



Social Technology Appropriation in Higher Education

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Abstract

In this paper, we discuss the processes and dynamics of Internet-based Social Software (or „Web 2.0”) technology appropriation in Higher Education. We define technology appropriation as the use of cognitive and physical resources by individuals in their daily practices. Departing from a psychological and pedagogical perspective, in which socio-cultural theory plays a major role, we present a clarification of the concept of appropriation, in order to establish the ground for the discussion that follows, concerning the dynamics of appropriation of technology by the young. The final part of the paper is dedicated to the exploration of the new forms of learning that are emerging from the appropriation of particular „Web 2.0” tools in Higher Education (tag clouds, wikis, blogs, podcasts). The issue of whether „traditional” Learning Management Systems (like Moodle or Sakai) are compatible with the pedagogical ideas behind the „Web 2.0 movement” is also debated.

Keywords: Social Technology, Web 2.0, Technology Appropriation, Higher Education

1. Introduction

The Internet has introduced dramatic changes in society over the past decade, but the very nature of the Internet is dynamic and has also been changing. In recent years, with the emergence of new Internet-based Social Software tools, grouped under the term „Web 2.0” (O'Reilly, 2005), users have been enabled to assume a much more participatory role in the production of online information, a move towards a „bottom-up” model of content generation. The user has become a producer *and* a designer of online materials, through the personalization achievable by social networking sites like *Flickr*, *MySpace* or *YouTube*. Information technology has also led to previously compartmentalized aspects of a person's life (work, rest, leisure, and learning) to become interwoven. Within the Tertiary Education arena, we are witnessing the emergence of new perspectives of what the purpose of the Universities should be (e.g. Bryant, 2006; Brown and Czerniewicz, 2008). This is happening in a society that is being dramatically changing by the impact of rapid technological developments: there is little use for a high-quality university education if the person who obtains it doesn't acquire the ability to keep his/her skills up-to-date, and if he or she remains alien to the dynamics that allow collaboration and the co-construction of knowledge through digital means. It is thus of primary importance to analyze how these new means of information and participation are appropriated by people.

Appropriation is a much richer concept than one could suppose before thinking carefully about it, and we found that it is not possible to give an account of *appropriation* without involving the concept of *affordance*, both of which are discussed in the next two sections.

Even if a full picture of today's Higher Education should take into account the growing of students that start or continue their studies at an older age, in the rest of this paper we concentrate our discussion on „traditional-age college students”, because they are still the most representative group within College and University students.

2. A definition of appropriation

Technology appropriation is the use of cognitive and physical resources by individuals in their daily practices. The process of appropriation begins with people trying out a technology, shaping it to the individual's or the group's needs and then making it an integral part of their lives (Carroll, Howard, Vetere, Peck and Murphy, 2002). In theoretical terms, whereas *mastering* a tool involves acquiring the skills necessary to use it, *appropriation* goes beyond that and includes also the development of competence to use that tool in a social context.

Appropriation is a form of *internalization*, because it is not just a matter of a person knowing how to use the technology at ease, but rather to take ownership of something that hadn't previously belonged to that person (Rogoff, 1995). It is also a process that takes place on different social levels, from the level of the individual user through the larger sociocultural environment (Overdijk and van Diggelen, 2006). While *appropriating* a technology, participants become more and more proficient in the use of a set of tools in the context of a social practice (Jonsson, 2004).

3. The concept of affordance and the role of affordances on technology appropriation

Technology can be conceived as being a constituent part of human nature, situated between the realms of the mental and the material, and between culture and biology (Cole and Derry, 2005).

A distinction can be made between *technology-as-designed* and *technology-in-use*: the former refers to tools as they were developed and marketed, and the latter is related to how technology is embedded in people's routines and daily practices. This distinction can be traced way back in the theory of technology (and art): Dewey (1916, as cited by Cole and Derry, 2005), for example, states that tools (and works of art) are things extracted from the natural world and put in the context of some human activity.

When a new technological product is introduced, the user can adopt a wide range of behaviors towards it, from plain lack of interest (and corresponding *non-appropriation*) through full acceptance (and thus *appropriation*). In between, a person can initially find a product interesting, and start a process of appropriation, but then rejecting it at some point (this path corresponds to a form of *disappropriation*) (Carroll et al., 2002).

The idea of *affordance* (Gibson, 1977; Norman, 1988) plays a very important role in any discussion related to technology appropriation. Being this an article about technology appropriation, it is also irresistible for us to emphasize the irony that the own concept of affordance was appropriated by Norman (1988) and was given a meaning that differs from the original conception that Gibson (1977) intended for it. Without entering into deep philosophical and psychological considerations, we can separate the original concept of affordance proposed by Gibson from the one more recently advanced by Norman by saying that the original idea of an affordance referred to „action possibilities” of an object, independently of an individual being able to recognize them, whereas for Norman affordances are perceived action possibilities, making the concept dependent upon cognitive and affective characteristics of the actor. Also, the irony (and pervasiveness of appropriation phenomena), is even enhanced by the fact that despite Norman has revealed that he never intended to appropriate Gibson's original concept of affordance (Norman, 1999), the research community around Human-Computer Interaction (HCI) appropriated Norman's idea of affordance, and hence the idea of affordance as perceived action possibility, rather than simply action possibility, has become a dominant concept in HCI.

In education, the identification of specific pedagogical affordances of a given technology assumes a major importance, since this is a relevant aspect in the demonstration of the surplus value resulting from using that technology, versus not using it (Burden and Atkinson, 2008).

4. Young people, culture and technology

The increasing connection of the world and its people (Solomon and Scuderi, 2002), is leading to the globalisation of culture.

It is important not to follow on the common mistake of considering young people an uniform mass: many studies on phenomena related to youth and childhood tend to consider these groups as somewhat homogeneous, and composed by passive and non-autonomous individuals who are *becoming*, and not yet *being* (Mominó and Meneses, 2008).

Group studies with people from age eighteen and up reveals a generation critical of online contents, dissatisfied with politics, and instead worried in conforming to peer norms and following celebrity (e.g. Livingstone, Couldry and Markham, 2008). There is a widespread idea, among young people, that being able to 'have a say' does not mean being able to be listened to.

In social networking services, like *Facebook*, *Hi5* or *MySpace*, people are not just media consumers: the adoption, seek, create and appropriate forms of participation in cultural production. By 2005, 87% of American Teenagers were online, and this percentage meant a rise of 24% of online presence in just 4 years, among this group (Pew, 2005, October 5).

Due to the perceived power of the Internet, and also because of the emergence of new technologies that make individual expression easier and more compelling, there is a growing group of people seeking to master the tools that enable them to be both creative producers and consumers of their own culture.

There is abundant literature in the domain of Cultural Studies discussing how objects and ideas are appropriated. Stolterman (2001), for example, discusses how the distinction between the user and the designer becomes blurred at the time of practical use of the object, as the sole act of using it is already a modification of its design. Another example is given by Moran (2002), who describes how handbags are modified by their users in the context of their practical needs and personal options. These examples prove that the link between design and real use of the object is not always so direct and foreseeable as one might think.

The term „*new media*” (e.g. Lister, Dovey, Giddings, Grant and Kelly, 2003) was coined to denote the major change that is taking place in content production, distribution and use. Although traditionally media refers to material products of institutions and organizations, „*new media*” infers something much less settled or identified. Behind the use of the adjective „new”, there is the conception that a clear break away from the „old media” has occurred: the „old” communication tools were characterized by a *top-down* approach, whereas the „new” are conceived as being much more democratic and open to individual expression. Interesting enough, as Notley and Tacchi (2004) point out, the statements made about the *revolutionary nature* of the Internet, have already been made in the past, when new technologies were introduced: radio, for example, has gone through a similar path, being early developed by the military, and then taking off at the hand of a minority of civil enthusiasts, and so on. Also, just as happened to radio, we have been witnessing subversions to the empowerment and liberation promises of the Internet (Notley and Tacchi, 2004).

Hartley (2004, as cited in Notley and Tacchi, 2004), for example, traces the history of the relationship between the producer and its audience, and the types of production of meaning that each historical stage of this relationship entails. According to this author, in premodern times meaning was considered „divine”, and deposited in sacred books, like the Bible: the text expressed what its supernatural producer said it did. With the Industrial Revolution and the Enlightenment, meaning started to be attributed to the texts themselves (and their authors). Since the Second World War, there's been an egalitarian shift, and meaning became associated with the interpretation that each person in the audience makes of a given text.

Young people around the world have been eager adopters of social networking services, video and web publishing, instant messaging and online multiplayer games. These phenomena are revealing of the strong influence that digital media have in people (Rheingold, 2008). The fact that they are also *not* prompted by adults is also very significant.

5. Dynamics of technology use by young people

Innovation requires communication, enthusiasm and commitment from the agents involved in the creative process. Although widely disseminated, ICT is yet to fulfill its promise of total diffusion into society (Schumarova and Swatman, 2006). Many new products are adopted by the narrow market fringe called „*the innovators*”, but it remains a challenge to extend end-user uptake into the wider „*early-adopters*” group.

There is a wide range of perspectives about technology, and its impact in society, from one extreme in which technology is viewed as an exogenous variable driving all progress in society, to another extreme, where the risks and menaces of technology for society, and youth in particular, abound.

In order to study the complex relationship between people and technology one cannot adopt simplistic and deterministic interpretations, and must be open to take into account all the complexities that the social construction of these relationships involves (Mominó and Menseses, 2008).

In a study on how the younger population *appropriates* technology, Carroll, Howard, Vetere, Peck and Murphy (2001) found three major issues associated with the use of technology by this group:

1. A sense of identity, or belonging: even from less sophisticated means, like SMS, young people extract important feedback from their peers, and the possession of a mobile phone number is a very important factor in social inclusion and in maintaining social links. There seems to be a hierarchy of proximity, from friends with which there is frequent contact through SMS, to people met through chat sessions.
2. Power management: for example, a person can set his/her own chat group, and thus control who can participate in a chat session, or decide when to chat, by blocking or unblocking the group at will.
3. Fragmentation management: the Internet helps young people to establish some cohesion to their lives, what has become very important since the geographical mobility of recent years

and also the widening of the social arena to the whole world, allowed by the Internet itself. ICT allows young people to form distinct virtual social groups, with who to interact independently from the others (for example, maintaining virtual communities of family, friends, professional or hobbyist interests).

The most powerful *attractors* that Carroll et al (2001) found in the process of appropriation of technology by young people were:

- a. *convenience* (for example being able to set a phone to vibrate in too noisy or too quiet environments)
- b. *utility* (for instance, they like their phones to be small enough to fit their pockets, but not so small they cannot easily write SMS in them)
- c. *fashion* (characteristics like the color or the design of computers, pen drives or mobile phones are very relevant among young people).

On the other hand, the most potent *repellents* to the appropriation of technology that these authors found were:

- a. cost, manifested in the inability to pay phone or internet bills
- b. difficulties of use and of learning
- c. unsolicited material, like mail boxes filled with spam (Carroll et al, 2001).

There seems to be a permanent tension between those who create new technologies and novice users who try to accommodate those tools to their own lives, and rarely sharing the idealized vision of their applicability with their creators. Table 1, summarizes and relates the three attractors to their repellents counterpart for technology appropriation. From such attractors/repellents relationship it is possible to state that repellents almost act as restrictions for their attractors counterparts, as we may say that convenience is limited by cost; utility must conform with easy to use and learn; and fashion need to be simple and affordable for people to adhere to.

Table 1: Attractors versus repellents for technology appropriation

<i>Attractors</i>	<i>Repellents</i>
Convenience	Cost
Utility	Difficult to use & learn
Fashion	Entropy, too much information

According to these authors, appropriation emerges from the interplay between: a) context (social environment where people study, work and live), b) people's personal needs and desires, and c) technology itself. In a broader sense, a deep link between *appropriation* and *participation* can be established, because appropriation extends to the realms of human culture (and not just technology), and is a set of phenomena in which people transform their perceived responsibility for activities in their surroundings and their understanding of the environment in which they live (Rogoff, 1995). This process that goes well beyond using a tool to solve a specific task: appropriation decisions are determined by environmental variables and cultural factors and the whole lifestyle of the person influences the appropriation dynamics. Technology itself is shaped by the social world from where it emerges. The meaning of the Internet, for example, depends upon the cultural context where it is used.

According to Miekle (2002), a distinction can be made between two types of Internet use: *interactive* and *tactical*: when using the Internet *interactively*, the user is limited to the options already prescribed by web sites and services creators, but he/she can choose to make a *tactical* use of the Internet, based on „intercreativity”, and thus collaboratively co-creating new contents and meanings. As Notley and Tacchi (2004) point out, the idea of “intercreativity” was early proposed by Tim Berners-Lee as a foundational principle of the World Wide Web.

6. ICT appropriation in Higher Education: a social-cultural perspective

In a broader sense, a technology is comprised of a set of tools that are deployed as components of a social practice (Cole and Derry, 2005). Learning takes place in a social-cultural system, in which technology affordances allow the users to (McLoughlin and Lee, 2007): a) connect and create social rapport; b) collaborate in the process of information discovery and sharing; c) co-create content; d) aggregate information and modify content.

The terms *information technology*, *learning technology*, and *educational technology* tend to be used in broad and intermixed senses when referring to the use of electronic devices in schools or universities, but we think a precise definition of each of these concepts can be useful. *Information technology* results from the application of the science of information (and information systems) to the development of tools for managing information. *Learning technology*, on the other hand, derives from the applied science of learning, that studies how people learn, in order to develop tools and strategies to optimize human learning. The term *educational technology* includes *both* information and learning technologies (Atkin, 1998). In this conception of educational technology, the collaborative and cognitive processes are viewed as “soft systems”, computers and other devices being the „hard systems”.

Constructivist theories of education have long exhorted teachers to behave like guidance agents to their students, and to promote active learning through hands-on experimentation. Since the emergence of digital media, many authors have noticed the potential match between the new tools and constructive approaches to learning (Dalgarno, 1996). What is rather new is the current population of „digital natives” (Prensky, 2001, October 1), who have started to use media players, cell phones and mobile computers even before high school (Rheingold, 2008).

What comes out from the implementation of technology in education depends on how technology is treated and received in the school context (Jonsson, 2004). It is important to study how social processes in the classroom are influenced by technology, and for this purpose there are theoretical frameworks that enhance our understanding of the global dynamics that involve psychological, social, cultural, and technological dimensions. By its popularity, robustness and elegance, we have chosen to present the theory developed by Vygotsky, Leont'ev, Luria and Rubinstein in the former USSR, and later modified by Engestrom and colleagues, in Scandinavia.

According to Vygotsky (1978), the relationship between human beings and the objects on our environment is mediated through cultural artifacts (these artifacts can go from a simple wooden stick to the complexities of human language).

Technology is shaped by social forces, people reshape technological tools by using it, and implemented technology shapes the social world. The individual acts like a socio-culturally embedded agent, and is not conceived merely as a *processor* or as a *system component*.

Artifacts should not be interpreted in isolation and should be studied in the context of their practical use (Engestrom, 1999).

Within an *activity system* (Vygotsky, 1978), the unit of analysis is *motivated activity directed to a goal (object)*. In the original formulation of the framework (Vygotsky, 1978) activities were conceived as conscious object-oriented actions, mediated by tools (artifacts). Later, Leont'ev emphasized the role that *community* has in mediating human activity, both by imposing rules that influence the individual's behavior, and by providing forms of *division of labor* (Engestrom, 1999).

One implication of these frameworks for educational practice is that school cannot be just one restrict *schooling* environment, as society requires the broader education of its citizens, in both the formal and informal aspects necessary to become an active participant in a democratic environment. For instance, one of matters in which school has been required to become involved is the struggle against info-exclusion. In Portuguese Universities, it is possible to identify some institutionalized pedagogical practices thorough which a relatively small number of teachers tries to explore the benefits and potentials of some ICT tools (Fonseca and Gomes, 2007). While this has happened with the adoption of LMS's

environments like Sakai or Moodle, today these platforms have finally entered mainstream use in Secondary and Higher Education institutions. But now the same phenomena, based on early adopters that anticipate and promote subsequent massive institutional use, is happening in respect to the introduction of Social Web tools in educational practice.

7. Social software, Web 2.0 and new forms of teaching and of learning

Students using tools like wikis and blogs have the chance to work independently, without being subject to any form of recognized authority. People in higher education settings resemble workers in an industrial installation who suddenly verify that, to make highly appreciated products, they don't need their plant machinery anymore ... there are free, non-institutional tools allowing them to become producers and also enabling them to consume more products, made by other people (and not just institutions).

There is a new culture emerging from the use of participatory media: these are not just enabling tools, but they are really changing the way our culture operates (Jenkins, Clinton, Purushotma, Robinson, and Weigel, 2006). Anderson (2003), for example, argues that the model by which cohort students interact asynchronously, through text, with a teacher and other students may not be a cost-effective one, and that that type of interaction could now be replaced by models that favor student-student and student-content interactions.

According to Rheingold (2008), participatory media (in which wikis, blogs, social bookmarking, *mashups* and video sharing are included), have three distinctive features:

1. *Many-to-many relationship*, where every person can not only receive, but also broadcast information, breaking the traditional asymmetry between broadcaster and audience that was the signature of predigital technologies.
2. *Power*, derived from the collaborative participation of many individuals.
3. *Wider, faster and cheap coordination of activities*, due to the use of information and communication technologies to amplify social networks.

Active, participative individuals are not directly derived from the ownership of a personal computer, or even from having access to the Internet and to Web 2.0 technologies. The existence of a participatory community requires people to use means of expression in effective and impacting ways (Rheingold, 2008). In this respect, education can play a vital role, by equipping today's "digital natives" with the cultural tools they need to recognize the links between the possibility to publish online and the power of individuals in a democratic society.

ICT promotes the blurring of boundaries between „high” and „low” cultural forms, and the mixture of genres in content production, leading to the emergence of terms like „edutainment” or „infotainment” (Notley and Tacchi, 2004).

Much more than facilitating access to content, the Internet provides the student with the great benefit of enabling him/her to control his/her learning experience in a variety of dimensions (Anderson, 2005). These dimensions include time (communication can be asynchronous), space (learning can be *desterritorialized*), media (due to the availability of several tools and resources, the student can choose from where to obtain her/his information) and content (ICT now allows the student to produce information, liberating him/her from the role of passive consumer).

In a classroom, the teacher should recognize the needs of each learner, intervene when necessary to indicate strategies to maximize learning, but always recognizing that effective learning requires active construction of meaning by the learner and open negotiation about the learning experiences (Atkin, 1998). A teacher should act as a tutor, rather than a „*sage on the stage*”. Instruction is a process by which explicit guidance is given to the student, but if the necessary conditions are present, the teacher can guide students into working more collaboratively: in fact, the social context of which the student is part, shapes the whole dynamics of the instructional process.

Learning happens in a variety of ways, from presence lectures to online activities. While online in „traditional” virtual environments provided by LMS's like Sakai or Blackboard, there is a sort of „black veil” (Amelung, Laffey and Turner, 2007) between the students themselves and between them and the teacher: this happens because all the participants have limited knowledge about what is happening around the online course or project. They all just have access to the words written by each other, and do not see others working. This prevents much of the incidental learning derived from the observation of others doing their work, and also constrains the motivation to keep learning in the context of a shared social experience.

In order to maintain a minimal level of engagement, instructors may impose a fixed number of posts to a discussion board. This has the perverse effect of students adapting their efforts to meet the minimal requirements and never becoming truly engaged in the activity. Many expert instructors try to emphasize the collaborative nature of learning while using LMS's, but these systems tend to lack the kind of cues that are important to motivate the students and not rich enough to enable *activity to shape learning*, through social interaction (Amelung et al, 2007).

Instead, the use of Web 2.0 tools and services can contribute to the establishment of alternative environments for informal learning (Selwyn, 2008). Though they were not specifically designed within an educational framework, Web 2.0 services are pervasive (if unauthorized) elements of ICT in Education, and the use of these tools by the students is definitely outside the University's institutional control. The new dynamics introduced by Web 2.0 is promoting active debate on whether learning spaces and structures shouldn't be fundamentally changed.

Siemens (2008) metaphorically compares a classroom to an Ecological System. As such, the classroom environment promotes certain kinds of activities, but discourages others. For instance (and very importantly), the fact that the classroom is a physically enclosed space is suggestive of a certain view of learning. The Internet environment, on the other hand, is suggestive of a very different perspective of learning.

Traditional LMS's, controlled by Institutional administrators are also very different ecologies compared to the ecologies created by open Web 2.0 services. One of the questions that are now being debated is whether *structure* is a requirement for any and each type of learning (Siemens, 2008).

Educational Institutions normally react at a slow pace in relation to technological developments. And LMS's, accordingly to Siemens (2008) tend to reproduce the dynamics of traditional classrooms, and little innovation is seen around LMS usage. But the technologies grouped under the umbrella of Web 2.0 are generative of new manners of interaction, reinforced by the fact that the open environment which they inhabit is full of novelty.

The evidence that college students are living much of their social lives online keeps accumulating. A Pew Report (Pew, 2005) found that 82% of undergraduate students in the United States were online. The same study revealed that in that country, 33% of teenagers share their creative works on the Internet. Also, these data are relatively stable, and have been steady in the past years: in a more recent study, done in a completely different country (South Africa), Brown and Czerniewicz (2008), verified that little has changed in the way students use ICT in their learning: most of the time they are online is spent in information seeking activities. This is somewhat surprising, given the rise of Web 2.0 tools in recent years, but Brown and Czerniewicz did find that the use of social software by students is not as popular as using Web search engines or instant messaging programs. They also found that there was a difference between the use that undergraduate and graduate students made of online tools: while the first preferred more scaffolded activities, the former were more prone to use more research-oriented tools (Brown and Czerniewicz, 2008).

Brown and Czerniewicz (2008) South African findings are not universal, since other reports (e.g. Tancer, 2006, July 11) show *MySpace* as being at the head of the most visited websites, before *Google*, *Yahoo* or *Microsoft*. It is interesting to note these discrepancies in the findings derived from different inquiries, separated by just a few years, but in different Countries. These differences can prove the dynamic and

diverse nature of the relations between ICT and Higher Education, and how hard it is to make general assumptions from just one or two localized reports.

8. Appropriation of some specific „Web 2.0” technologies in Higher Education

From all the characteristics of the diverse Web 2.0 applications, the one that unifies the concept, and that has more potential to impact Education, is the sociability nature of these tools: Web 2.0 is about supporting group dynamics and the establishment of digital networks among people. In this sense, the terms *Web 2.0* and *Social Software* could be confounded. But Web 2.0 goes beyond the original concept of Social Software in that a greater emphasis is given to new possibilities supplied to the individual in terms of self-expression and filtering, through collaborative remix ability (McLoughlin and Lee, 2007).

As Web services and information systems become more and more complex, there emerges the expectation that its users will be involved in its enhancement, a phenomenon that could be defined as „*design by appropriation*”. People using these systems become „*end designers*”, playing an important part on software development. Many innovative characteristics of recent products have been designed in this manner.

Social software technology is not limited to the tools we are going to mention in this section, but those presented here are surely representative of the kinds of services that have emerged or gain popularity on the web during the last few years, and that motivated the creation and widely adoption of the term Web 2.0 (O'Reilly, 2005, September 30). It is important to notice that many of the technologies that we will mention are used in conjunction with each other, or are incorporated in more traditional Web services with the goal of expanding their efficacy, usability and/or popularity.

The combined use of weblogs, wikis, social bookmarking (tagging) and syndication, for example, can promote enhanced dynamism on the communication between the elements of a learning community (teachers, students, people from the social context where the learning is taking place).

8.1. Tagging

A concept that is at the heart of social software is that of „*tagging*”. Tags are applied freely by those accessing photos (e.g. *Flickr*), web sites (e.g. *del.icio.us*), blogs (e.g. *Technorati*), etc. This is a kind of social bookmarking activity that allows people to annotate and collect their favorite web links within an open online environment.

Tagging is a process of implicit negotiation between people about the words that best describe a given online resource. It is also a means of breaking the traditional asymmetry that has existed between predigital broadcasting media and its audience (Rheingold, 2008).

Through the use of tags, resources can be easily distributed and shared, in both public and private domains. A person accessing a social bookmarking service can choose whether to search information by keyword (tag), by a person's or object's name, classification scheme (folk taxonomy, or „*folkosonomy*”) or popularity (Boulos and Wheeler, 2007). Tags may also be used to create tag clouds, which are a form of conceptual map, visually depicting the contents of a given website.

Some parallelism between tags in tag clouds and evolutionary systems can be made: for example, within an evolutionary context, fitness of a tag can be derived from its popularity.

Social bookmarking websites, like *del.icio.us* can produce more relevant search results than Google alone, because the resources found have already been selected and classified by other people, with similar interests. In fact, the usefulness of these sites is proportional to the number of people that use them, tagging resources, mashing it up, and remixing information. This contrasts with traditional institutional and governmental environments, in which the policy of information management is all around managing scarce resources.

8.2. Syndication through RSS and Atom

Really Simple Syndication (RSS) and Atom are a very important interface exposed by social software. Through RSS, a static resource created by a student or a teacher can become a dynamic *part* of information objects created by other people. Syndication feeds can be used to receive updates from blogs, newspapers, databases, paper announcements, among other sources.

Using the syndication facilities of RSS, students and teachers gain a greater control over the way information is aggregated and accessed, in order to best serve the learning activity at hand (Boulos and Wheeler, 2007). A RSS feed can be used, for example, to subscribe to a regular podcast that is then downloaded automatically when the new episode is available.

Content aggregation applications have become increasingly transparent and tools like Blogger are making the task of content submission easier each day. The term *andblogosphere*” was coined to denote the virtual environments that result from interlinking blog contents through syndication technologies.

The proliferation of microformats and syndication proved that interoperability does not require centralized control. There are issues around security and privacy that derive from the open nature of syndication, but we think these questions are better addressed through education, rather than coercive control.

Since students can choose what feeds to subscribe, they can create their own, personalized, networks. Syndication promotes the formation of loosely connected communities, in which a person can participate in networks of people from all around the world. Through Atom or RSS feeds, a student can participate in discussions that are far beyond the limits of any set of discussion topics in a Forum within a LMS.

8.3. Blogs

When thinking of the impact of social software in education, *weblogs* (blogs) are one kind of tool that readily comes to mind. As Bryant (2006) points out, the first wave of teacher and student *blogging* is now informing a second wave of adoption, in which blogs are promoted as the most simple and effective form of personal portfolio, or as tools of academic exploration. Those who have been using blogs for some time are keen to share their experiences about what works and does not work, contrasting with the posture of traditional software vendors who were always trying to sell a „wonderful” (and many times expensive) product.

Bloggging allows a conversational sense-making within a virtual social network, and this is one aspect of it that keeps people engaged and motivated (Bryant, 2006): it is not just a way for a person to write his/her own thoughts for personal reflection. Blogs have been used extensively by young people as a means to express their joy, sadness and revolt, very often incorporating images and photographs in the text. Besides being used as an agenda, or a diary, the blog can take the function of a mural painting, or a „wall journal” where people can express their opinion about events on their immediate or far surroundings (Sousa et al, 2007).

Tools like *Google Blogger* or *Livejournal* are free services that allow blogs to be created through very simple steps. Search engines soon recognized blogs as a potential market niche, and specialized blog indexation services emerged (e.g. *Technorati*). Syndication and tagging, mentioned in the previous sections, are also essential for the blogosphere dynamics. Another important contribution to guarantee the authoring recognition of original contents published in blogs was the creation of the *Internet Blog Serial Number* (IBSN) that fulfills the same purpose that ISBN (*International Standard Book Number*) has in relation to books.

When the words of a blogger are read, and when others enter the dialog, the blogger is no more a passive element observing the Internet, and becomes a creative actor on the web. Blogs can even enjoy significant popularity: in a recent study, Sifry (2007), found that among the 100 most popular websites on the Internet, 23 are blogs. Blogs make possible a bottom-up movement that challenges the traditional role of the single (or few) opinion-maker(s): today, every person can have a voice, and a potential audience.

In Universities, Faculty has been blogging for some time, using a variety of formats: from chronological disposed course syllabi to presentations of their lab results.

When used in an educational context, as a means to support a learning process, blogs may be labeled „*edublogs*”. Although a blog can be created and managed solely by the teacher, and used in as *instructional* (traditional) way, they can also be used collaboratively, either by allowing teachers and students to work in common projects, or by giving the possibility to each student to have his/her own blog, that the whole world can see (including his/her teacher and colleagues, who can all act as tutors in a scaffolding process).

8.4. Wikis

Despite the enormous popularity of some wikis, like Wikipedia, the vast majority of wikis are being used in closed communities, and private realms (Bryant, 2006).

Using a biological framework, wikis can be seen as evolutionary landscape, in which content is being permanently exposed to environmental pressures and where mutations are represented by the modifications introduced in the previous version of the document (Dron, 2007). One can even reconstruct the „*phylogeny*” of the wiki entry by consulting the revisions’ historic.

Used in an educational context, wikis represent powerful enabling tools, allowing teachers and students to easily explore areas of knowledge, and developing only as much as they need for their learning tasks. Wikis allow the building of a structure upon which groups of individuals have the freedom to build on each other's contributions, and thus creating resources in a truly collaborative way.

In a wiki, all users can manage, erase or modify the content of each entry, in a fast and interactive way. The contents of a wiki tend to be in perpetual construction, and the previous versions of the online material are kept in an historical register.

8.5. Podcasts

The impact of podcasting in education is huge. Many Universities, notably in the United States, are now distributing iPods and other *mp3* players to their students, and the impact of podcasts in college-level learning is now being the object of several ongoing studies (Lee and Chan, 2007). Although recorded audio, as a medium, has been used for many years now in Distance Education, the Internet, and more recently Web 2.0 syndication through RSS, have allowed an explosion on digital audio delivery all over the world. The cost of producing and of hearing podcasts is usually very low, and educational podcasting is being used to reach remote publics all over the world and to transform isolated learning experiences into real online community connections. With tools like *Apple iTunes* at the disposal of people and Institutions, we witness a ever growing number of highly reputed Universities (e.g. Open University in UK, Berkley, Harvard, Yale) making course-specific podcasts and putting them on the Internet easily accessible not only to their students, but to the whole world. This constitutes a significant example of the transformations that are taking place in Higher Education and in society at large, in terms of openness and dissemination of knowledge.

8.6. Traditional Learning Management Systems (LMS's)

Learning management systems (LMS's) are the most visible elements of the institutional side of the digital frontiers associated with higher education LMS's have been available for many years now, and they have allowed the integration of geographically disperse learners and teachers (McLoughlin and Lee, 2007). Two of the best known and widespread of LMS's are Moodle and, to a lesser extent, Sakai (just to mention open-source LMS's)

A LMS presents itself to a user as a centralized website, *managed* by people who are given special administration *privileges*, who can easily follow every step each user makes. This functioning model

resembles a lot the traditional classroom model in where people are assembled together on a given space with the clearly defined objective of learning. LMS's have been adapting their functionalities to incorporate Web 2.0 features like blogs, wikis, *podcasts*. Even so, students have become accustomed to be producers of content in environments that are much richer, and that allow much more freedom and personal expression, than any LMS can ever deliver. Being *managed* systems, LMS's are poorly compatible with the chaotic nature of learning, and by their own design philosophy tend to impose structures on content and on interaction that people are becoming unaccustomed, with all the new Web 2.0 at their disposal. The current generation of students, who seek greater autonomy and connectivity tend to be dissatisfied with the use of traditional LMS's (McLoughlin and Lee, 2007), because despite these tools enable the expression of personal views on a given course or topic, they are still close to the classroom metaphor, and are not open to the personalization that is possible when using Web 2.0 services. The functionalities *inside* LMS's appear within the context of a protected environment provided by the school's Information System, and thus still dependent on the decisions and control of administrators and teachers.

9. Final Remarks and Recommendations

Technology appropriation is a dynamic process in which the existence of complex psychological and socio-cultural factors precludes any attempt to formulate normative models solely based on basic research (Carroll et al, 2002).

Even so, theoretical frameworks derived from long-standing (and resilient) schools of thought can be applied and serve as guiding principles to a pedagogically-oriented use of Web 2.0 tools: in this respect, social-constructivism emerges (again, and reinforced, in our view), as a useful source of advice for agents preoccupied with the integration of Web 2.0 services in educational practices. There are others, more recent, theoretical perspectives about Education in a world where communication and collaboration technological affordances abound. For instance, George Siemens (2008) has notoriously been defying the idea that the social-constructivist framework offers the best set of ideas to interpret the educational phenomena surrounding the use of Web 2.0 tools, and his proposed alternative framework is starting gaining momentum and acceptability, although not without some important dissonant voices (e.g. Kerr, 2006, December; Verhagen, 2006, November).

Despite what we have exposed in the last section, about Learning Management Systems, we are aware that the *giving away* of control over content is a very delicate issue, since there are legal and ethical matters involved, and there is also security issues related to unrestricted access to the Internet, but it can also be argued that Higher Education has the mission to prepare adults to the perils (and opportunities) that exist on the Internet. in order for this learning to be effective, it must happen within an open environment, just as any kind of learning should ideally be a genuine reflex of the real world, and not of some artificial island inside a classroom or an Institution's Information System.

The ultimate word on how a tool is used is given by the individual, in whose life that particular tool has got to be incorporated. What Web 2.0 promises as its most essential challenge is the networking effect of connecting individuals. This may provide the means to turn the *information society* into a *relational* one. Part of it, relies on how technology appropriation evolves.

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