDataDataContext - This class is generated by visual studio. Based on a connection string, it generates all the classes, tables, views and stored procedures. The entry point in this self-generated object model is the DataContext class.

3.6 Database Model Diagram

To store all the information needed to use the application was built the following database. This database was constructed according to the relational model, i.e. the information stored in different tables relate to each other through the use of primary and foreign keys. A diagram of the database can be viewed in Figure 3.11.

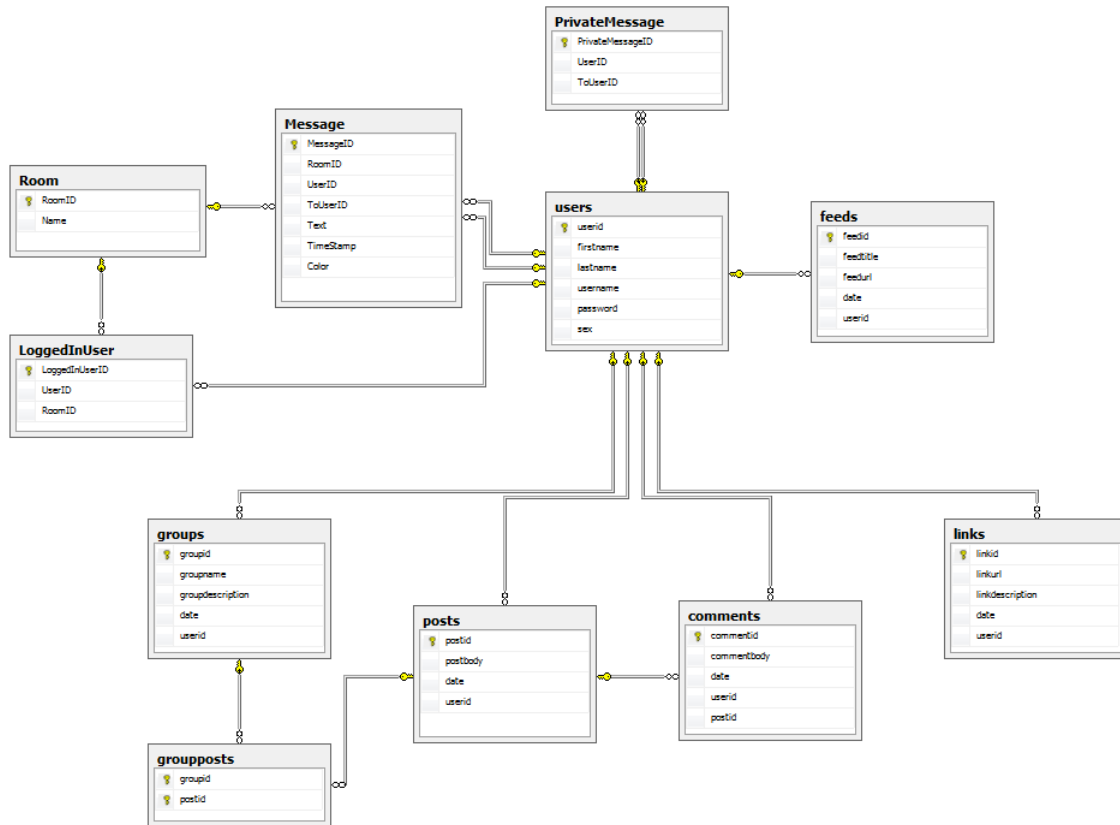


Figure 3.11: Database model diagram.

Tables

The tables that constitute the database are listed below.

- **Comments** - Information relating to comments made about a particular post. Besides the commentary, is stored the date and time, the identification of the user who made the comment and the identification of the post on which the comment was made.
- **Feeds** - Here are stored the RSS feeds. In addition to the URL of the feed is also registered his title, the date and time and the identification of the user who inserted the information.
- **GroupPosts** - Association between the tables Posts and Groups. Hence we can draw the following information: posts that belong to a designated group or which group belongs a post.
- **Groups** - Definition of the existing groups. Information stored: group name, description, date and user identification.
- **Links** - Information about the stored links. It's stored the link description, its corresponding URL, the date and time and the user responsible for its publication.
- **LoggedInUser** - Registration of active users in the chat.
- **Message** - Registration of public messages of the chat. All messages exchanged between users are recorded, as well as the time and the room in which they were published.
- **Posts** - Information on the posts published by users on the wall. each post has an associated user and a date and time
- **PrivateMessage** - Registration of private messages of the chat. Each message is associated with the sender and the receptor.
- **Room** - Definition of the existing chat rooms.
- **Users** - User data. Are stored the following information: first name, last name, username, password and sex.

Chapter 4

System Demonstration and Validation

This chapter presents the developed application. Initially it presents the PLEBOX, e-learning platform, to which several modules were developed. Finally all the modules are shown and explained.

4.1 PLEBOX - Personal Learning Environment Box

The PLEBOX is a modular and expandable e-learning platform, capable of supporting a simplified interaction with the user. The PLEBOX has innovative features compared to existing platforms, such as creating a customizable work environment, the ability to add applications to PLEBOX, the existence of a framework for developing new modules and finally, wants to be a new way of expose learning content.

Today, Internet use is widespread and is a major source of sharing and distributing knowledge. The use of e-learning platforms is becoming increasingly frequent, aiming to make education more direct and effective. However, many platforms are also flawed for lack of ease of use and are generally closed systems, not expandable for new functionality. Thus limiting the user to the features available, forcing him to seek external solutions to his problems, if the platforms does not allow it. This feature may make its use unattractive, leading to a disinterest on the users part in using the system in question.

The users's possibility to create their own personal learning environment, within the platform, will undoubtedly be a great potential for the system, allowing customization of the desktop in order to suit the user's work. The ability to add modules to PLEBOX, developed as to meet the needs of users, makes it an open and customizable platform that will provide new ways of interacting with content and learning for students.

As already stated, the PLEBOX allows inclusion of modules. The modules can be considered applications developed by third parties that will be integrated into the platform. The modules are meant to expand and to include tools in the platform, allowing multiple tools to gather learning or communication in a single site [32].

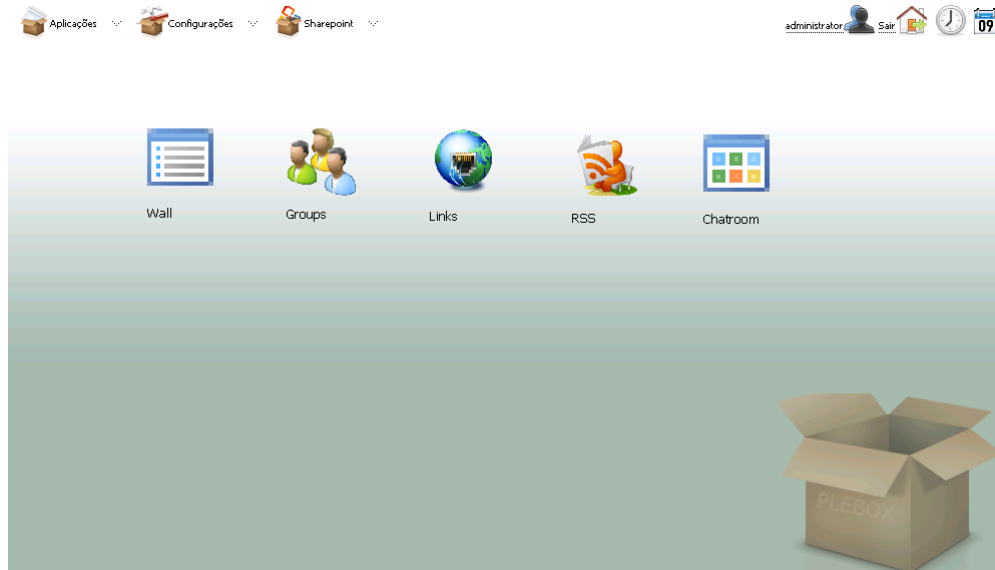


Figure 4.1: Environment of the PLEBOX.

Development of new modules

The creation of a new module for PLEBOX implies the fulfilment of some requirements. After creating a new project in Visual Studio it will be necessary to fulfil the following steps.

- Add the following references: *Microsoft.SharePoint*, *System.Web.Extensions*, PLEBOX and *System.Web*.
- Add the following directives to the main class: *System.Web*, *System.Web.UI*, *System.Web.UI.WebControls*, PLEBOX and *Microsoft.SharePoint*.
- Assign the following inheritance: *Microsoft.SharePoint.WebPartPages.WebPart*.
- Override the method: *CreateChildControls*.
- Create a *valid strong name*. In the project properties select *Signing*, then *Sign the assembly* and finally in the *Choose a string name key file* select *New*. On the window *Strong Name Key* deselect *Protect my key file with a password*. In the *Key File Name* field enter the name of the class. Finally save and exit.
- Create the assembly file.
- Create the file WebPart Definition File (DWP). Add to the project a new XML file and change its name to *ClassName.dwp*. Then get the *Public Key Token* using the *External Tools*. In the *External Tools* option select *Get PublicKeyToken*. Copy the key back and replace it in the DWP file.

Installing new modules

Installing a new module in the platform PLEBOX requires two files: the assembly file that contains all the module code and its installation DWP file that contains all the information of the module assembly file. It is also necessary to register the module as safe in web.config file. In Figure 4.2 we can see the interface for installing a new module. It is presented to the user a list of modules currently installed on the platform. In addition to the fields to enter the file name DWP assembly the user can also select an icon for the new module.

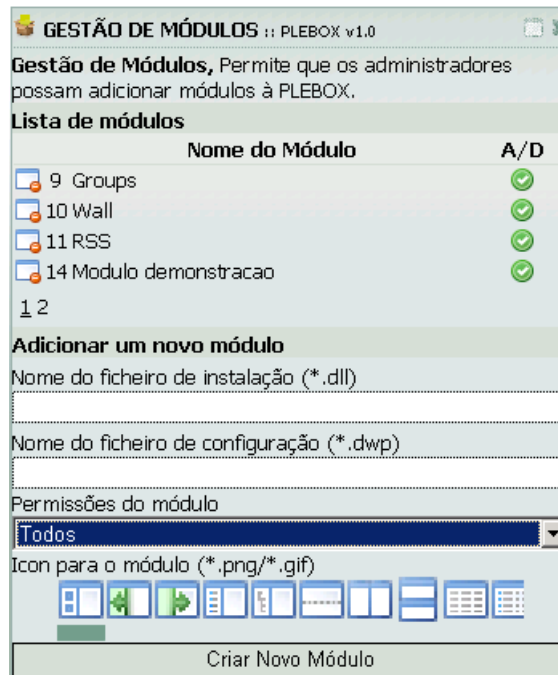


Figure 4.2: PLEBOX modules management.

The PLEBOX was thus presented as a modular platform, scalable and capable of supporting a simplified interaction with the user, with a customizable working environment with the ability to gather in one place a diverse set of applications. Making use of Rich Internet Application (RIA) and presenting a form of interaction much more powerful and easy to use, it has created a more sophisticated system of user interaction. The management module and the ability to integrate new modules, further expanded the platform.

Then we will present the modules Share&Learn, which were developed for PLEBOX.

4.2 Share&Learn

The developed application will be presented in this chapter. It is intended to demonstrate the possible interaction between the user and application, thereby enhancing the utilization of all its features. Will be made an exhaustive description of all features per module. For

each feature, will be presented suggestions for its use and potential usage scenarios. The user will be the central figure in the demonstration. The objective being to this chapter illustrate possible applications of the functionalities available. Always bearing in mind the main objective of this project, namely the creation of an environment that allows interaction and collaboration between users.

4.2.1 Wall

The wall module is one of the most important available on the platform PLEBOX. Here are presented to users the posts and comments published. The posts listed have been published by the user that is accessing the application at the time, or by other system users. This listing is presented chronologically and the most recent are presented first.

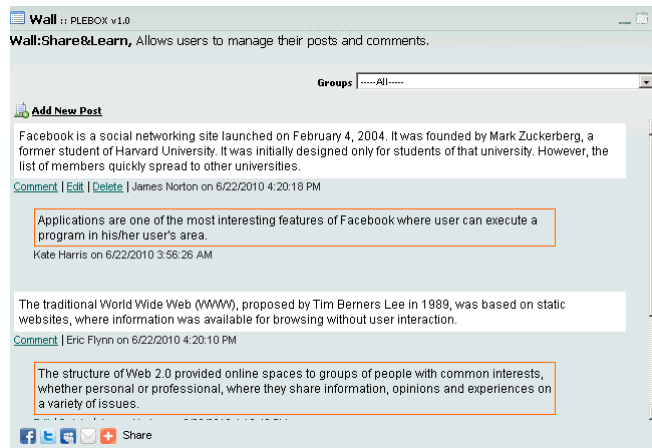


Figure 4.3: Illustration of the wall.

Each post is linked to the identity of the user who created it, and the date and time of its publication. Each post may also be associated with one or more comments. These comments may be of the same author of the post, or any other user of the platform.

There are several available operations that users can perform on the posts and comments. They are listed as follows.

- **Insert** - To insert a new post, the user should use the button "Add New Post" available at the bottom of the page. The system activates a panel similar to that used to insert a comment where he can enter the information he wants to share.
- **Edit** - A user can edit a post or a comment if it is its creator. By using this option a new panel is made available to the user, where he can change the post in question. If he wishes to proceed with the operation he should use the save button that will make the system reload the list with the updated post.
- **Delete** - A post or comment can be eliminated only by the user who created it.

- Comment - If a user wishes to make a comment about a particular post, he may do so using this option. The interface available to enter a comment is similar to that used to insert a new post.

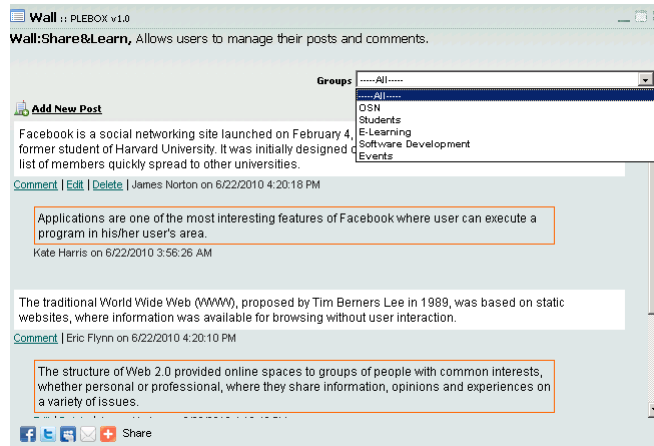


Figure 4.4: Selecting a group to filter the visible posts.

Topping the list of posts is available a list of groups that the user can select. Each post can be linked to a group. At the time of its introduction into the system, a post will be linked to the group that is selected. By default are listed all the posts. However the user can select a specific group, thus filtering the list of posts. An example of the list of groups is shown in Figure 4.4. The user can also send an email from this module or access an OSN of his choice to share information with his contacts.

4.2.2 Groups

The management of groups is made in this module. These groups will serve to organize information available in the module wall. A group is defined by its name and description of its purpose. The groups will be extremely important in the module wall, since that will allow users to associate each entry to a specific group, organizing that way the information they want to share and directing it to users who want to find knowledge on a particular topic. It is possible from this module to access an OSN or send an e-mail

In the management of groups the user has available the following features listed below.

- Insert - Using this option, the user is prompted to enter the group name, which should be small to facilitate their consultation, and a description of the target of the group or theme that is intended to deal with its creation.
- Edit - If the user is the creator of a certain group he can edit its information, changing its name or description.
- Delete - Like the previous option, the option to delete a group is only available to the user who created it.

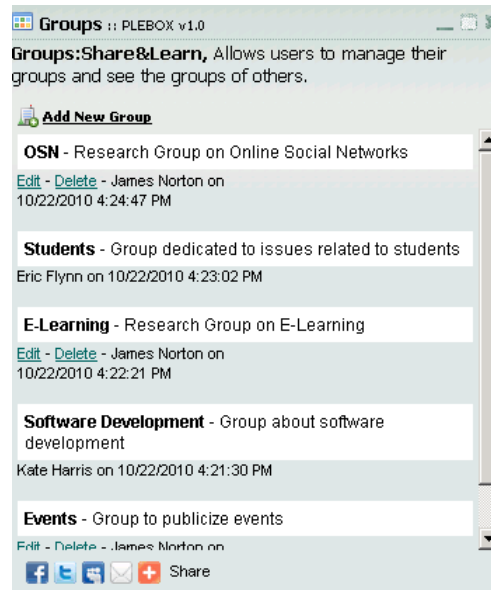


Figure 4.5: Illustration of the groups module.

4.2.3 Links

In this module a set of links are provided, entered by system users with the aim of sharing them with other users. Each link, in addition to the URL has an associated description which should elucidate other users on the content available on it.

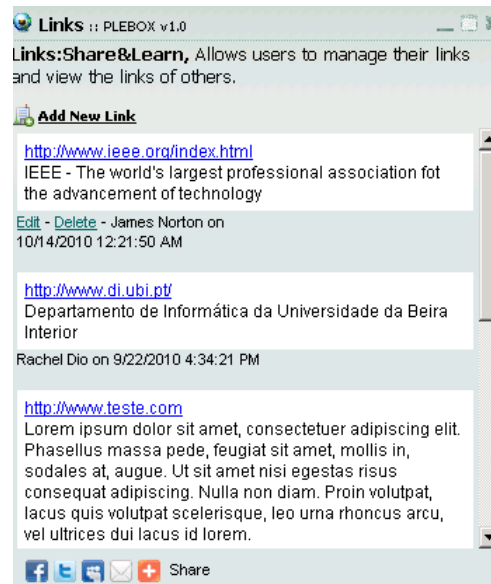


Figure 4.6: Illustration of the links module.

In the links management users have at their disposal several features listed as follows.

- Insert - When inserting a new link, the user will be asked to insert the complete URL and a description of the link.
- Edit - It is always possible for the user responsible for adding the link, edit its information.
- Delete - Delete the link if the user is responsible for its creation.

Each link allows users to access the site in question, simply by clicking the link, a new page is open with the site regarding this link. If the user wishes to share data from this module can do so by going to an OSN, or using the option of sending emails at the base of the module.

4.2.4 RSS - Really Simple Syndication

The RSS module aims to allow users to provide RSS feeds. RSS feeds summarize content together with links to full versions of that content. This type of technology is widely used today to share the latest news on various subjects. By selecting a feed, all its contents are presented to the user, and he can see a particular news in detail if he wishes.

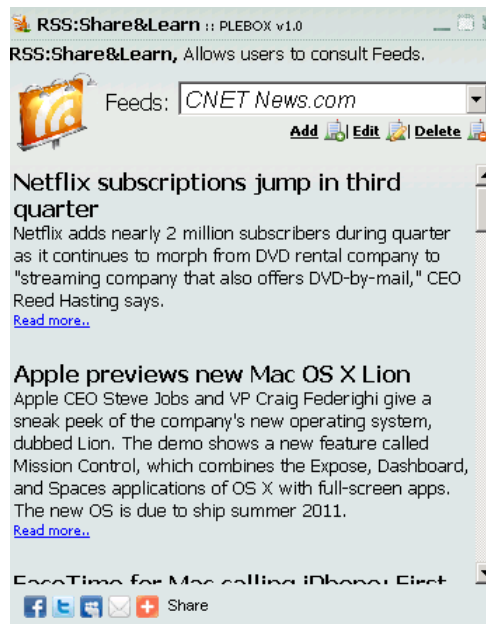


Figure 4.7: Illustration of the RSS feeds module.

In the RSS management the user has available the several features listed as follows.

- Insert - When inserting an RSS feed the user is asked to insert the corresponding link that normally is provided by the site's feed supplier.

- Edit - The user responsible for the creation of the feed can change its link using the edit option.
- Delete - Using the delete option, the user can delete the feed, if desired.

The set of available feeds are presented to the user in a *dropdownlist*. After selecting a feed, the system loads all the information it provides, which is composed of a title and a preview of the news, as well as their date. If the user wants to access the full story, he can use the link Detail that will direct him to the site owner of the feed. From this module is also possible to access an OSN or send mail using the icons present in the base module

4.2.5 Chat

The Chat module allows users to communicate with each other in real time. The chat includes all users connected to the system at the time, and sent messages are visible to everyone. When starting the module, the user has the latest messages exchanged among other users available, and may consult them or even take part in the conversation.

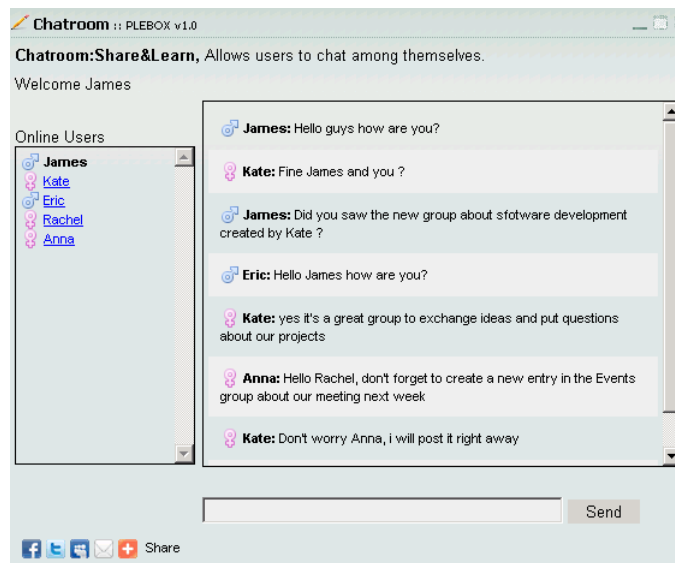


Figure 4.8: Illustration of the chat module.

In the left side of the module is the list of online users. There is the possibility of making a private conversation with one of these contacts, simply by clicking on the name of the user in question. Then see a new smaller window will appear, where the user will conduct a private conversation with the other user. For the private conversation take place is necessary that the guest user gives his consent.

This module is of particularly importance in the global scenario of the e-learning platform as it allows users to keep in direct contact with each others, which may be located in different geographical locations, but that through this functionality can interact and share

diverse information. Thus enabling the creation of a collaborative work environment in real time, where the players act to manage their learning process, collaborate and interact with others in similar situations. The user can also access an OSN or send emails to your contacts using the icons available in the base module.

Chapter 5

Conclusions and Future Work

In this chapter the conclusions are presented and some proposals are made for future work.

5.1 Conclusions

Today new technologies are increasingly present in people's lives. In the area of e-learning, they gain relevance in schools and in the lives of students. E-Learning is gaining importance and position in the proceedings of student learning. However, although there are several solutions for e-learning today, some of them of high-quality, all they show to be closed learning environments. They provide a number of features that vary by level of permissions to users, usually students and teachers. Teachers use the platforms to create disciplines, and provide content related to the topics under study for students to consult. There is usually a one-way flow of information from teacher to student, thus making the student a passive agent. This means that the student has a passive attitude toward the platform, and consequently towards the subject matter. This approach is not very stimulating for the student, not encouraging him to take an active role in defining his learning process.

Moreover, the web has undergone some changes in recent years. Before the web was composed mainly of static pages of content, which could be accessed by users. However, those contents could only be changed by the administrator of the page. Users had a passive attitude, they only query pages. Recent years have witnessed the emergence of a set of applications that allow the user to have a fairly high degree of interaction. Applications such as OSN, where user-generated content can be provided by themselves and the user can contact with various people. This type of approach and define Web 2.0 applications.

Online social networking are sites that live of the people who use them, the content they provide, of their friends and relations that exist between them. These sites are targeted to the user, where he generally builds his profile, creating a page about yourself. This page is made up of all sorts of information that the user decides to make available to others. One of the most important factors in this type of sites are friends, whether they are personal friends or just virtual. It's the friends and the contact with them that makes this kind of sites interesting and potentially profitable to the user.

The characteristics inherent to OSN like collaboration and content sharing environments enhance the creation of exciting and potentially profitable environments for its users in terms of knowledge acquisition and sharing of experiences. These characteristics are very important for the improvement of learning environments. The ability to encourage students to interact with the learning content and its creators is essential for the students to take a critical posture in relation to this content and also give their contribution to improving it. The development of critical thinking and proactivity is raised in an environment of sharing lived in a social network online.

Make the student an active agent able to define their learning process and resolve problems that arise during this process, instead of just being a receiver of knowledge, will be a significant improvement in the quality of education. Augmenting the creation of future professionals better prepared for the job market with obvious benefits to society in general.

The creation of an application that can provide the characteristics of online social networks in an e-learning platform can be an extremely important element in creating a work environment more attractive for the student. The overall vision of close integration between the e-learning platforms and OSN can bring a huge number of advantages to traditional platforms.

We identified the potential contributions of online social networking for e-learning platforms. From this research an application has been built that creates a collaborative environment for content sharing and interaction between users on a e-learning platform. It is concluded that the goals set at the start of this work were fully achieved.

This work presents the potential of OSN in the development of the student learning process, describing the most relevant available applications. Current learning management systems are platforms with rigid structures that do not promote students pro-activity, making it unattractive over time. This failure may be overlapped with the dynamic and cooperative environment of OSN. Web sites such as Facebook, MySpace and Twitter belong to the Web 2.0 vision. This new structure gives users spaces to contact with each other's and share information between them. They can have numerous Web sites with several available services that will allow, for instance, contact with groups of people with common interests or Web sites where one can make or edit existing content, such as wikis. These services enhance information and knowledge sharing and interaction between users, furnishing tools that improve the contact among students, where they can manage their own learning process. Then, OSN enhance e-learning experience.

5.2 Future Work

E-Learning and OSN are relatively new areas and constantly evolving. It will be interesting and potentially profitable to continue the research work carried out. The web and information technologies do not stop evolving and we are surprised almost daily with innovators news in this area. OSN have become a worldwide phenomenon, with an increasing number of supporters, and it is very likely that they are here to stay.

Will therefore be interesting to monitor and analyse the developments around these two areas and to reflect on possible synergies that might result from there.

As a new application, the approval by the users is essential for its validation. It's suggested the creation of a questionnaire aimed at assessing the quality of experience by users when using the application. The results obtained will undoubtedly be a good basis for improving the application in order to constantly improve its usability.

PLEBOX is a young and growing e-learning platform. Being a modular platform, the creation of new modules will be essential to its claim as a valid e-learning tool. The creation of modules devoted exclusively to the most diverse online social networking will be a significant improvement in building an environment of constant interaction within the platform.

References

- [1] H. Shaohua and W. Peilin, "Web 2.0 And Social Learning in a Digital Economy" in *IEEE International Symposium on Knowledge Acquisition and Modeling Workshop (KAM 2008)*, Wuhan, China, December 21-22, 2008, pp. 1121-1124.
- [2] D. Bauerova and M.L. Sein-Echaluce, "Open Dialog as a Tool for University Education" in *29th International Conference on Information Technology Interfaces (ITI 2007)*, Cavtat/Dubrovnik, Croatia, June 25-28, 2007, pp. 33-38.
- [3] L. Amaral and D. Leal, "From Classroom Teaching to e-Learning: The Way for a Strong Definition" in *Proceedings of World Multi-Conference os Systemics, Cybernetics and Informatics (WMSCI 2006)*, Orlando, Florida, USA, July 16-19, 2006.
- [4] N. Hoic-Bozic, V. Mornar and I. Boticki, "A Blended Learning Approach to Course Design and Implementation" in *IEEE Transactions on Education*, Vol. 52, Issue 1, February, 2009, pp. 19-30.
- [5] G. Kakasevski, M. Mihajkov, S. Arsenovski and S. Chungurski, "Evaluating Usability in learning management system moodle" in *30th International Conference on Information Techonology Interfaces (ITI 2008)*, Cavtat/Dubrovnik, Croatia, June 23-26, 2008, pp. 613-618.
- [6] Li Jin and Z. Wen, "An Augmented Social Interactive Learning Approach Through Web2.0" in *33rdd Anual IEEE International Computer Software and Applications Conference (COMPSAC 2009)*, Vol. 1, Seattle, Washington, July 20-24, 2009, pp. 607-611.
- [7] J. Breslin and S. Decker, "The Future of Social Networks on the Internet" in *IEEE Internet Computing*, Nov.-Dec., 2009, Vol. 11, Issue 6, pp. 86-90.
- [8] T. Orehovacki, G. Bubas and M. Konecki, "Web 2.0 in education and potencial factors of Web 2.0 use by students of information systems" in *Proceedings of the ITI 2009 31st International Conference on Information Technology Interfaces (ITI 2009)*, Cavtat/Dubrovnik, Croatia, June 22-25, 2009, pp. 443-448.

-
- [9] M. Cunha, A. Raposo and H. Fucks, "Educational technology for collaborative virtual environments" in *12th International Conference on Computer Supported Cooperative Work in Design (CSCWD 2008)*, Xian, China, April 16-18, 2008, pp. 716-720.
- [10] F. Wang, L. Xiayuan, Z. Chengling and X. Chunyan, "Construct Personal Environment Based on Web2.0" in *International Conference on Management and Service Science (MASS 2009)*, Beijing, China, September 20-22, 2009, pp. 1-4.
- [11] M. Hamada, "An Integrated Virtual Environment for Active and Collaborative e-Learning in Theory of Computation" in *IEEE Transactions on Learning Technologies*, Vol. 1, Issue 2, April-June, 2008, pp. 117-130.
- [12] A. Harrer, N. Pinkwart, B. McLaren and O. Scheuer, "The Scalable Adapter Design Pattern: Enabling Interoperability between Educational Software Tools" in *IEEE Transactions on Learning Technologies*, Vol. 1, Issue 2, April-June, 2008, pp. 131-143.
- [13] (2010, Jul.) CEIL - Collaborative Inquiry and Experimental Learning. [Online]. Available: <http://www.cielproject.eu/>
- [14] (2010, Jul.) SAIL - Scalable Architecture for Interactive Learning. [Online]. Available: <http://sail.sourceforge.net/>
- [15] G. Dettori and D. Persico, "Detecting Self-Regulated Learning in Online Communities by Means of Interaction Analysis" in *IEEE Transactions on Learning Technologies*, Vol. 1, Issue 1, January-March, 2008, pp. 11-19.
- [16] P. Kärger, D. Olmedilla, F. Abel, E. Herder and W. Siberski, "What Do You Prefer? Using Preferences to Enhance Learning Technology" in *IEEE Transactions on Learning Technologies*, Vol. 1, Issue 1, January-March, 2008, pp. 20-33.
- [17] W. Hu, T. Chen and Q. Shi, "Collaborative Web-Based E-learning Environment for Information Security Curriculum" in *World Academy of Science, Engineering and Technology*, Vol. 53, 2009, pp. 489-492.
- [18] "CREATING AND CONNECTING - Research and Guidelines on Online Social and Educational Networking", *National School Boards Association*, July 2007.
- [19] A. Bradley. (2010, Jan.) A New Definition of Social Media. [Online]. Available: http://blogs.gartner.com/anthony_bradley/2010/01/07/a-new-definition-of-social-media/
- [20] J. Kerievsky, *Refactoring to Patterns*, Addison Wesley, 2004.
- [21] *C# Language Specification - Standard ECMA-334*, ECMA International, 4th Edition, June 2006.
- [22] C. Nagel, B. Evjan, J. Glynn, K. Watson and M. Skinner, *Professional C# 2008*, Wrox, Wiley Publishing Inc., March 2008.
- [23] D. Esposito, *Introducing Microsoft ASP.NET 2.0*, Microsoft Press, 2005.

REFERENCES

- [24] P. DeBetta, *Introducing Microsoft SQL Server 2005 for Developers*, Microsoft Press, 2005.
- [25] M. Li and Z. Liu, "The Role of Online Social Networks in Students' E-Learning Experiences" in *International Conference on Computational Intelligence and Software Engineering (CiSE 2009)*, Wuhan, China, December 11-13, 2009, pp. 1-4.
- [26] K. Figl, S. Kabicher and K. Toifl, "Promoting Social Networks Among Computer Science Students" in *38th Annual Frontiers in Education Conference (FIE 2008)*, Saratoga Springs, New York, October 22-25, 2008, pp. S1C-15 - S1C-20.
- [27] S. Murugesan, "Understanding Web 2.0" in *IT Professional*, Volume 9, Issue 4, July-August, 2007, pp. 34-41.
- [28] L. Sorensen and K. E. Skouby, "Next Generation Social Networks - Elicitation of User Requirements" in *IEEE 19th International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2008)*, Cannes, France, August 31 - September 4, 2008, pp. 1-5.
- [29] M. Bhattacharya and J. Dron, "Cultivating the Web2.0 Jungle" in *Seventh IEEE International Conference on Advanced Learning Technologies (ICALT 2007)*, Niigata, Japan, July 18-20, 2007, pp. 897-898.
- [30] J. Dron and M. Bhattacharya, "Lost in the Web2.0 Jungle" in *Seventh IEEE International Conference on Advanced Learning Technologies (ICALT 2007)*, Niigata, Japan, July 18-20, 2007, pp. 895-896.
- [31] J. Vassileva, "Toward Social Learning Environments" in *IEEE Transactions on Learning Technologies*, Volume 1, Issue 4, October-December, 2008, pp. 199-214.
- [32] T. Simões, *PLEBOX - Personal Learning Environment, Box Thinking inside the Box*, University of Beira Interior, June, 2010.
- [33] B. De Wever, P. Mechant, P. Veevaete and L. Hautekeete, "E-Learning 2.0: Social Software for Educational Use" in *Ninth IEEE International Symposium on Multimedia Workshops (ISMW 2007)*, Taichung, Taiwan, December 10-12, 2007, pp. 511-516.
- [34] M. Ebner, "E-Learning 2.0 = e-Learning 1.0 + Web 2.0?" in *The Second International Conference on Availability, Reliability and Security (ARES 2007)*, Vienna, Austria, April 10-13, 2007, pp. 1235-1239.
- [35] D. Gallula and A. J. Frank, "Enriching the E-learning Experience in the Framework of Web 2.0 Using Usability 2.0" in *Fourth International Multi-Conference on Computing in the Global Information Technology (ICCGI 2009)*, Cannes/La Bocca, France, August 23-29, 2009, pp. 229-234.
- [36] D. Hussein, G. Alaa and A. Hamad, "Web 2.0 Based Service-Oriented E-Learning Systems: Recurrent Design and Architectural Patterns" in *11th ACIS International*

-
- Conference on Software Engineering Artificial Intelligence Networking and Parallel/Distributed Computing* (SNPD 2010), London, United Kingdom, June 9-11, 2010, pp. 227-234.
- [37] W. Te-Hua, N. Y. Yen, D. Yue-Lin and T. K. Shih, "Courseware Authoring Tool for Achieving Interoperability among Various E-Learning Specifications Based on Web 2.0 Technologies" in *International Conference on Parallel Processing Workshops* (ICPPW 2007), XiAn, China, September 10-14, 2007, pp. 25-30.
- [38] K. Nagi and P. Suesawaluk, "Research analysis of moodle reports to gauge the level of interactivity in e-learning courses at Assumption University, Thailand" in *International Conference on Computer and Communication Engineering* (ICCCE 2008), Kuala Lumpur, Malaysia, May 13-15, 2008, pp. 772-776.
- [39] T. Khamnayev, "Applying Some Principles of Semantic Web to Alleviate Lack of Collaboration and Integration in eLearning" in *Portland International Center for Management of Engineering and Technology* (PICMET 2007), Portland, USA, August 5-9, 2007, pp. 1005-1010.
- [40] P. Drazdilova, J. Martinovic, K. Slaninova and V. Snasel, "Analysis of Relations in eLearning" in *IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology* (WI-IAT 2008), Sydney, Australia, December 9-12, 2008, pp. 373-376.
- [41] J. Martinovic, P. Drazdilova, K. Slaninova and V. Snasel, "Relation Analysis in eLearning" in *7th Computer Information Systems and Industrial Management Applications* (CISIM 2008), Ostrava, Czech Republic, June 26-28, 2008, pp. 133-138.