

# **Adaptive Learning Environments with Knowledge Representation and Social Interaction**

State of the Art, Research Proposal with Work Plan  
Doctoral Program in Informatics Engineering (ProDEI)

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**“Whoever seeks the truth is seeking God, whether consciously or unconsciously”**  
St Teresa Benedicta of the Cross (Edith Stein) co-Patron of Europe



## Preface

This technical report partially fulfils the definitive registration in the Doctoral Programme in Informatics Engineering at Engineering Faculty of Porto University, Portugal. It is a reviewed version of a first report delivered in February 2007. Since then there has been some developments in the current research and it seemed important to rewrite this document. Moreover, this research project, since January 2008, has partly been supported by a FCT grant under the reference SFRH/BD/36206/2007.

## **Abstract**

The main topic of this research is evaluating the impact of technology usage on teaching and learning. In concrete, our research hypothesis starts with the premise that technology can be adapted to education and not the other way round in order to reach higher levels of effectiveness, when compared to using available standalone Web 2.0 tools in learning contexts.

The research method started with the study of learning theories, the technological available solutions that could be used in learning contexts, in particular the social software. Some experiments have been carried out using Ning's social software in a high school context and its outcomes gave an interesting turnout for using social networking in education. However, some adaptation was considered necessary in order to motivate and involve actively students into learning. Therefore we decided to draw a conceptual framework where the commercial available Hi5 social networking site and Moodle LMS could be used as users' platforms, but considering two different approaches: the students and teacher side. Additionally the assessment feature and the knowledge representation, as well as the adaptation feature in learning was taken into consideration.

The current research now tries to answer the problem of connecting the classroom with the student's room space, using Web 2.0 technologies to bridge both contexts and mediate the student's learning process. Later on, in a high school context, we will validate the developing tool to sustain the research hypothesis of adapting technology and using it as intermediary mechanism in learning activities outside the classroom.

### **Keywords:**

e-Assessment, e-Learning 2.0, interoperability, social networks, web 2.0

### **ACM Classification Keywords:**

D.2.6 [ Programming Environments]

I.2.1 [Applications and Expert Systems]

K.3.1 [Computing Milieux]: Computers and Education-Computer Uses in Education

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## 1. Introduction

The Internet has definitively changed the way people interact with information and this transformation process has not stopped yet. Now we are assisting to the massification of Internet and at the same time new services are appearing. (O'Reilly 2005) mentioned that with the Web 2.0 the future is here, we have just to distribute it. The youngsters, the digital natives, look at the web with close proximities perspective, while in contrast, adults, the digital immigrants, have some barriers and difficulty in seeing the involved scope.

Despite adults and youngsters having distinct approaches to Internet and information communication technology (ICT), both are actors of an active and social process of learning in schools, where a changing attitude is urging. Today the Internet provides interesting engineering solutions, which are reflecting a new second version of e-Learning systems where all school practitioners should actively get involved, reaching new skills and critical thinking. The literature gives reference to an empowered learner, a member of the net generation, who gives more focus to learning systems based on conversation, interaction, sharing, creation and participation (Downes 2006).

Unfortunately, the schools have difficulties in using technology on their own benefit and involve students in interesting learning activities. Additionally teachers are uncomfortable with the technology usage, specially knowing their students are digital natives. So how can we change this scenario in order to use technology on behalf of learning? We argue the students should use technology at school when acquiring new skills but with effective goals and knowing why are using that particular tool. Therefore, schools should bridge essential skills like maths and geography or history with web technologies and between their teachers and students. Moreover, at home, usually on their rooms, students tend to use their computers on leisure rather learning activities. So how can we bridge the classroom activities with the room activities?

The collapse of contexts in time and space is a dynamic feature which must be taken into consideration (Boyd, D. 2008) when establishing those bridges between school matters with students lives, teachers with students and classroom activities with the student's room activities. This is a difficult task, but we are focusing the interoperability and the adaptation of technology to enhance learning in those multiple contexts. The future research approach is towards a hybrid solution between technology and school to validate our claim that interoperable and adapted system solutions can enhance learning mechanisms, bridging formal with informal contexts.

This report, after this introduction, will reference an overall state-of-art about e-Learning and Web 2.0, where we describe some Web technologies, its usage and its applications in learning contexts. The purpose of this study is to give a sustained background of a doctoral research proposal of technology usage as a mediator between teachers and

students, to motivate and transform the learning phenomena in an appealing and successful activity. The third chapter will reference more specifically the ongoing research proposal on social networks usage with formative assessment with an interesting game scenario. A particular high school was chosen to validate this approach and this choice was made because the researcher is also teacher at that specific school.

## **2. State of the Art in e-Learning and Web 2.0**

### ***2.1 Learning Paradigms***

What does a paradigm mean or what is a learning paradigm? Well, a paradigm is a model, a perspective, a value system, a frame of reference, a filter, or a worldview that guides one's actions. It has the power to influence our perception.

New paradigms are appearing into our society, due to the abrupt changes in information systems and the emergent spin-of web technologies, namely Web 2.0.

Therefore learning itself must modify, adapt and incorporate these push-ups. However, it is not enough to create a new paradigm. If the education community does not see its potential and misses the window of opportunity, it would be in paradigm paralysis. This might happen just because of their mindset, which prevents from perceiving the entire significance. It is possible to see a new technology and completely miss its true application. This is because an actual paradigm is only either ready or equipped to deal with current perspectives (Ted McCain and Ian Jukes 2000).

In fact, while the web platform has evolved into a 'read-write' web (O'Reilly 2005) with e-Learning systems, having content creation rather than reading (Downes 2006), schools did not incorporated these technologies push-ups. The learning classrooms scenario with a traditional assessment system remains about the same. However, the employers complain that young people are not gaining the needed skills for the modern workplace. In addition, students exhibit distinct learning styles, technology structured or goal orientation with social enhancement and the schools do not cope with their learning perspective. Today we are assisting to a school dysfunction, where the teachers and school administration should provide solutions for those students and employers complaints.

The school model should incorporate the labour and students changes and become a truly learning place for the present generations acquire the needed skills for the jobs that are going to be invented. If we look into the students learning act, the teacher mediates the process and if the process is not right, then the teachers should change their education style. The teachers changing attitude is needed and should be supported by the school administration. In fact, if teachers rely on the present learning paradigm, they are blind to the true power of the school systems. This is a critical mistake and new learning

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mechanisms should not be compromised by the actual paradigm. Because of their oversight, the entire success of learning in future can come out compromised.

A growing community of educators and developers has been gathering around new models of learning. For instance in Portugal the interactic 2.0<sup>1</sup> social network is a place where more than five hundred educators gather around technology and education to exchange experiences, or the classroom 2.0<sup>2</sup> where more than ten thousand world educators are building today the school of the future.

The overall principle starts with the premise that schools should enhance learners the opportunity for using technology tools and participate in active learning, rather than passively receiving knowledge. In addition, students claim greater control over the learning experience with oriented tasks and having the chance of finding answers in searchable web mechanisms. They are fond of using collaborative learning spaces and opening the learning process to other people like their parents. They also would constitute their own personal learning environment (PLE) or portfolios, which they could use to interact or build their learning experience (Scott's Workblog 2006), (Marc Prensky 2001), (Diana Oblinger 2003).

The master key to change the school paradigm and regain success lies on how we perceive and apply the new technologies. It is time for education to catch up by delivering new skills for students and new roles for teachers in this search for wisdom.

### **2.1.1 Participation**

Learning environments are changing from a presentation to a participation paradigm. However, what is participation all about? While interactivity is a property of the technology, participation is a property of culture. So what are participatory cultures? Today many teenagers create media content or share content they produce. They are actively involved in participatory cultures.

A participatory culture is a culture with relatively low barriers to artistic expression and civic engagement, strong support in creating and sharing one's creations, and some type of informal mentorship whereby the knowledge acquired by the most experienced is then passed along to novices. Not every member must contribute, but they all feel some degree of social connection with one another. All members are free to contribute when ready and their contribute will be appropriately valued.

In fact, while for digital immigrants, the Internet primarily means the World Wide Web, for digital natives it means email, chat, games where they are already content producers. These communication and entertainment-focused activities enable youngsters to engage in multi-tasking, becoming proficient at navigation and manoeuvre to win, judging their participation and that of others. In terms of personal development, identity, expression

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<sup>1</sup><http://interactic.ning.com/>

<sup>2</sup><http://www.classroom20.com/>

and their social consequences, participation, social capital, civic culture are the activities that serve to network today's younger generation (Livingstone 2003).

Participatory culture is emerging as the culture that absorbs and responds to the explosion of new media technologies that make it possible for average consumers to archive, annotate, appropriate, and re-circulate media content in powerful new ways. A focus on expanding access to new technologies carries us only so far if we do not also foster the skills and cultural knowledge necessary to deploy those tools toward our own ends.

Several forms of participatory culture include:

**Affiliations** -memberships, formal and informal, online communities centred around various forms of media, such as: Facebook, Bebo, Hi5 or MySpace.

**Expressions** -producing new creative forms, such as: digital sampling, skinning and modding, fan videomaking, fan fiction writing, zines and other mash-ups.

**Collaborative Problem-solving** - working together in teams, formal and informal, to complete tasks and develop new knowledge, such as through Wikipedia, alternative reality gaming.

**Circulations** - Shaping the flow of media such as: podcasting or blogging.

A growing body of scholars suggests potential benefits of these forms of participatory cultures, including opportunities for peer-to-peer learning, a changed attitude toward intellectual property, the diversification of cultural expression, and a more empowered conception of citizenship. Access to this participatory cultures function as a new form of hidden curriculum, shaping what students will succeed and what will be left behind as they enter school. Some have argued that students acquire these key skills on their own by interacting with popular cultures. Three concerns, however, suggest the need for policy and pedagogical interventions:

**The Participation Gap** - the unequal opportunities access, experiences, skills, and knowledge that students will have for fully participating in the world of tomorrow.

**The Transparency Problem** - the students challenges about digital media, or social and cultural heritage that can shape their perceptions of the world.

**The Ethics Challenge** – the student's traditional forms of professional training and socialization are breaking down, and are giving place to more community participation where these same students are increasingly having public roles as media makers, even outside school spaces.

For the first two concerns, teachers must work together with other colleagues to ensure that every student has access to the skills and experiences needed to become a full participant and must not commit preconceived judgements before talking with all students. Also students are socialized into emerging cultural standards, that can shape their practices as media makers and participants in online communities. For the last concern, schools, as institutions, have been slow to react to the emergence of this new participatory culture. For students, the only opportunity for change is outside school and

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informal learning communities. However, it is still time for schools to devote more attention to foster a set of cultural competencies and social skills that young people claim. The school culture should shift the focus of literacy from one of individual expression to community involvement. The new literacy involves social skills developed through collaboration and networking.

The new skills include:

**Play** - the capacity to experiment with one's surroundings as a form of problem solving;

**Performance** - the ability to adopt alternative identities for the purpose of improvisation and discovery;

**Simulation** - the ability to interpret and construct dynamic models of real-world processes;

**Appropriation** - the ability to meaningfully sample and remix media content;

**Multitasking** - the ability to scan one's environment and shift focus as needed, to highlight details;

**Distributed Cognition** - the ability to interact meaningfully with tools that expand mental capacities;

**Collective Intelligence** - the ability to pool knowledge and compare notes with others towards a common goal;

**Judgment** - the ability to evaluate the reliability and credibility of different information sources;

**Transmedia Navigation** - the ability to follow the flow of stories and information across multiple modalities;

**Networking** – the ability to search for, synthesize, and disseminate information;

**Negotiation** – to participate in diverse communities, discerning or finding multiple perspectives, and grasping or following alternative norms.

Students acquire the skills they need to become full participants in our society (Jenkins, Clinton et al. 2006), but the school is not having an active role on this task. However would not be better the school practitioners meet those demanding skills and provide students the needed rather the traditional and usual skills?

### 2.1.2 Involvement

Active involvement is a key issue on the changing learning process. It refers to the amount of physical and psychological energy that a student devotes to the academic experience. Furthermore, involvement occurs along a continuum, that is, different students manifest different degrees of involvement in a given object, and the same student manifests different degrees of involvement in different objects at different times. It has both quantitative and qualitative features. The extent of a student's involvement in

school work, for instance, can be measured quantitatively (how many hours the student spends studying) and qualitatively (whether the student reviews and comprehends reading assignments or simply stares at the textbook and daydreams) (Astin 1999 ).

Nevertheless, teachers cannot force active involvement. They cannot impose their approach on students whose perceptions of reality run contrary to theirs. However, they must feel obligated to share their views with such learners to promote awareness of alternative ways of thinking, communicating and acting in school.

However many students are and will remain passive and dependent upon when taught. Others will certainly resist any learner-centred method. A few will become defiant, or defiantly indifferent.

For dependent students, learning is, and will continue to be, teacher-centred. Either they will treat teachers as experts, who know what the student needs to do, or they will passively slide through the educational system, responding mainly to teachers who "force" them to learn. They do not like the uncertainty associated with choices; they feel insecure in a context not rewarded by compliance; they feel anxious if communication is not mainly one-way.

Even though there is an active involvement of students in activities and decisions that are interesting, they might act differently. If there is no defined road but rather some exploration activities, they will look at it. In addition, the social involvement is crucial. If a colleague has enrolled, he or she will go next. Recent studies based on inquiry learning, (S. Manlove, A.W. Lazonder et al. 2006), revealed that essential questions designed to provoke collaborative inquiry by students and teachers on proposed topics and/or themes, really change the students involvement.

Students with some freedom to choose which activities they want to investigate and pursue essential questions are a nice commitment between the two types of learners (active, passive). Furthermore, connected assessments to activities push students to critically reflection and higher levels of understanding or even changes on the levels of commitment.

### **2.1.3 Empowerment**

Empowerment is also another key issue for the changing learning process. It implies a culture of continuous innovation in learning, and relates the amount of control that students believe themselves to have over their studies. In fact, the more extent students are involved in decision-making, the higher levels of confidence at school become. Through empowerment, students are able to manage and adapt, to change and contribute, to generate changes in their lives and environments.

However, students must have a high “intrinsic task motivation” or perceive themselves to be empowered for them to succeed.

There are four possibilities:

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- I- **Meaning** done to the work carried out by the student. Effective teacher supervision can enhance it more.
  - II- **Competence** associated with the student's work role. Teacher's feedback on performance, or encouraging the work performance, enhances the feeling of competence.
  - III- **Impact on** the student's work might have in the future.
  - IV-: **Self-determination** the student has to accomplish the learning objectives. He or she can decide on the order and pace of work.

Furthermore external context and students reactions to reality, play an important role in their empowerment. Students must have an active rather than a passive orientation to school. Being active students, they will respond favourably to learning opportunities and are subject to a greater variety of experiences through which can question and re-shape existing thought processes (Thomas K. and Velthouse B. 1990).

## **2.2 A Brief Outlook in Learning Theories**

The learning theories of Behaviorism, Cognitivism, and Constructivism though used as theory background, do not completely support the social interaction technology based, can have on learning.

If we only look at any of the attributes commonly associated with this these three learning theories, they all are in line with the definition of learning (Driscoll 2000).

*“Learning is a persisting change in human performance or performance potential, which must come about as a result of the learner's experience and interaction with the world.”*

Moreover, if we compare these learning theories with the epistemological traditions of Objectivism, Pragmatism, and Interpretivism one can find a direct relationship, where as:

- Objectivism is similar to Behaviourism, as it states that reality is external and objective, and that knowledge is gained through experiences.
- Pragmatism is similar to Cognitivism, as it states that reality is interpreted, and knowledge is negotiated through experience and thinking.
- Interpretivism is similar to Constructivism, as it claims that reality is internal, and knowledge is constructed.

However, all these learning theories state that learning occurs inside a person and do not reinforce the social aspect of learning. Even social constructivist views, which hold that learning is a socially enacted process, promote the principality of the individual in learning. In fact, these theories do not address learning that occurs outside people and the impact social networking sites can have in their lives.

However, recent social technologies are drastically changing the communication ways and undoubtedly, the way we learn and think. These breakthroughs are emerging in informal learning spaces which are growing on importance. This occurs in a variety of ways– through communities of practice, social networks, and through completion of work-related tasks.

The learning theories behind formal contexts must take into account the communication social processes, the connected information handling and the way information is explored. An entirely new approach should include social interaction and add new learning activities, moving learning towards social connectivity.

The Connectivism approach, presented by (Siemens 2005), considers these same issues and explains not only the individual but also the social and organizational learning processes. This learning theory goes beyond the Constructivism itself and even the latest modifications of Social Constructivism for including social interactions without avoiding the same inside-out limitations of the original theory. The starting point of this concept is that knowledge exists by itself. Students must not build it. They are supposed to achieve knowledge by connecting the nodes where information is located. These nodes can be fields, ideas, communities that specialize and gain recognition for their expertise. The student is supposed to make links or bridges, which allow short connections between pieces of information. This capacity to form connections between different sources of information can create useful information patterns and have echo in many fields, such as economics, mathematics or computer science. Surprisingly, Siemens claims that the starting point of Connectivism is the individual. Personal knowledge is comprised of a network that feeds into organizations and institutions that in turn feedback into the network, and then continues to provide learning to individual. This cycle of knowledge development (personal-network-organization) allows learners to remain current in their field through the connections they form.

Social network analysis is an additional element in understanding learning models in a digital era (Kleiner 2002). Within social networks, hubs are well-connected people who are able to foster and maintain knowledge flow. Their interdependence results in effective knowledge flow, enabling the personal understanding of the state of overall activities.

Another interesting topic is the argumentation analysis. Despite of using argumentation as a private activity aimed at justifying old ideas or revising new explanations for well-established concepts with conservative ways of seeing the world, it is possible to define argumentation as the social activity leading to the development of novel ideas, to the distinction of new concepts and, generally, new ways of seeing the world (Walton 2005).

In addition, semiosis is the infinite process of sign interpretation and the mind uses it according to the laws of inference and argumentation structures. Thinking and reasoning are based on abductive, deductive and inductive inferences, aiming at establishing beliefs, habits, rules and codes. Through this kind of arguments studying, students should learn how to question any chosen standpoint and discuss with valid reasons (Van-Gelder

2005). However, this is a quite advanced skill that is not easy to acquire and is based on defeating “cognitive biases”, prejudices and mental laziness.

In a social context, the premises can be better assimilated and with the social interactions, faster understanding can also be reached. The interaction is a crucial aspect to understand some particular topic. Sometimes a student by himself or herself is not capable of breaking some barriers that other students have no difficulty to dealing with, and by working closely together, they reach a new level of knowledge. Also (Brown 2002) claims that the internet leverages the small efforts of many with the large efforts of few. The central premise is that connections created with unusual nodes support and intensify existing large effort activities. Brown provided a project experiment, which links senior citizens with elementary school students in a mentor program. The children listen to these grandparents better than they do their own parents. The small efforts of the many- the seniors – complement the large efforts of the few – the teachers. This amplification of learning, knowledge and understanding through the extension of a personal network is the epitome of Connectivism.

Going a step further with collaborative learning environment, where social interactions emerge and also with structuring information, some fundamental features start to take shape. Some of them should be considered in a system requirement. One can start with the classification presented by (Hein 1995).

- Learning is an *active process* that requires the learner being engaged with the world.
- There are always *two different levels* in the learning process: the first level comprises *constructing meaning*, while the second level involves the *construction of meaningful systems*.
- *Language* has a central role in learning.
- Learning is a *social activity*, it is intimately associated with our connection with other human beings, our teachers, our peers, our family as well as casual acquaintances.
- Learning is *contextual*, we do not learn isolated facts and theories in some abstract ethereal land of the mind separated from the rest of our lives; we learn in relationship to what we know, what we believe, to our prejudices and to our fears.
- *One needs knowledge to learn*, it is not possible to assimilate new knowledge without having some structure developed from previous knowledge to build on. The more we know, the more we can learn.
- *Motivation* is a key component in learning. Unless we know "the reasons why", we may not be very involved in using the knowledge that may be instilled in us, even by the most severe and direct teaching.

Web learning environments, where students have no guidance, does not result in effective knowledge. In fact, pure discovery learning, without any guidance does not result in knowledge acquisition (de Jong 1998). Furthermore, learning and intellectual development are undoubtedly related to social interactions, the learner constructs knowledge due to interaction with others (Driscoll 1994).

### **2.3 Learning Principles from a Technology Perspective**

A dynamic digital learning system can complement a face-to-face class approach. Some authors call it B-learning, as for blended learning, where both systems coexist. One key issue is the student's goals and motivations, which will determine the degree of interaction and engagement upon the digital learning space. Nevertheless, these issues relate the student with the teacher, the tool availability for teaching and the right environment to accomplish the knowledge apprenticeship.

Nowadays different web-based systems have grown with the aim of supporting the learning activity. Among them, the most common are the so-called CMS (courseware management systems), online environments that provide a wide set of functions for a virtual classroom, such as the sharing of learning material to read, programming examples to analyze, quizzes to take, tools for communications like chat-rooms or email services and others.

These systems, as (Weber and Brusilovsky 2001) argues, owe their popularity to their versatility. In fact, research in AIED (Artificial Intelligence in Education) has produced systems that can provide better support to the students, but that remain fragmented in respect to the educational activity considered as a whole. The authors are referring mainly to ITS (intelligent tutoring systems) and AH (adaptive hypermedia), well known technologies which draw their force from the construction of a learner model and the definition of specific teaching behaviours depending on this model.

The potential of moving these types of systems into a web-based environment is appealing, and can be justified at least by two reasons. The first one is related to users, who would be many more compared to those of a traditional standalone application, therefore a personalization of the service would become fundamental. The second one is leaving more autonomy to the student with better teacher assistance and collaboration between peer students.

E-Learning was presented by (Drucker 2000) as a new *ubiquitous* learning process with two fundamental benefits: the eliminations of the barriers of time and distance and the personalization of the user's experience. E-Learning is integrated into the value chain activity, that is, it integrates content in context, delivering the timeliest form of knowledge. Nevertheless, some barriers still exist and e-Learning is not the answer to all.

Another field of research is CL (collaborative learning). A clear and useful description of this scenario is given by (Dillenbourg 1999). Some aspects worth mentioning are:

- The number of people involved in the process,

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- The way people learn in collaboration,
  - The kind of collaboration instituted among the different actors,

In addition, the learning community is making a shift from traditional academic education with Computer-based learning (CBT) into CSCL (Computer Supported Collaborative Learning) systems.

CBT is seen as a self-paced and user-friendly interface that attempts to automate education and replace the instructor with some pre-recorded educational content. Although it provides a richer and more personalized user experience with multimedia technologies and asynchronous interaction, its contents and methods are for a general audience. CSCL, on the other hand, focuses on the use of technology as a mediation tool for collaborative methods of instruction. Collaborative learning can be categorized depending on the locus of use (intra, inter or extra classroom), on how the use is coordinated synchronously in time, e.g. chat programs, or asynchronously, e.g. email, or on the instructional role they are designed to situate a learning process, or to support problem solving. Thus, as (Lipponen 2002) says,

*“CSCL is focused on how collaborative learning supported by technology can enhance peer interaction and work in groups, and how collaboration and technology facilitate sharing and distributing of knowledge and expertise among community members”.*

Another attempt to cast the new web-based instruction into a theoretical framework is presented by (Young 2004). After pointing out how little research is present in order to understand

*“the unique ways in which the web might promote, impede or fundamentally affect the way in which we learn and the development of related skills”,*

the author defines the new medium as a *“cognitive tool”*, Where the web supports one’s cognitive powers and receives its cultural significance and meaning by the community of users. This means, from my point of view, that while helping learning and thinking to occur, from a web-based activity, the web’s ‘normal’ usage routines is determining and subsequently affect the way it is further developed.

This dialectic between student and tool is deeper described using three theoretical positions:

- *Situated cognition*, which emphasizes authentic activities as the most fertile learning setting,
- *Distributed cognition theory* posits that one does not possess knowledge as such, rather *“knowledge evolves from a complex relationship between the tools, rules, values, artefacts and individuals making up a particular environment”*,
- *Activity theory*, that studies cognition as the result of the learner’s goal-oriented activities, the various tools used in these processes, the communities involved in the environment and the rules they have established.

These theories act as conceptual maps to understand the everyday use of the web and to draw effective instructional routes based on the growing new technologies.

The work of Young, therefore, does not intend to be a conclusive assertion on the nature of web-based activities, but it opens diverse directions of research and stresses the importance of a theoretical reflection in order to drive and understand the practice.

In addition, in the field of e-Learning theory, it is worth noting other research done in the following directions:

- The definition of some ethical guidelines for computer supported education (Aiken and Epstein 2000), based on the fundamental dimensions of human beings. For example, systems should avoid information overload (intellectual dimension), they should encourage and not demoralize the user, while supporting the developments of positive character traits (ethical dimension), or should not attempt to replace the teacher (social dimension).
- The definition of a “blended learning” paradigm (Motschnig-Pitrik and Mallich 2004), in which the advantages of traditional lecturing are conjugated with the repeatability of e-Learning software. A complete and deeper form of learning is in fact reachable only if the ‘human factor’ is maintained within the educational process: in such a scenario, the burden of delivering significant parts of intellectual knowledge is allocated to the computer, while the teacher acts as a facilitator and a bearer of the human values to be transmitted to the student.
- The assessment of e-Learning strategies applied to student’s performances. If learning can be described (within the framework of cognitive load theory) as a passage of information from working memory to long-term memory, there are techniques to evaluate the frequency and success of this process and therefore estimate the design of a learning environment (Heo and Chow 2005).

In the e-Learning discussions, (Downes 2005) argues that personal descriptions, as found in social networks, and resource descriptions, as found in the semantic web, should be merged to form a single network, the semantic social network. Also (Marchiori 2006) claims there are in learning systems cost relations between technological and social aspects. To enable computers to play a key role in collaboration environments, one must combine computers with people. Therefore, learning systems should have:

- *More interaction* like the Digg swarm (Diggs Lab),
- *More connection* between social space and data space, associated with the semantic web usage,
- *Go social* with social software where by spreading the load we multiply the benefit,
- *Go visual* creating interactive systems enticing the user like in (MMORPGS 2006) environments,

- Maintain the *social cost low* by using poor semantics and reasoning, like old keywords approach, rather than precise semantics and exact reasoning from semantic web.

With that, we posit e-Learning has the potential to become more personal, social and flexible with new web services, empowering students in a truly learning environment.

Some good examples can be found such as (Tagworld) for meeting people; (Flickr) for sharing photos; (Technorati) for tracking blogs; (Wink) for making tutorials; (eMill) for making e-Portfolios; or (Eurekster) system for vertical community web search; (Twitter) a social networking and micro-blogging service that allows users to send updates which are text-based posts.

There are various webbing tools, which are present in table 1 and classified according to the user's interaction. The first level only enables access to data and information. The second level considers the formulation of opinion based on other points of views and a third level, the user's contribution is added.

Types of tools	Factual information	Formulate opinion	Contribute own opinion
Alerts	✓		
<b>Wikis</b>	✓		✓
<b>Webcasts</b>	✓		
AudioBlog	✓		
<b>Podcasts</b>	✓	✓	
<b>Blogs</b>	✓	✓	
<b>Chat interview</b>	✓	✓	
<b>Discussion Boards</b>	✓	✓	✓
<b>Quick poll</b>	✓		✓
<b>Survey</b>	✓		✓
<b>e-Portfolios</b>	✓	✓	

Table 1: Tools analyses

The tools analyzed, where user's accesses information and can contribute with their own opinion are the most important ones. These tools are: **Discussion Boards (forum)**, **Quick poll & survey** and **Wikis** that are an interesting concept of collaborative social knowledge construction, which deserves some in depth analyses later on.

Later on **e-Portfolios**, **Podcasts** and **Blogs**, are described in more detail. E-Portfolios can combine access to information where users can contribute with their opinion. Milligan describes this as PLE (Personal Learning Environment) where learners have greater control over their learning experience, managing resources and activities they participate. In addition, they would personalize their own learning environment and interact with the

web system to access content, assessment and other activities (JISC e-Learning Focus 2006). In addition, the combinations of Podcasts or Blogs with feeds, and the possibility of adding reader's comments is becoming very interesting to explore in learning environments.

## **2.4 Related Learning Tools**

Sometimes, the simplest concepts have the greatest impact. For many, technology is intimidating and simplicity is more important than its potential or features. Despite the book having its own place in learning, there is a lot of interesting web tools that can give a big push up on learning and bring a new dimension into it.

### **2.4.1 Discussion Boards (Forums)**

For instance, forums or discussion boards enable web users to connect different information sources of a particular subject, usually of the community interest. This dynamic knowledge is very important in operational issues, where no book is available. It is like a manuscript or a bunch of connected ideas or notes. We can see these tools on two perspectives. On one side when we are looking for a particular subject, and maybe someone has already presented it in a forum, and someone has already answered it. Alternatively, on the other side, we can actually contribute with our own ideas, in a discussion and therefore participate on the collective knowledge construction.

There are some differences between a discussion board and a forum. While in a discussion board, the topics introduced invite us to contribute; in a forum, there is usually a question and answer process around a specific topic, of the overall interest. We can even consider discussion boards and forums the same. It depends on how we use them.

### **2.4.2 Quick Poll & Survey**

These two tools are also very interesting. Whereas a quick poll, from which a general perception of the population can be obtained in a short period and is a non-scientific method, a survey is a scientific sample of opinions considered representative of a whole. Therefore, polling can measure opinion, but a survey can actually be a decision maker. Both are usually used in on-line environments and can add social aspects, especially actively increase user's participation. There are innumerable online software tools that can be used. For instance for an online survey or polling we can use (Statpac), or (SSIWEB), or even (Free-website-polls).

These issues can be used in collaborative spaces, where feedback input is necessary, for instance to choose tasks to be performed or make a stand on a controversial discussion.

### 2.4.3 E-Portfolios

In addition, e-Portfolios are tools used to construct one's identity within social networks and organizations. They are value learning in forms of collection, archive, learned, reflected or presented assets.

With (E-portfolios) learners build and maintain a digital repository of artefacts, which they can later use to demonstrate competence and reflect on their learning.

In fact, with the students' portfolios organized within a platform, it will be interesting to enable all students to quickly navigate through them and compare distinct forms of organization. Portfolios are important means of documenting and evaluating achievements and improvements in student learning, but can also enable students to work out their differences and divergences. By reaching mutual consensus and commitment, students are increasing their level of citizenship.

In addition, on the teacher perspective, portfolios can be used to develop teachers own professional expertise. Teachers can collect all teaching documents that they have accumulated over the years and produce a private teacher portfolio containing central aspects and reflections on their work as a teacher. Later on, this same portfolio can be the starting point for students to build their own portfolio.

### 2.4.4 Blogs & Wikis

Blogs are a simple concept that has the potential to alter the way in which people encounter and examine ideas, receive news, and even learn. A blog is short for web log, and consists of regular updates, links, and news posted on a personal site. Blogging can be used as a means of disseminating information across an organization (Siemens 2002).

Blogging uses a new medium for connecting and interacting, where all share the format, enabling the social interactions. It is the ability to empower anyone, with a journalistic model, exploiting the true democratic nature of the web.

The overall uses have still not been completely explored, but they can be associated with:

- Knowledge sharing and knowledge management (Bottoms Up KM Development),
- Customer service (Blogging Goes Corporate),
- Interactive journalism (Instapundit),
- Communication,
- Self-expression,
- Learning (SchoolBlogs),
- Self-marketing,
- Campaigning/social reform (Tara Grubb),

- Community building, experience tracking (A K-log Pilot Recap) storytelling (Nichani and Rajamanickam 2001).

The benefit is the democratization of information with content creation and consumption in a decentralized manner. The user is in control and the audience has acquired a central role, with the possibility of adding comments links and starting a dialogue with not only the author, but also other readers as well.

This idea is to provide a sharing meaningful and understandable space, where the space is more important than the content itself. Truly, knowledge acquired and shaped as a social process has a new dimension in learning environments. Furthermore, wikis are used for collaborative content creation, with syndication standards and aggregation services or tagging services (folksonomies). It is a very interesting vision the Archimedean spiral where knowledge is the central point, the ideas are the starting point, and the learning processes the radii, which is a continuous monotonic function.

### **2.4.5 Podcasts**

Podcasting derives its name from Apple's iPod, but to create a podcast or even to listen to one, we do not need to own an iPod, or any portable music player for that matter. It is a new type of online media delivery. It is possible to publish selected audio files on the internet and users subscribe via an RSS feed to automatically receive the new files.

Podcasting is very useful for interviews, and then deliver them over the internet to anyone who wants to listen in. Of course, it involves producing our own audio files (usually in MP3, or WMA formats) and then publishing them online somewhere, indexed for subscription and reception by an RSS (Really Simple Syndication) reader. They are then downloaded to subscribers' iPods, cell phones, iTunes directories, or other locations to listen to whenever we want. In fact, it is quite simple to produce and deliver podcasts. One can find some interesting examples on (makezine.com) or even at top ten (PodcastAlley).

## **2.5 Web 2.0 as a Research Tool**

### **2.5.1 The Evolution from Web 1.0 to Web 2.0**

Web 2.0 has emerged from the characteristic feature of participation, where users contribute to growing pools of information, becoming co-developers of web sites and citizen-producers and publishers, working in a range of media. Web 2.0 is manifesting in a number of very popular sites and massively distributed on online applications.

In figure 1, a comparison between web 1.0 and web 2.0 is illustrated. There it can be seen that Web 2.0 is much more about change in people and society than about technology. Sites like (Myspace), (Youtube), (Digg), (Bebo), and (Flickr) clearly represent this recent web strand (O'Reilly 2005).

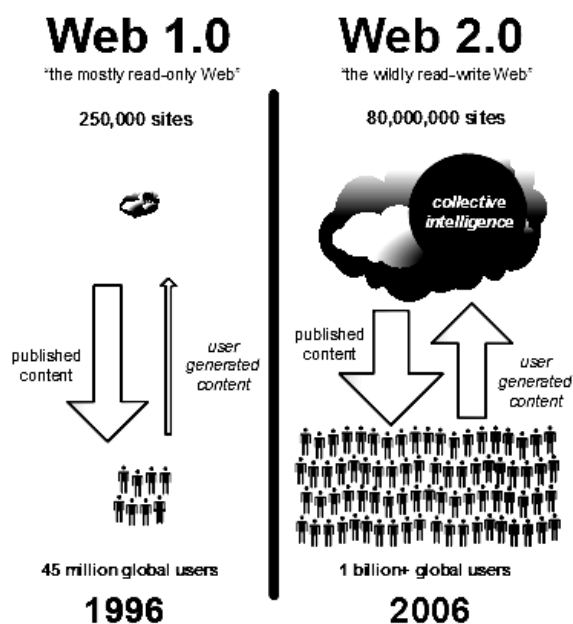


Figure 1 – Ten years of web evolution (Hinchcliffe's 2006)

Also in figure 2, we can visualize the elements present on the web 2.0, where we can find, on the right side, some tools and technologies and in the centre, there is the cloud people, interacting in both two ways with a web system. This system is software that gets better within people interaction. It provides in numerous services and gives control to the user. There are some other properties represented: trust, tagging, beta, small pieces, permalinks and, of course, user control.

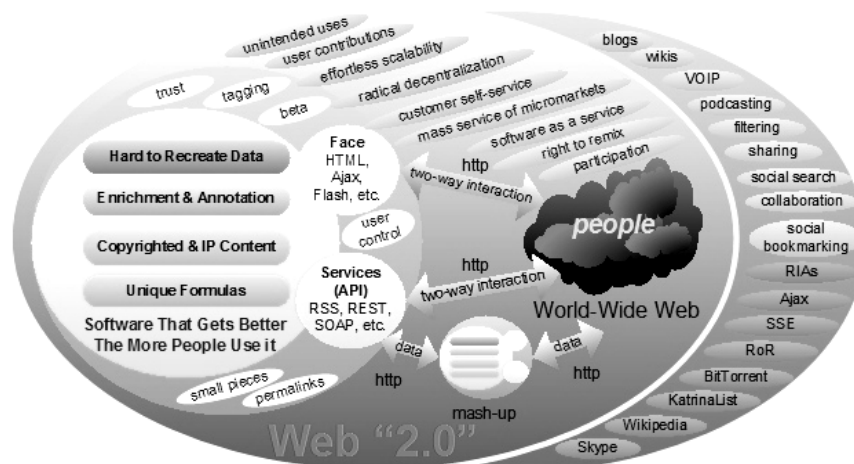


Figure 2 – Elements of web next generation (Hinchcliffe's 2006)

## 2.5.2 Semantic Web

(Mizoguchi and Bourdeau 2000) defined the “*Instructional Design*” paradigm as the evolution of Intelligent Tutoring Systems and Interactive Learning Environments. This new paradigm fosters the introduction of ontological engineering in the educational field.

Three different kinds of ontologies could give support to the description of a learning resource.

- *Domain ontologies*: the content would solve problems related to the content of language ambiguities, and would evolve basic keyword queries into semantic searches.
- *Context ontology*: identify learning contexts such as an *introduction*, an *analysis* of a topic, or a *discussion*, or *presentation* contexts such as an *example* or a *figure*.
- *Structure ontologies*: to specify the construction-grammar to assemble small bits of information into personalized and quick-delivered learning narratives; concepts like *Prev*, *Next*, *References*, *IsBasedOn* etc. constitute the semantic connections to build a “Lego” learning system tailored to meet individual skill gaps.

Another overview of the future implications of ontology usage in teaching and learning is proposed by (Wilson 2004), who gives a clear and useful summarization of the potential benefits of it in the following points:

- Students are provided with advanced browsing and searching support in their quest for relevant material on the web.
- Syntactically different but semantically similar resources can be more easily located.
- The same work involved in creating ontologies can directly benefit learners by helping them to visualize and comprehend the relationships between concepts in their domain.
- Information can be shared across educational applications, enabling reuse not only of learning objects but also of domain knowledge and pedagogical strategies.
- Learners can be provided with intelligent and personalized support that they would otherwise miss out (for example, personalized courses can be generated on demand).

In a similar way, the author outlines also the implicit risks of a serious employment of the technology in the educational areas:

- The ontology development process can be difficult and costly: the more expressive the ontology is the more complex and time-consuming this task becomes.

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- The context within which ontology is supposed to be used tacitly constraints the definition of its concepts; so, in order that knowledge can be effectively shared, the contextual information must be formalized as well.
  - Rich and complicated ontologies, far from the hierarchical structure of taxonomies, carry great expressive power, but are hard to comprehend especially for end-users.
  - Since communities from different backgrounds (like library science, knowledge engineering, and business) are involved in the ontology development process, there is a lot of overlap and reinvention, or many situations in which the same things are defined differently.

A precise discussion of the relationship between Semantic Web and e-Learning is also offered by (Devedzic 2004), who stresses the possibility of an improvement in AIED (Artificial Intelligence in Education).

(Stutt and Motta 2004; Stutt, Collins et al. 2005), describe in a detailed way a scenario where one of the major problems of the Semantic Web, the competing and overlapping nature of its ontologies, would be overcome by the existence of a multiplicity of community-based Semantic Learning Webs (SLWs). In fact, since the nature of the medium is distributed, it makes sense to let agents construct ontologies and repositories in a distributed way. Communities would build so-called “knowledge charts”, in order to represent the information of their interest, while specific “knowledge browsers” would navigate these digital spaces looking for consistency and correlation between concepts.

In particular, ontologies are used to represent domain knowledge (the content of the learning), argumentation schemas (the relations between pieces of knowledge) and pedagogical narratives, while other useful technologies deal with the visual representation of knowledge charts, information extraction for automatic ontology population, annotation and semantic browsing of the resources.

### **2.5.3 Syndication and Aggregation Web Feeds**

In the typical scenario of using web feeds, the content providers publish a feed link on their site which end users can register with an aggregator program (also called a *feed reader* or a *news reader*) running on their own machines. When instructed, the aggregator asks all the servers in its feed list if they have new content; if so, the aggregator either makes a note of the new content or downloads it. Aggregators can be scheduled to check for new content periodically. The kinds of content delivered by a web feed can be html, or links to WebPages, or just notify users of content updates, with summaries in the web feed rather than the full content itself.

The distinction between rss and atom is due to the dissatisfaction with rss, mainly because of the multiple incompatible and widely adopted versions of rss. The intention of atom was to ease the difficulty of developing applications with web syndication feeds.

### 2.5.4 Ajax and Php

Ajax is not just a JavaScript based language, but also several technologies, which bring transparent communicating and manipulating data in conjunction with a server-based technology into web applications. From the server-based side, the technologies capable of working in conjunction with Ajax, the most suitable is perhaps Php, a very popular scripting language.

Ajax incorporates standards-based presentation using XHTML and CSS; dynamic display and interaction using the Document Object Model; data interchange and manipulation using XML and XSLT; asynchronous data retrieval using XMLHttpRequest; and JavaScript binding everything together.

Ajax is also a key component of web 2.0 applications such as (Flickr), now part of Yahoo, (37signals) applications, as well as other Google applications such as (Gmail) and (Orkut; O'Reilly 2005).

### 2.5.5 Social Software

Social software is a tool that allows people to connect with others, to share ideas and collaborate. The most important feature of this type of software is the networked nature of communication. It supports group interaction and other communications systems that host many-to-many interactions. Some examples can be found at (Groove), or (Friendster). It can also include collaborative filtering technology like Amazon's recommendation software and EbayDotCom.

More important is the collaboration aspect, where tagging comes along. That is the importance given to *Social tagging software*, which enables users to create shared bookmarks to online resources with additional metadata. Social tagging websites like bookmarking services (e.g. del.icio.us) or photo sharing services (e.g. Flickr), use “tag” images and share bookmarks respectively within a large user community.

The advantage of these social tagging systems is that the user is free to choose any descriptive terms and is not restricted to a preconceived vocabulary, taxonomy or ontology. This bottom-up approach, which results in semi-structured information spaces, is “social classifications”. This differs significantly from the knowledge engineering and semantic web approach that induces having shared ontologies of well-defined terms and structures to enable machine computation.

Social tagging is not a formal approach to knowledge modelling; it is rather a complementary mechanism to the highly structured top-down approach. There are several good examples of social tagging software with different services.

- (Swik), a search engine that learns from your community;
- (O'Reilly's CodeZoo), houses socially shared tags;
- (del.icio.us), a social bookmarking service;

- (Flickr), a photo sharing service;
- (Technorati), service to find Blog postings;
- (Suprglu) service, for aggregation;
- (43Things) a social list;
- (voo2do) also an on-line to-do list;
- (Ma.gnolia.com) to find web sites and build community online;

The table 2 tries to provide an overview on the user's motivations on tagging. On the vertical axis, there are the benefits of tagging; while on the horizontal axis is the content creation. The social bookmarking tools usually fall on the category users tagging other content. However, Flickr users are generally managing their personal collections for private use or for sharing with friends and family. The Suprglu service is a new way of gathering all our content on del.icio.us or flickr on a unique place. The blog aggregator *Technorati* uses tags supplied by the user (either presented within an RSS feed or linked to from the HTML page) to describe their blogs so that others may discover them (Tony Hammond, Timo Hannay et al. 2005).

Tag user	Others	Technorati	Swik 43things voo2do CodeZoo
	Self	Flickr Suprglu	del.icio.us ma.gnolia.com
		Self	Others
		Content Creator	

Table 2: The benefits of tagging users vs. content creator

Additionally there are interesting services associated with social tagging:

- (Flock) a social web browser;
- (Elgg) a social network platform;
- (Bebo), a social networking site;
- (Google docs and Spreadsheets), authoring and collaborative Working tools;
- (Netvibes), integration tools;
- (Drupal) an open source content management platform.

## 2.5.6. Social Networking

Social network(ing) sites are most popular with youngsters and young adults, where they create well-developed profiles as the basis of their online experience. Also users share personal information with a wide range of “friends”(Boyd 2008).

Globally, MySpace, Orkut and Facebook are currently used by millions of users. In Portugal, interesting though, youngsters prefer to use Hi5 for establishing new connections and growing their network of friends. For them Hi5 serves, the core information needs to support their network of friends (figure 3). Many youngsters view online spaces as semi-private, with context limited to social interaction (Boyd 2008), (Stutzman 2008). The majority of young people simply use new media as tools to make their lives easier, strengthening their existing friendship networks rather than widening them (Ofcom Office of Communications 2008). Undoubtedly, from the perspective of young people, technology is fully embedded in their everyday activities. The young people of today are creative and expressive as in the past, but the difference is that by digitising their creative efforts, they can share it with lots of friends. The digital connectivity enables exchanging in new ways.

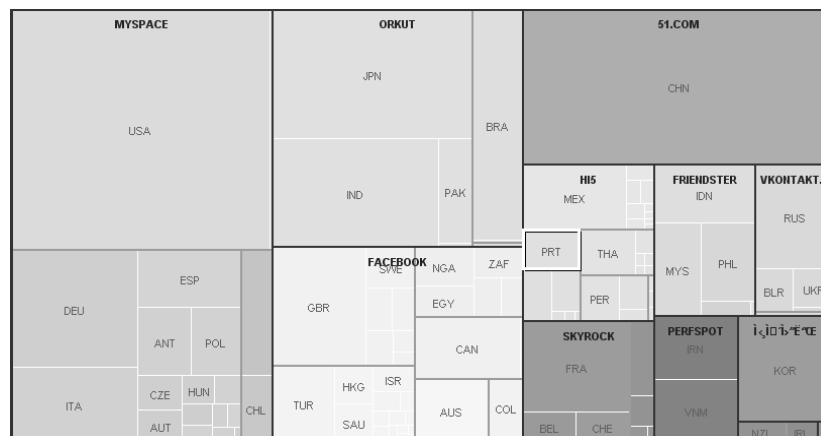


Figure 3: Social Networks Treemap (Many eyes 2008)

Recently some research reports (Ofcom Office of Communications 2008),(FaberNovel Consulting 2007),(Demos report 2007) presented for the United Kingdom, a comparison between youngsters and young adult’s usage of social networking sites. Briefly, it can be summarised:

### Youngsters (16-24 years):

- The value of youngsters who uses communication with people they not know increases to 22%.
- The primary and the secondary nets are twisted together.
- Prefer to use Bebo (63% of those who have a social networking site profile).
- Consider capable of self-regulation about levels of risk.

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**Young Adults (25-34 years):**

- Only 17 % of adults used their profile to communicate with people they do not know.
- Tend to distinguish their relationships into different social networks.
- The most popular is Facebook (62% of those who have a social networking profile).
- Are concerned about the dangers of the net.

Both groups create well-developed profiles and consider communication with known contacts, as the most popular social networking activity. Additionally, only few users highlighted negative aspects to social networking. For instances privacy and safety issues' regarding social networking sites leaving settings open, as well as, some risk and harm done by users namely posting content (especially photos) that could be reputationally damaging or online bullying.

Social networking sites are dynamic software tools, which change at a rapid rate, and are providing several new services. Recently they have opened their interfaces to third-party applications. The OpenSocial platform and standalone Facebook platform, two major social networking solutions, provide developers expansions in what users can do (Facebook developers 2008; Open Social 2008).

### **2.5.7 Structuring Information**

One of the main difficulties in collaborative spaces lies on how to structure information, where all users can reach for new material. Social tagging is a free structured approach to classification, where users assign their own labels, which is variously referred to as a '*folksonomy*'. This free tagging approach to classification is jumbled, by contrast to a formal classification system which generally is predictive both of the ordering of terms that are used within it, and of the terms that will be allowed by. This is a bottom-up, very flexible classification scheme, but far cheaper. In addition, the terms used are any terms that users might be expected to use in the future when searching for this information.

However, there are several approaches on structuring information. For instance, the Concept Maps usage within web 2.0 where we can use (CmapTools) to produce interesting maps with links to pages. Also even with social tagging software, such as (del.icio.us) and with (Technorati) it is possible to relate similar topics with simple tagging. It is possible to see dynamic tagging, for instance in (Thecloudsearch) or in (TagLines) an automated Folksonomy tool from (Francis Shanahan), using Mushups. Even the (Digg) website for community share, discover, bookmark web content, or the (43Things) enables interesting approaches to structure information.

All these structures occur in something that aggregates them, and users have an important role for them to grow. However, this chaotic messy space enables individuals to learn and

form connections. Another tool is knowledge trees usage, as a cartographic mode to make complexity visible by (ArBor & SenS).

Also for structuring information we can use (ISO Topic Maps) or (W3C rdf schema 2004), but Web2.0 technological development tools can provide social, collaborative, participative services driven by RSS feeds, web services programming via AJAX and APIs. For example, Veerendra Shivhare has made an interesting “live tree” view of Amazon’s entire product catalogue just using AJAX and calls to Amazon web service. (Amazon Catalogue Tree), (Ajaxian).

## **2.6 E-learning 2.0**

The web is changing mainly because of user’s interaction-technological-participation social paradigm. In fact, the new generation of users, which were grown up with the internet as an integral part of their lives, see it not for information search, but rather as a communication platform. These same users, the so-called digital natives or N-Gen (Next Generation or Network Generation) are the ones who attend classes in a learning system, which is not attractive enough. If they are growing up in a technological framework optimized for participation and collaboration, they will not feel comfortable in the old roles of student. Therefore, if we want to be successful in an e-Learning environment, we must provide the same enthusiastic aspects they are becoming to be familiar within the Web. E-Learning systems based on web 2.0 will give some answering solutions to the problems raised. The connection between these two is well described in (Downes 2005), who based on some Connectivism principles, considers that e-Learning systems must have a learner-centred design for N-Gen students, and teachers and learners should act as peers within social networking environment. He states that social software ought to provide services built upon a web platform with “micro content”.

In fact, if we look to traditional learning applications and systems managing learning objects within a pre-defined learning architecture, we must now migrate to an open learning environment composed of interoperable open-source platforms and tools aimed at supporting the social interactions of peers on the N-Gen (Fumero, Aguirre et al. 2006).

In order to develop a brand-new pedagogical model and implement it for the next generation web, we must consider profound implications for learners, and for society, with the emergence of web 2.0.

Additionally, learning applications written in open source code are also contributing to the development of participatory and collaborative e-learning environments. Open source standards such as the (Schools Interoperability Platform (SIF)), (Opengroup) allow data to move easily between courseware applications, while open source course management systems such as (Moodle), (Plone), (Atutor), (Dokeos), (Bodington), and others, are highly modularized, allowing teachers and students to select, edit, or extend learning components most appropriate for their purposes. Moreover, with open source code, teachers, designers, and students can readily develop new modules and add them to

catalogues of available educational components, allowing the learning platform itself to evolve collaboratively according to the needs and imaginations of the participants.

This cultural shift from the static presentational forms of web 1.0 to the dynamic participatory architecture of web 2.0 – requires a parallel conceptual shift from what we call e-Learning 1.0 to e-Learning 2.0. This shift is fundamental for N-gen learners, which is being shaped by the power of the new information and communications technology.

The N-gen users, now accustomed to different media sources of communication and entertainment, will feel at home in the context of self-directed learning, acquiring and contributing as natural parts of the learning process. In table 3, we present the differences between traditional and innovative e-Learning systems.

The fundamental difference of e-Learning 1.0 to e-Learning 2.0 is the shift from architecture of presentation to architecture of participation. This change would enable learners to take an active, collaborative role in shaping their learning programs. This shift would be exemplified in specific environments, which sends students into the processes of communication and creativity (Sinclair, McClaren et al. 2006), (Veen 2006).

If we look now at social networking sites usage at schools, we notice most of them have banned access to social networking sites and in a recent paper Boyd showed that young people were more likely to access social networking sites on the Internet at home than anywhere else (Boyd 2008). Therefore, we argue schools rather than harnessing the technologies and blocking the social networking sites in name of safety and despite teacher's unconfident levels, there should be a changing attitude towards social networking sites usage. Some teachers and other school practitioners have already realised the advantages outcome the disadvantages. They recognise the value of learning outside the classroom and the importance of having a digital space where students can recognise and transfer learned skills into new situations and contexts (Veen 2006; ] Rivoltella 2008; Many eyes 2008). Several examples of using Web 2.0 tools and social networks in education have been accomplished with interesting results. In general, they all consider interaction creates opportunities for enhancing class cohesion, and the quality of interaction is important in the learning experience. Students learn about one another through digital profiles. They experience the social phenomena of being connected, expanding their learning structures and cultural experiences, fostering intercultural skills (] Rivoltella 2008),(van Harmelen 2008).

Moreover, social learning experiences, with an online social networking site, have the potential to reduce social exclusion, thus increasing student's self-efficacy. The Self-efficacy theory claims that student's beliefs about their capabilities to realize a goal, influences the way they approach tasks. Accordingly, students with strong self-efficacy have a higher level of confidence to fulfil assignments, whereas those with weaker self-efficacy may not, as they fear criticisms from the network's established members. The successful integration of such Web 2.0 tools will require understanding of the social and educational contexts by the teacher and the school system (Liccardi 2007).

<b>e-Learning 1.0</b>	<b>e-Learning 2.0</b>
Focus on Content Presentation	Focus on Learning Processes
Focus on Access & Download	Focus on Communication & Interactions
Fixed or Static Design	Co-developed with Learners & Instructors shaping Design
Individualized	Customized/Personalized
Teacher-Directed	Cooperatively Activated
Static	Evolving
Information/Content	Knowledge & Understanding
System-paced	Learning-paced
1:many	Collaborative & 1:1, many:many
Search and Retain	Contribute, Tag, and Share (Folksonomy)
Tests and Examinations	Demonstrations and Prototypes
Prescribed	Negotiated and Contracted
Web of documents	Web of data
Web as Media	Web as platform
Communities of Practice	Social-Networking
Pre-defined learning architecture	Open learning environment
Feedback limited	Feedback rich

Table 3: E-learning Comparison

Some teachers and school practitioners are starting to see social networking sites as a window opportunity to motivate students and engage them in different learning experiences. It is a fact that newly empowered learners will give more focus to learning systems based on conversation, interaction, on sharing, creation and participation (Downes 2006). But McKenzie had already claimed that a web system must provide a structure, supporting the student's investigation and keeping them on the path while seeking "the truth" about whatever issue (McKenzie 1999).

## **2.7 Related Research Community**

### **2.7.1 People**

Some senior researchers, almost all professors, whose work are related with this field of interest and worth mention:

- Ann Macintosh, from Centre for Digital Citizenship Institute of Communications Studies, the University of Leeds, United Kingdom;
- Carsten Ullrich from Shanghai Jiao Tong University Shanghai, China;
- Giasemi Vavoula from University of Leicester, United Kingdom;
- John Seely Brown, senior fellow at the Annenberg Center at USC (University of Southern California);
- Joshua Schachter, CEO of Del.icio.us.

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[- Julian Sefton-Green from school of Education at the University of Nottingham author of Informal Learning with Technology Outside School;](#)

- Kirsty Young from University of Technology Sydney, Australia;
- Lora Aroyo from CWI, the Netherlands;
- Maggie McPherson from University of Leeds, United Kingdom;
- Marc Prensky author of Digital Game-Based Learning (McGraw-Hill, 2001), CEO of Games2train and creator of the sites [www.dodgamecommunity.com](http://www.dodgamecommunity.com) and [www.socialimpactgames.com](http://www.socialimpactgames.com) ;
- Michael Auer, Carinthia University of Applied Sciences, Austria;
- Peter Brusilovsky from School of Computer Science, Carnegie Mellon University;
- Steve Wheeler from Faculty of Education, the University of Plymouth;
- Tim O'Reilly, CEO of O'Reilly Media;
- Vania Dimitrova from University of Leeds; United Kingdom;

[- Weiqin Chen from Department of Information Science and Media Studies, University of Bergen, Norway;](#)

- Wim Veen, from Centre for Educational Innovation and Technology, Delft University of Technology, Holand;

Some junior researchers, PhD students or recent PhD fellows, whose work has been followed:

- Davinia Hernández Leo, from Pompeu Fabra University, Barcelona, Spain. She has just got her PhD on a pattern-based design process for the creation of CSCL macro-scripts computationally represented with IMS LD from University of Valladolid, Spain;
- Dana Boyd from School of Information (iSchool) at the University of California (Berkeley). Her research is about how American teenagers socialize in networked publics like MySpace, Facebook, LiveJournal, Xanga and YouTube;
- Frederic Stutzman from University of North Carolina at Chapel Hill's School of Information and Library Science. His research interests include online social networks and their use in relationship management, social computing, and emergent perspectives on digital identity;
- Yishay Mor, London Knowledge Lab, United Kingdom. His research is around pattern networks, finding ways to fitting patterns into teachers' practice (Planet) and Supporting collaborative group work using mobile phones in distance education (CoMo).
- Asma Ounnas from University of Southampton, School of Electronics and Computer Science. Her research is around the study of web-based group formation in e-learning, which involves allocating students to teams, Communities of Practice, and Social Networks;

Some researchers whom I had the privilege to meet and talk about my research:

- Frank Fischer , University of Munich, Germany;
- George Siemens from Red River College in Winnipeg and Learning Technologies

- Centre, University of Manitoba, Canada;
- [Miguel Baptista Nunes, University of Sheffield, United Kingdom;](#)
  - [Peter Gerjets, IWM-KMRC, Tuebingen, Germany;](#)
  - Pierre Dillenbourg from EPFL, Lausanne Swiss;
  - [Rob Reilly, MIT-EDU, USA;](#)
  - [Sally Barnes, Graduate School of Education - University of Bristol, United Kingdom;](#)
  - [Sten Ludvigsen, Intermedia University of Oslo, Norway;](#)
  - [Ton de Jong, University of Twente, Netherlands;](#)

### 2.7.2 Research Groups & Projects

\* **Research Group:** Learning Societies Lab (LSL), University of Southampton , school of electronics and computer science

**Coordinator:** Hugh C Davis

**Project :** mPLAT: Mobile Placement Learning and Assessment Toolkit.

\* **Research Group:** Knowledge Media Lab [Carnegie Foundation for the Advancement of Teaching](#)

**Coordinator:** Toru Iiyoshi

**Project:** [KEEP toolkit](#) and Web site being developed by at the Carnegie foundation.

\* **Research Group:** Systems Research Group (GSIC), School of Telecommunications Engineering, Valladolid, Spain

**Coordinator:** Yannis Dimitriadis

**Project:** mosaicLEARNING: Mobile, open-source, standards-based & secure, context-Aware, individualized, collaborative eLearning from From Intelligent & Cooperative.

\* **Research Group:** University of Nottingham, United Kingdom

**Coordinator:** [Mike Sharples](#)

**Project:** [Web2.0 Technologies for Learning at Key Stages 3 and 4](#). A project funded by Becta to investigate and describe Web2.0 (social networking and collaborative media production) activities by children to support their learning at school and in the home.

### 2.7.3 Reference Conferences & Workshops

Abrev.	Call closes	Event Date	Name	url	Obs.
<b>AIED07</b>	December	July	International Conference on Artificial Intelligence in Education	<a href="http://www.isi.edu/AIED2007/">http://www.isi.edu/AIED2007/</a>	2)
<b>CISSE</b>	December	October	International Joint Conferences on Computer, Information, and Systems Sciences, and Engineering	<a href="http://cisse2008.org/home.aspx">http://cisse2008.org/home.aspx</a>	6)
<b>CISTI</b>	February	June	Iberian Conference in Systems and Information Technologies	<a href="http://cisti2008.uvigo.es/index.php/CISTI2008/index/index">http://cisti2008.uvigo.es/index.php/CISTI2008/index/index</a>	1)
<b>CSCL07</b>	October	June	International Conference on Computer Supported Collaborative Learning	<a href="http://www.isls.org/cscl2009/">http://www.isls.org/cscl2009/</a>	2), 3)
<b>DIGITEL</b>	May	November	IEEE International Conference on Digital Games and Intelligent Toys Based Education	<a href="http://www.ask4research.info/digitel/2008">http://www.ask4research.info/digitel/2008</a>	3)
<b>ECEL</b>	May	November	European Conference on e-Learning	<a href="http://www.academic-conferences.org/ece/ece2008/ece108-home.htm">http://www.academic-conferences.org/ece/ece2008/ece108-home.htm</a>	
<b>ECTEL</b>	April	September	European Conference on Technology-Enhanced Learning	<a href="http://www.ectel08.org/">http://www.ectel08.org/</a>	
<b>ELSys</b>	February	September	E-Learning Systems at DEXA	<a href="http://www.dexa.org/">http://www.dexa.org/</a>	4)
<b>IADIS E-Learning</b>	May	July	IADIS International Conference e-Learning	<a href="http://www.elearning-conf.org/">http://www.elearning-conf.org/</a>	1)
<b>IADIS WWW/ Internet</b>	July	October	IADIS International Conference WWW/Internet	<a href="http://www.internet-conf.org/">http://www.internet-conf.org/</a>	
<b>ICALT</b>	December	July	IEEE International Conference on Advanced Learning Technologies	<a href="http://www.ask4research.info/icalt/2008/other/s/">http://www.ask4research.info/icalt/2008/other/s/</a>	3)
<b>ICIW</b>	January	June	International Conference on Internet and Web Applications and Services	<a href="http://www.iaria.org/conferences2008/CfPICIW08.html">http://www.iaria.org/conferences2008/CfPICIW08.html</a>	
<b>ICL</b>	May	September	International Conference on Interactive Computer aided Learning	<a href="http://www.icl-conference.org/">http://www.icl-conference.org/</a>	1)
<b>IMCL</b>	October	April	Interactive Mobile and Computer Aided Learning	<a href="http://www.imcl-conference.org/">http://www.imcl-conference.org/</a>	3
<b>ISM</b>	June	December	IEEE International Symposium on Multimedia		
<b>JURE</b>	March	August	Junior Researchers at EARLI	<a href="http://www.earli2009.org/">http://www.earli2009.org/</a>	4), 5)
<b>VEWAeL</b>	January	June	Virtual Environments and Web Applications for e-Learning at ICIW	<a href="http://www.iaria.org/conferences2008/VEWAeL.html">http://www.iaria.org/conferences2008/VEWAeL.html</a>	4)
<b>WEBIST</b>	October	March	International Conference on Web Information Systems and Technologies	<a href="http://www.webist.org/">http://www.webist.org/</a>	3)
Notes:					
1: Conferences attended		2: Biannual conference		3: Important	
4: Workshop		5: Doctoral Consortium/ youth track		6: e-conferences	

Table 4: Reference Conferences and Workshops

### 2.7.4 Reference Journals

- Computers and Education ;
- E-learning papers;
- IEEE Transactions on Education Reference Conferences & Workshops;
- International Journal of Computer-Supported Collaborative Learning (ijCSCL);
- International Journal of Computer-Supported Collaborative Learning (ijCSCL);
- International Journal of Emerging Technologies in Learning (IJET);

- International Journal of Instructional Technology and Distance Learning (ijITDL);
- International Journal of Knowledge and Learning (IJKL);
- Journal of e-Learning and Knowledge Society (Je-IKS);
- Journal of the Learning Sciences;
- USDL Journal;

### **2.7.5 Other References**

- [-ACM E-learning magazine ;](#)
- [-ACTA Press ;](#)
- Classroom 2.0;
- [-ECS EPrints Repository from University of Southampton;](#)
- [-Futurelab Innovation in Education;](#)
- IEEE Computer Society Technical Committee on Learning Technology (LTTC);
- [-Interactic 2.0;](#)
- [-ISI, University of Southern California's Information Sciences Institute;](#)
- ISLS, International Society of the Learning Sciences;
- [-L-tree tool site;](#)
- MacArthur Foundation ;
- [-My blog;](#)
- [-My research web site;](#)
- [-NSBA \(National School Boards Association\);](#)
- OfCom;
- [-Open Social Directory is a free resource for the OpenSocial Community;](#)
- [-ProLearn Academy;](#)
- [-White Rose Research online, a shared, open access repository for the Universities](#) of Leeds, Sheffield and York;

## 3. Research Proposal

### 3.1 Overview

Today in Portugal, the high schools with teenagers aged between fifteen and seventeen years old have different learning offers but they all are divided, accordingly to specific matters, in classes. Each school class has different teachers, at least one for each particular domain and all teachers have, during the week, some time slots, where they work with their students. Learning should happen, at this time, in the classroom, but it is not always the case. Usually we hear teachers claiming time is not enough and students did not pay enough attention or they need to do additional work. Of course there are several other problems around education, but we decided to focus in opening the classroom and involve other practitioners in the learning experience. By breaking the classroom walls, the students could be capable of learning in other environments and still with teacher support. So how can a student work outside the classroom with teacher support? and which other spaces could be used for learning? In order to answer those questions we considered social networking usage, where students spend a lot of time with their network of friends (Silva and Restivo 2007). In fact, those spaces involve students more than classroom itself and without knowing they are in fact developing some technological skills.

The schools and formal contexts continue to have an important role in student's development, where the teacher is crucial to guarantee the effective student's skills achievement, but informal contexts, are essential for the student development (Jenkins 2006). There are unfortunately some barriers that difficult the teacher social networking presence. To outcome these barriers we considered the teacher does not need to become a member of their student's social networking site. The technology itself should establish those bridges between teachers-learning environments, with students-social networking spaces.

Moreover, the key aspects in the learning process are still the people and not the technology. Technology is a mean and not an end towards education. In fact, the education goals are the same as in the past: prepare the youngsters for the adult life with the required skills to become full citizens and promote social and cultural rise.

Therefore, this research proposal is focusing in Portuguese high schools, trying to use technology as a mediator between formal and informal contexts, with teachers, students' interaction and opening the learning process to other practitioners. As (Cross 2008) clearly said :

*“teachers not having time to get to know web technology...the kids have already learned to use the web; perhaps the teacher doesn't need to. How about a teacher/student partnership to improve learning? “*

Our premise is to promote those partnerships, to increase student's success, by providing diversified learning spaces with teacher supervision and without increasing teacher's workload. In addition, our research started to look at assessment, because evaluation is essential for learning effectively happen. This evaluation can be formal or informal, or as we prefer to say, summative and formative. That is, the continuous feedback of student's knowledge acquisition is essential for increasing their motivation and success levels.

In fact, when students really have the chance to practice, making responsible decisions as a group and experience autonomy, they become involved and better learners. As students begin to take ownership of their learning, both in the classroom and in other contexts, they look for support to others in the same position. In other words student involvement in learning activities, with control over their own learning and teachers to coach and guide them, is half way towards the success of learning acquisition.

This dichotomy view of digital spaces between teachers and students therefore could be seen not as a barrier but rather as a technology usage. We can all use the digital highways with different approaches but with the same underlying goal: improve the student's motivation, success, and teacher working conditions.

## **3.2 Research**

### **3.2.1 Problem**

The classroom is still very important for learning, but some enhancements to traditional activities should be applied in order to motivate students to participate more actively. The additional mechanisms should diversify the learning methods or strategies to increase the student's levels of success. However, each year it passes by, the students are becoming less and less motivated in classroom contexts, but more active in multiple surrounding informal learning contexts, in particular around social networking sites. Some researchers are considering using social networking but, as we may expect, some school practitioners resist the usage of social networking site in their student's activities. The aspects and consequences of these new modes of technological socialization sweeping the younger generations are being documented by several reports (NSBA (National School Boards Association) 2007), (DeRossi 2007),(Grunwald 2007) that supports our research approach of using social networking in education and predict an increase in the students' levels of commitment towards education.

### **3.2.2 Questions**

Why e-Learning spaces are beneficial for school systems? and how is it possible to engage students in learning activities around social networking sites? What are the advantages in using social networking sites embedded with learning activities, when compared with other e-Learning systems? How is it possible to use assessment as a game

rather a formal activity? Several questions around social networks, informal learning and assessment come up within our research, but we defined our hypothesis and research question as follows:

**Hypothesis:** Technology should be adapted to education and not the other way round in order to reach higher levels of effectiveness, when compared to using available standalone Web 2.0 tools in learning contexts.

**Research question:** Is it possible to establish bridges between formal and informal learning supported by social networks, linking school subjects with students' lives? How this connection can effectively improve students' learning processes in the acquisition of relevant skills?

### 3.2.3 Objectives and Expected Contributions

The main objectives of our research are to specify, implement and validate a tool that could link two web platforms: Moodle and Hi5. The first one is preferred by the teacher, while the latter by students. The idea to follow is to use the Moodle test or smash potatoes activities into a learning system that can be added as a gadget in Hi5. Also the learning system will represent all the activities in a structured way. Moreover we plan to highlight the importance of formative assessment with those activities and ensure feedback for the student and the teacher on the results obtained in carrying out these activities outside the classroom.

The expected contribution lays on making connections between activities that are dealt in a classroom, managed by Moodle, with the social networks of students, maintained by Hi5 and give focus on the achievement of the learning activities outside classroom with a formative assessment features. The expected added value to achieve should be the interoperability between Moodle and Hi5, the usability and the portability of activities.

There are five goals that would be interesting to cover.

- **Classification of activities** which can cover the topics, the competences to achieve and the in depth level of them.
- **System adaptation** where can involve clustering the students profiles or learning styles, as well as, the activities provided by the teachers.
- **Representation of learning activities** using an orthogonal map with scores like a game scenario.
- **Interaction of the users** using a social network and providing friends suggestions accordingly to their interests or difficulties.
- **Assessment methods** for providing feedback as a formative tool, which is crucial for following up the students supervised by their teachers.

### **3.2.4 Approach**

The approach method used up to now can be synthesised to an exploratory research on learning theories and representation of knowledge. Also we analysed and used some Web 2.0 social software tools in classroom contexts and based on those experiments we draw a conceptual framework, where we believe can increase the connection between formal learning contexts (classroom) with an informal learning contexts (social space). Our first approach was a collaborative scenario and several research experiments were analysed (Clark 2000), (Dillenbourg 1999). However, the overall results did not seem very satisfactory. We looked then at competitive scenarios, with games supporting learning activities, and the results of these researches were more appealing to follow (Van-Gelder 2005), (Zhong, Liu et al. 2002). Several references with social experiments around collaborative and competitive were found in literature (van Harmelen 2008), (Veen 2006), (Susi, Johannesson et al. 2007), (Prensky 2003) and we decided to follow the competitive model because of the student's profile and the feedback we had with the previous field experiment.

Therefore, we plan to develop a hybrid solution based on a social networking site, with assessment activities in a game scenario. The activities are built in the web site by the users or exported from the Moodle LMS platform. This tool will be tested in a professional course in order to validate our research question. We plan to use three classes and deliver inquiries to evaluate the system usage. For instances the tool can be used on a regular basis of time, e.g. every week, in order to engage students to do the activities, or the system can be seen as a cumulative set of activities which the students can do them whenever they want, e. g. do all the activities just in the end of the course. With these variations, we expect to compare the impact of continuous formative assessment to unsupervised assessment in learning. Some performance measures will be registered namely the time spent with the game, or scores achieved, or compare the students involvement levels in the school activities with the grades achieved in a subject. Also at moment, we plan to compare our system, to a LMS platform, to a social network site as standalone learning platforms. In addition we plan to use a social software tool, namely a wiki based platform, with the same classes, in order to support the claim that even simple technological solutions can effectively improve students' learning process. Moreover, we also plan to validate the importance of using assessment with games to increase the student's involvement to do those activities. Finally, we will evaluate the teachers, parent and students reaction to the technological tools usage, the system benefits and flaws to improve it.

## **3.3 Proposed Solution**

### **3.3.1 Conceptual Framework**

The L-tree general system overview, where different concepts and theories were integrated, is present in figure 4.

Firstly, to reinforce the student's levels of motivation and interest for learning, we are expecting to use a pirate's treasure game scenario approach. Secondly, to involve parents, family relatives and student friends, a social network site was selected. It was theorised that many students would be familiar with Hi5 interface and with norms of interaction and this should be an advantage choice (Stutzman 2008). As students spend large amounts of time on Hi5, the inclusion of learning activities may be beneficial. Finally, the formative assessment activities, triggered by each teacher of a particular subject of one school class are available to feed the game.

The games and social networks are not popular at the teacher's point of view and tests are not particularly interesting for students. Therefore, our system architecture, for supporting learning activities, has two different perspectives:

**The teacher:**

- Views a web place where he or she can post the activities. Each activity (quizzes, inquiries, fill in the blanks, etc.) is an individual element and can be imported from other learning environments (e.g. Moodle).
- Classifies each activity with a skill, a topic and level of difficulty.
- Receives the overall performance of the class learner.

**The student:**

- Views a pirate's treasure game scenario as activities that will have a score in the end.
- Can add it to their social networking site and invite friends to play along.
- He or she can repeat any number of times and choose in the map a particular group of activities. The game can be played by any member of their social networking and returns the top scores.

The system is expected to provide a Treemap (Ben Shneiderman), an orthogonal map, visualisation feature to easily identify the activities and skills level achieved. The actors (teacher and student) will have a clear picture of student's on-going knowledge acquisition. Moreover, the informal assessment activities will have a purpose and students will be more motivated and socially involved to do it.

The teacher provides different types of assessment such as calculated questions, matching questions, multiple choice questions, true/false questions with feedback and short answer questions. After, the teacher posts the test and classifies it with a specific theme and a level of difficulty, the system changes unconnected tests into an attractive pirates treasure map. The idea is simply to provide a game with different themes, where the player must do all the thematic activities to find the treasure. Each time the user plays obtains a score and some suggestions to do better on next time to find the treasure. For instances in the failed items, the system can give suggestions (visit a web page or read a specific page book) helping the student find the right answer.

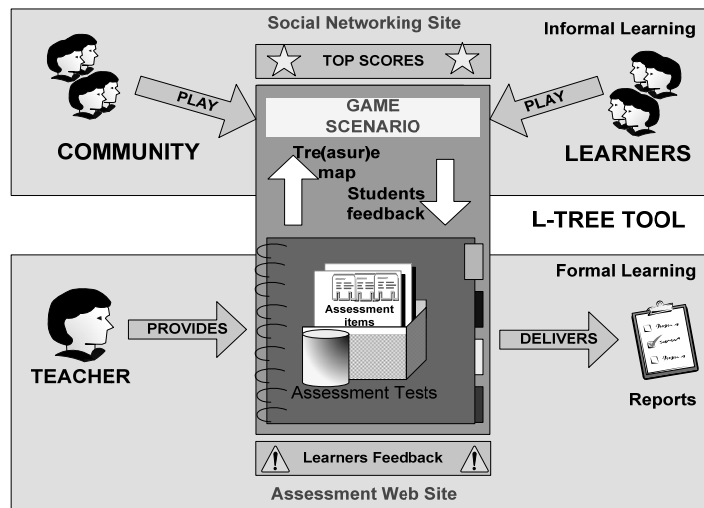


Figure 4: Proposed L-tree system architecture

In addition, the system can perform auto-assessment tests, asking to the player “how well are you doing?” and if the player is conscious of the flaws then the score is increased. The game will keep track of the top scores of all registered user’s, especially the ones who found the treasure. The idea is, in future, use the game in other course subjects, involving more teachers. Another idea to follow is, in order to maintain the player’s motivation, the system can change the assessment items difficulty accordingly with the student-player’s performance. Additionally the system will visualise, in a tree map, the overall performance of the player in each theme/subject in order to identify the achieved skills. Finally, the system sends feedback, about student’s performance, to the teacher(s). Last but not least we must reference the learning theory behind our approach is the Connectivism and the importance students give in establishing bridges between their peers.

### 3.3.2 System Stand Out Requirements

A precedent survey (Silva and Restivo 2008) was conducted by the authors to find out which requirements such a learning system, to be used in a social networking site, should support. We came up with OpenSocial Google’s platform approach, data portability and interoperability.

The first requirement: OpenSocial Google’s platform (Open Social 2008) is an open-source code that allows any participating social media site to implement a common set of application programming interfaces (APIs) and create "universal" applications. In addition, the Hi5 social networking site was a compulsory choice and its maintaining corporation is a member of OpenSocial. The second requirement: Data portability is a trustworthy service for users to move their data around web systems. Unfortunately, this feature is not yet available, but data sharing is now starting to be provided as a service. Finally the last requirement: Interoperability, the ability of two or more systems to exchange information and to use the information that has been exchanged was considered because many teachers use Moodle LMS environment. Therefore exporting assessments

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from Moodle seemed to be a relevant issue. We expect to deliver a solution in which the assessment tests will use the GIFT format. GIFT is an import format available for importing Moodle quiz questions from a text file. It supports distinct types of questions that can be mixed in a single text file. The format also supports line comments, question names, feedback and percentage-weight grades (GIFT format).

### **3.4 Work Plan**

#### **3.4.1 Previous and Current Work Carried Out**

This research has formally started in September 2005, with a curricular activity, which involved on January 2006 a conference organization. At that time an e-Learning web architecture (Silva and Restivo 2006), appealing to the use of web semantics in learning contexts was presented at Comic06 and discussed. Also a poster was presented on XATA 2006 conference, (Silva and Restivo 2006), where some ideas were clarified. Then in June an internal research study was also presented and discussed. Later on September 2006 the concepts of social networks applied to knowledge construction and argumentation were interrelated and a study was presented at ICL 2006 (Silva and Restivo 2006). After, the research headed towards two seminal ideas: the formal representation of knowledge and collaborative environments with social networks. For the first, we thought a simple architecture might be appropriate for organizing data, such as learning contents, and define the relationships between data. For the latter, the collaborative environments with social networks seemed, along with the theory of Connectivism to support our approach. This line of research was presented in three Doctoral Consortiums at CISTI, IADIS e-Learning and EPIA in the year of 2007, (Silva and Restivo 2007a, Silva and Restivo 2007b, Silva and Restivo 2007c), which helped to mature the ideas.

During the last three years, I also attended several workshops and courses. I attended eight activities. Six were from the Virtual Doctoral School of the Kaleidoscope Network of Excellence, one from the Demo-net Network of Excellence and one from the University of Porto, which is summarised next:

- [VGK Current Cognitive Approaches to Media-Based Learning](#), April 2005, Tuebingen-Germany,
- Cognitive Approaches to Media-Based Learning II: Authoring Multimedia Instructional Materials, November 2005, Tuebingen- Germany,
- [ICO Course on CSIL](#), November 2006, Twente-Netherlands,
- [Demo-net PhD Colloquium](#) September 2006, Krakow-Polland,
- [Virtual Doctoral School on argumentation in science education](#), March 2006, Bristol-United Kingdom,
- [Kaleidoscope Symposium](#), November 2007, Berlin-Germany,
- Alpine [CSCL Rendez-vous 2007](#), January 2007 Villars-Swiss,

- Methodology and learning-teaching environments in the University of Porto, April 2008, Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto (FPCEUP).

Additionally during this time, I was also a high school teacher trying to find out the best usage possible of digital learning environment.

Currently, in 2008, an analytical research on Social Networks, namely the issues of open standards, data portability and interoperability (Silva and Restivo 2008a) was presented at EDEN conference. On the other hand, after using Moodle LMS at school, I considered the platform could enhance more students' participation and interaction around learning activities. A subsequent action was using Ning's social network site. The outcome of this experience was reflected in a publication (Silva and Restivo 2008c), which is going to happen in October in the Web 2.0 meeting. In general, the students did not like very much to change from Hi5 to Ning and maintain both profiles and when other teachers were asked to join Ning's social networking site they simply answered back they had their work with Moodle and despite finding some advantages in Ning's social networking site, they will continue using Moodle. So how could teachers continue using Moodle and enhance students-teacher interaction? And how was possible to maintain Hi5 students profile and format this environment with learning activities? To answer these two questions we proposed a different system architecture, trying to scaffold the student's digital activities and building a distinct digital school environment, plugging teachers with student's roles. Also formative and diagnostic assessment features are starting to become relevant in our work. Some ongoing tasks are now in hands, namely doing some inquiries to the students who used Ning's platform and to the teachers which features they consider relevant in a feedback assessment tool. In addition, one must not forget to inquiry students about the social environment usage for assessment prior to develop the proposed assessment L-tree tool. In fact, a conceptual framework is going to be presented at ICL2008 in the end of September (Silva and Restivo 2008b) and some feedback will enrich my current work. I present next my future and planned work.

### **3.4.2 Future Work Plan**

Our ongoing work is now developing the proposed tool which already has a web presence (L-tree.org) and is based on distinct assessment activities. We plan to deliver a tre(asur)e map where the teacher "loads" with assessment activities. This assessment game based tool will be embedded in a social networking site, namely Hi5 and despite our choice, the l-tree gadget can be used in any OpenSocial platform, namely mySpace or Orkut. We expect to analyse the impact of this learning tool in one particular Portuguese high school, which will later on validate our claim that adapting social networks for learning activities is an added value feature. In order to analyse in depth the tool usage, several experiences are planned to occur with different pedagogical scenarios. Another interesting work to do in future is using a RPG game scenario, in order to promote collaborative work among students with supervised activities (Rosenberg 2006; Greek M. 2008).

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However we are conscious the results and conclusions, we will obtain with these experiments will be interesting just to compare to the other results experiments using social software tools. Our research results cannot be generalized for all students or all matters and each school has its own reality. We expect, with this project, to demonstrate the advantages of using a social networking site with assessment activities effectively improve the student's levels of acquiring relevant skills.

Through continued research in this area, we also expect to better understand our students and create exciting new opportunities for learning. The power of social digital spaces is just starting to become a promising, as well as, challenging field of study.

The planned research is going to be carried out between **September 2008** and **September 2010** in a total of **24** months. The major tasks predicted are the following:

**WP1: Proposed learning solution: twelve months**

- WP11:** Architecture Specification: **two** months,
- WP12:** Application Development: **six** months
  - Navigational and Interface Design: two months,
  - Functional Design: two months,
  - First Prototype: two months,
- WP13:** Proof of concept : **four** months
  - Application Evaluation: three months,
  - Validating results: one month,
  - Improvements for the tested system: one month.

**WP2: Learning with technology scenarios: fifteen months**

- WP21** Follow the developments of other researcher's works and comparison of our project with other ongoing research projects: **nine** months,
- WP22** Perform an experiment using a technological social available learning solution: **nine** months,

**WP3: Thesis Report: twelve months,**

- WP31:** Define overall thesis structure: **one** month,
- WP32:**Thesis theoretical writing: **four** months,
- WP33:** Thesis validation and conclusions writing: **six** months,
- WP34:** Thesis revision: **five** months.

**WP4: Dissemination: During all twenty four months research.**

I present a Gantt project chart, on annex A. One final remark, there are 8 planned working reports. One report elaborated after specifying the conceptual business model and the assessment and feedback model (**WP11**), another after the first prototype (**WP12**), and other for the application evaluation (**WP13**). I plan to do an experiment with a social software learning solution and compare results with the previous experiment. Next, a learning scenario study (**WP21+WP22**). These reports can result in conference papers, or even published journal articles. Moreover, during one year's thesis writing, I plan to publish at least four contributions. The first contribution will be a literature survey about using social networking sites embedded with informal learning spaces (**WP32**) and a second contribution will be a case study about all three social experiments (Ning, Wiki, L-tree) (**WP32**). A third contribution will be a position paper about **social software usage on education**, and the last contribution will be a reflection paper about innovation in education, which will be the basis of **WP33**, the chapter conclusions.

### **3.5 Some Conclusions**

The starting point of our research was the technology usage in education. In particular, a social networking site applied to learning spaces that could provide a value proposition when used for education purposes. In fact prior of developing a technology based solution one must identify the value-adding activities of the system and be able to measure and compare it with the different potential system behaviours. It is of major importance to identify and understand which system behaviours add value into education. Recently the research community has produced several reports and articles about its usage in education. Their analysis highlights two distinct learning approaches. For a traditional approach, the social networking usage requires a less controlled learning mechanism, with a user-generated content, which jeopardizes the teachers' existence. For an innovative approach, social networking can act as an instructional concept and user skills development, which can be integrated into the traditional learning approach enhancing the teacher role in education. Another approach is presented by (Ruth Reynard 2008), who claims the valuable social skills that support learning are not the skills developed within current social networking sites. Nevertheless, some would argue that valuable learning skills are beyond social learning theories and social networking software embedded in learning holds a rupture to the learning act itself. We also agree the learning act must be reinvented, incorporating these technology push-ups, not forgetting the actors and the purpose of learning.

During the last three years of reflection on innovative practice, we started to look at technology, but now we are looking at the learning phenomena itself. Education is still essential for several reasons, namely social rising and achieving specialized skills. Unfortunately, education is facing a lack of effectiveness and impact in students' lives. They are more engaged in informal learning activities and less interested in coping with the classroom activities. So how school practitioners can motivate their students in order to engage them in the learning process? This research work is trying to demonstrate the essential aspects of social network site with assessment feedback are crucial for engaging

students again in the learning process. Nevertheless, the technology must bridge the students with their teachers. Many research currents claim a changing from a teacher centred activity to a student centred activity. Our position is neither, but on the assignments side. Each assignment must be negotiated with both actors and technology can be used to perform the negotiation process, providing assignments feedback.

Certainly, Facebook, Hi5, Bebo, or other social tools may one day disappear, but social networks are part of our participative culture and will be around for the next years. In addition, the assessment feature and the face-to-face learning characteristic are crucial for the success of transforming students into learners. With this research work, we expect in the end to contribute for the changing of education in order to effectively improve students' learning processes in the acquisition of relevant skills.

### **3.6 Publications**

- Silva, J. and F. Restivo (2006a). Building a distributed system for dynamic information search, organization and classification for educational purposes CoMIC'06, January 2006, Porto, Portugal.
- Silva, J. and F. Restivo (2006b). Web-based Knowledge Portal for Educational Purposes .XATA 2006 — XML Aplicações e Tecnologias Associadas, February 2006, Portalegre, Portugal.
- Silva, J. and F. Restivo (2006c). Combining Ontologies, Social Networks and Argumentation into a Dynamic Learning Portal. ICL 2006, September 2006, Villach, Austria.
- Silva, J. and Restivo, F.(2007a), Adaptive Learning Environments with Knowledge Representation and Social Interaction [ Doctoral consortium]. CISTI 07, June 2007, Porto, Portugal.
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- Silva, J. and Restivo, F. (2007c),Applying Virtual Learning Environments in a Portuguese High School Context [ Doctoral consortium]. EPIA07, December 2007, Guimarães, Portugal.
- Silva, J. and Restivo, F. (2008a) Towards the convergence of technologies using Open Standards in Social Networking Software. EDEN 08 June 2007, Lisbon, Portugal
- Silva, J. and Restivo, F. (2008b) E-assessment through Social Networks in a Portuguese High School Context - A Conceptual Framework, ICL 2008, September 2008, Villach, Austria. (accepted)
- Silva, J. and Restivo, F. (2008c) Social Networks Usage in a Portuguese High School Learning Context, Web 2.0 Meeting, October 2008, Braga, Portugal (accepted)

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## Annex A: Gantt Project Chart

	2008				2009												2010											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S			
<b>WP1: Proposed Learning solution</b>																												
WP11: Specify the social learning environment conceptual model inquiring the teachers and students																												
WP11: Specify the feedback assessment conceptual model.																												
WP12: Implementation of a pilot prototype giving particular focus to social networks with learning environments.																												
WP13: Evaluate the prototype in a high school with three classes																												
WP13: Do inquiries to evaluate the system usage. Deliver them in an online basis for students and teachers																												
WP13: Identify improvements for the tested system																												

WP2: Learning with technology scenarios																								
WP21: Comparison of ongoing research projects and available learning solutions																								
WP22: Use a technology solution in a high school with three classes																								
WP23: Follow upcomings and review the state of art.																								

	2008				2009												2010											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S			
WP3 Thesis Report																												
WP30: Define overall thesis structure																												
WP31: Write first theoretical thesis chapters																												
WP32: Write thesis chapter related with field experiences																												
WP33: Write thesis chapter related with thesis validation,																												
WP34: Write thesis chapter conclusions and future work																												
WP35: Review thesis chapters																												

<i>WP4: Dissemination</i>																												
Publish research work in conferences and journals																												
Update the Research Web Sites																												