School of Technology and Architecture

Master on Open Source Software

"Metaversia – A MOOC Model for Higher Education"

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Abstract

Globalization and economic interdependency of a post-modern society point toward an internationalization mission for the university. However, on a global scale, social, economic, and cultural circumstances have significant effects upon an individual's ability to show the merit required in higher education. The growing open access movement reveals the early emergence of a meta-university that bring cost-efficiencies to institutions through the shared development of educational materials, which is particularly important to the developing world. But despite the huge success in the dissemination and democratization of knowledge provided by the open access movement, it has attached a severe financial downside, and configures a hamper in educational innovation due to its failure in harnessing Web 2.0 collaborative technologies.

In order to find a model that better suits the needs of collaborative teaching and learning in a networked information economy, two approaches are followed in this dissertation. The first consists in the analysis and comparison of the open education ecosystem. On the other approach, based on the previous results, we propose a MOOC model, Metaversia, for a collaborative network that harness the capital exchange potential, and knowledge-building opportunities that rests on the connections between people, enabling citizen's full participation in the actual networked information economy.

Keywords: E-learning, Open Education Resources, OpenCourseWare, Massive Open Online Courses

Resumo

A globalização e interdependência económica de uma sociedade pós-moderna impelem a universidade para uma missão de internacionalização. Mas à escala global, circunstâncias sociais, económicas e culturais têm implicações significativas sobre a capacidade dos indivíduos em mostrar o mérito exigido no ensino superior. O movimento de acesso livre revela o surgimento precoce de uma meta universidade que traz mais valias do ponto de vista financeiro para as universidades através do desenvolvimento partilhado de materiais educativos. Mas, apesar do enorme sucesso na disseminação e democratização do conhecimento proporcionado pelo movimento de acesso livre, este possui severas desvantagens financeiras e configura um grande passo atrás na inovação pedagógica devido a sua falha no devido aproveitamento das tecnologias colaborativas da Web 2.0.

A fim de encontrar um modelo que melhor se adeque às necessidades de ensino e aprendizagem colaborativa numa economia da informação em rede, duas abordagens são seguidas nesta tese. A primeira consiste na análise e comparação do ecossistema educação aberta. Na outra abordagem, com base nos resultados anteriores, propomos um modelo para um MOOC, Metaversia, para uma rede de colaboração que aproveita o potencial de troca de capital, e de construção de conhecimento que existe no relacionamento interpessoal, permitindo uma plena participação dos cidadãos numa economia da informação em rede.

Palavras-Chave: Aprendizagem online, E-learning, Open Education Resources, OpenCourseWare Massive Open Online Courses

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This work is dedicated to our late colleague Hugo Vedor.

Lisbon, October 2012

Tiago Santos

“The educated differ from the uneducated as much as the living differ from the dead”

Aristotle

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List of Abbreviations

EU – European Union

CMS – Content Management System

GDP – Gross Domestic Product

IPR – Intellectual Property Rights

LMS – Learning Management System

LCMS – Learning Content Management System

MIT – Massachusetts Institute of Technology

MOOC – Massive Open Online Course

OER – Open Educational Resources

OCW – OpenCourseWare

OLCOS – Open eLearning Content Observatory Services

PDF – Portable Document Format

UNESCO - United Nations Educational, Scientific and Cultural Organization

VLE – Virtual Learning Environment

1 Introduction

1.1 Context and Motivation

The emerging networked information economy is providing technology that enables a series of changes in the way information, knowledge, and culture is made and exchanged. This digital revolution challenges fundamental aspects of the current university model. Open-access movements as the MIT's Open Courseware are a well-succeeded but limited response to these challenges because they fail to embrace collaborative learning and knowledge production. This thesis intents to address the creation of a digital platform that can suit the needs of collaborative learning and knowledge production of the actual networked information economy (Tapscott & Williams, 2010a).

1.2 Research Question and Objectives

The goal of the thesis is to create a platform for collaborative learning and knowledge production for higher education. The research question addressed in this thesis is the following:

“Is it possible to create a model of a digital platform that can address the needs of collaborative learning and knowledge production of the actual networked information economy?”

In order to answer this question, the following objectives need to be accomplished:

• Define a conceptual model of a collaborative learning and knowledge production for higher education;

• Prototype the conceptual model using open-source software.

1.3 Methodology

The method used to construct the thesis consists of three parts: literature study, construction of the conceptual model and prototyping the created model.

The literature study will be focused on the emerging networked information economy and how technology is enabling a series of economic, social, and cultural adaptations that are reshaping higher education. Next it will be studied the state of the art of the open education ecosystems where we analyze the OCW and MOOC initiatives in order to understand how are they leveraging collaborative teaching and learning, identifying its strengths and weaknesses and the main elements from we can build a framework to support the modeling and prototyping.

The model consists in the definition of the structure and main platform tools and features that will be later prototyped with open-source CMS.

1.4 Outline of the Thesis

The structure of the thesis is defined by the following chapters:

Chapter 1 introduces the objectives and gives an overview of the worked developed in the thesis and its contributions.

Chapter 2 starts by presenting the transformations in higher education that are challenging the traditional university model. Then we address the definition of non formal education and its importance in the process of individual and community empowerment and how the Web 2.0 is creating the conditions for the emergence of new kinds of open participatory learning ecosystems that supports active learning. Next, we take a closer look at two facets of the open-access movement, the OER, OCW and MOOC initiatives to later provide an overview over the different types of software that support teaching and learning.

Chapter 3 provides a state of the art of the open education ecosystems where we analyze the OCW and MOOC initiative in order to understand how are they leveraging collaborative teaching and learning.

Chapter 4 explains our conceptual model and prototype for a global network for higher education.

Chapter 5 presents the final conclusions and suggests future work.

2 Literature review

2.1 Internationalization: The New Mission for the Post-modern University

Over the past 850 years, the mission of university transformed in multiplicity and nature. The medieval European university arose under pre-nation-state conditions with a teaching mission, but with the rise of the nation-state, the early modern university of Europe and Latin America adopted the nationalization mission, or service to the government. In contrast, the formative U.S. college set the focus on the service to the individual of the nation-state, to serve the goals of a democratization mission. On the other hand and simultaneously, the German (or Humboldtian) university promoted the research mission, still under pre-nation-state conditions. Throughout the 20th century, the modern American university elevated the public service mission, or service to the public of the nation-state, but the erosion of the nation-state by transnational capital is forcing universities to internationalize their triad mission of teaching, research, and public service. Today, globalization and economic interdependency of a post-modern society point toward an internationalization mission for the university as a service to the body of worldwide nation-states, becoming this way a transnational corporation that serves global consumers rather than national subjects (Scott, 2006).

From the Middle Ages through today, the university has stood as a key international organization, attracting legions of students from abroad and laying the foundations for globalization, knowledge-based human activities, and democratic political systems (Scott, 2006). A new global emphasis on international or multicultural curricula—a global education mission—and on increasing foreign student populations, international exchange of students and faculty members, and research collaborations between institutions in different nations. An apparent convergence of higher education structures and policies worldwide is creating four main aspects of internationalization that Kerr, quoted by Scott (2009), distinguishes: the flow of new information, faculty members, students, and curricular content. As an example of this convergence and its motivation we have EU's creation of the European Research Area, a set of activities, programmes and policies to foster the globalisation of research and technology in order to "*attract considerable amounts of R&D investments, notably China, India and other emerging economies"* ("European Research Area - Why do we need ERA?," 2012). Another example is the *Universitas 21* ranking of national higher education that has been developed to *"highlight the importance of creating a*

strong environment for higher education institutions to contribute to economic and cultural development, provide a high-quality experience for students and help institutions compete for overseas applicants" (Olds, 2012). In the post-capitalist society described as the "information age" or "knowledge society", knowledge—not capital, land, or labour—is the basic resource. Consequently, the university is the pivotal institution in this society because it produces (research mission) and transmits (teaching and public service missions) the bulk of society's new information (Scott, 2006).

Despite the profound economic, scientific, and academic advantages of internationalization, there is a risk of transforming higher education into just another knowledge industry. The privatization of knowledge, promoted by international and national regulation of intellectual property, could threaten the survival of the university, diverting funding and slowing down research, which damages teaching and the ability to provide "universalistic" public service, undermining the internationalization mission itself (Scott, 2006).

Nevertheless, Readings, quoted by Scott (2006), imagines that the emerging of this non-ideological university will open up unprecedented possibilities for freedom of communication and ethical thought. Post-modernist argue that even "thick" medieval institutions, such as the university, will be replaced by "thin" modern or post-modern structures that resemble flexible, global networks. If so, distance education technologies will be critical to the success of this new venture (Scott, 2006).

2.2 Expanding Global Market and Financial Support in Higher Education

More than one-third of the world's population is under 20.
There are over 30 million people today qualified to enter a university who have no place to go.
During the next decade, this 30 million will grow to 100 million.
To meet this staggering demand, a major university needs to be created each week.
Sir John Daniel, 1996 (Brown & Adler, 2008)

The number of students pursuing tertiary education has sky-rocketed worldwide over the past years, growing five-fold from 28.6 million in 1970 to 152.5 million in 2007. This translates into an average annual increase of 4.6%, with the average number of tertiary students doubling every

15 years. But a closer look at the data reveals that the expansion has been particularly intense since 2000, with 51.7 million new tertiary students enrolled around the world in just seven years (UNESCO, 2009).

The highest average regional growth rate belongs to sub-Saharan Africa but despite this achievement, the region still lags behind other regions, what took 37 years to achieve in sub-Saharan Africa in terms of student numbers occurred in recent years on average every two years in China or five years in Latin America and the Caribbean. Nevertheless, the tertiary education systems in sub-Saharan Africa are already under considerable strain and could not accommodate higher growth rates due to lack of funding and qualified academic staff (UNESCO, 2009).

Rapid growth has also been reported in East Asia and the Pacific, where the number of students has risen twelve-fold. After the year 2000, the region became the global leader in terms of student numbers, surpassing North America and Western Europe. This is primarily due to China, where the student body has grown on average by almost 19% each year since 2000 (UNESCO, 2009).

Student numbers also grew since 1970 in Latin America and the Caribbean by ten-fold. The expansion has been markedly slower in South and West Asia with an average annual growth rate of 5.2% (UNESCO, 2009).

The slowest rate of change occurred in North America and Western Europe. Given the combination of historically high participation ratios and declining birth rates, the number of tertiary students in the region is 1.6 times that of 1970. But there is still a commitment to tertiary education growth as these national goals illustrate ("The Future of Higher Education: Beyond the Campus," 2010):

- By 2025, 40% of Australians will have degree qualification and 60% of the American population should hold high-quality college degrees or credentials.
- By 2020, 50% of the Dutch labour force between the age 25 and 44 should hold a higher education degree and 20% of the Australian student cohort will be from low socio-economic status group.

Summing up the regional growth comparisons, the time required for student numbers to double is 27 years in North America and Western Europe compared to 8.4 years in sub-Saharan Africa and 9.3 years in the Arab States. Student numbers doubled every 10 years in East Asia and the Pacific as well as in Latin America and the Caribbean. Again, the growth rate has been slower in

South and West Asia, where it took 13.6 years for student numbers to double. In 1970, nearly all tertiary student in the world studied in North America or Western Europe. But today, it is just one out of four students. Since 2005, East Asia and the Pacific has had the largest share of global tertiary education students, now exceeding 30% of global enrolment (UNESCO, 2009).

The shift in the global distribution of tertiary students is also apparent when grouping countries by their income levels. Today, a great majority of tertiary students live in low- and middle-income countries while just three decades ago we had the opposite (Figure 2).

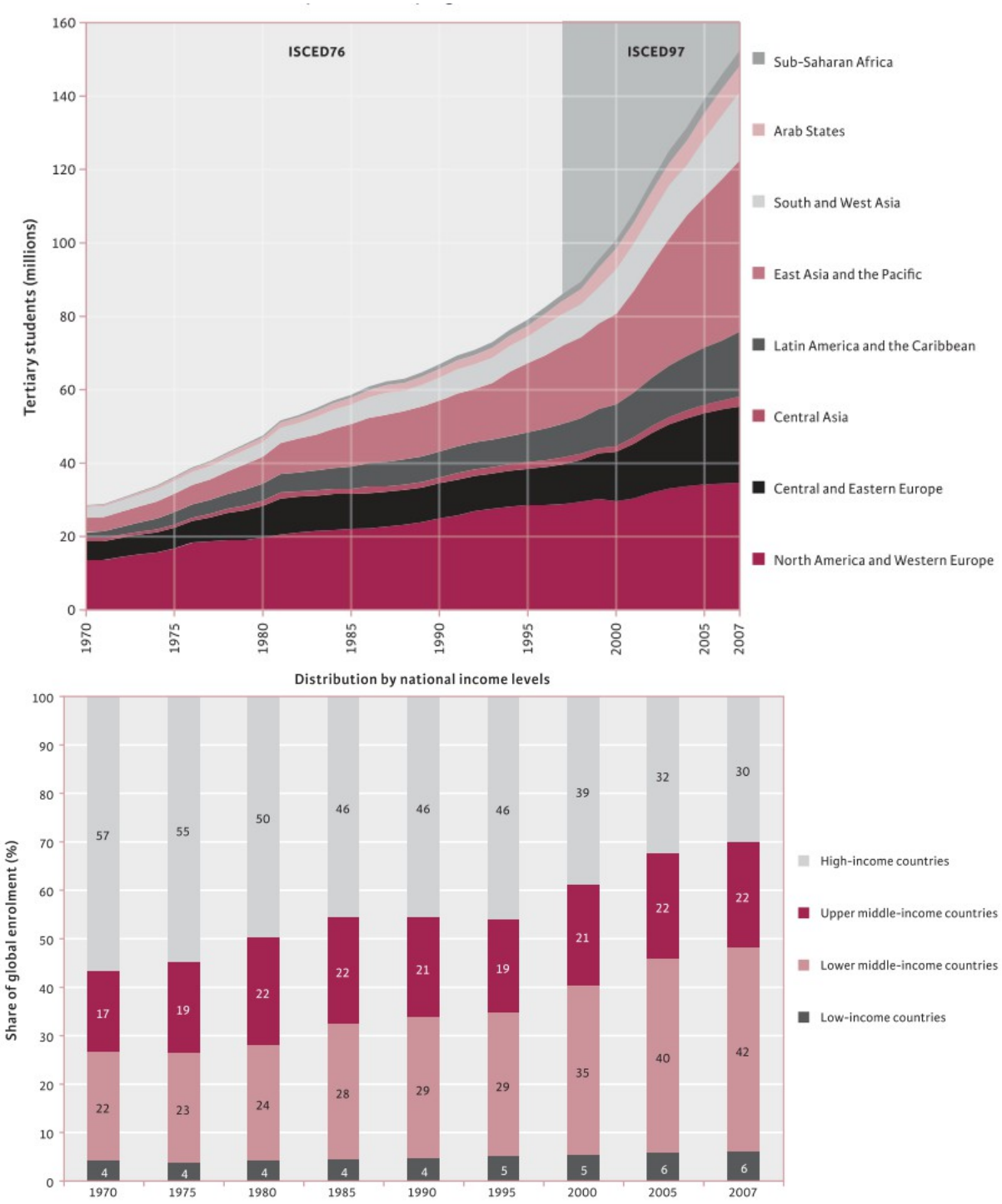

Figure 2: Tertiary enrolment by region as a percentage of global enrolment by national income levels (UNESCO, 2009)

Broadening access to tertiary education has massive cost implications for governments, especially in developing countries. Therefore, it is not surprising that almost all low-income countries with low levels of public spending on tertiary education have low participation ratios. But, despite low participation ratios, many developing countries already spend a similar share of their national wealth on tertiary education as developed countries. This can be attributed to the extremely high expenditure per tertiary student compared to the expenditure per primary or secondary student or GDP per capita. Tertiary education systems and their costs are more strongly tied to international markets. While salaries for primary school teachers need to be competitive at the national level to attract qualified teachers, the competition for highly-skilled staff for universities is on a global scale. As such, the risk of academic 'brain drain' tends to deter the lowering of salaries for tertiary education staff. In developed countries, cost differences are less pronounced, even in countries with the highest cost differences such as North America and Western Europe, where public expenditure per tertiary education student is barely double that per secondary education student (UNESCO, 2009).

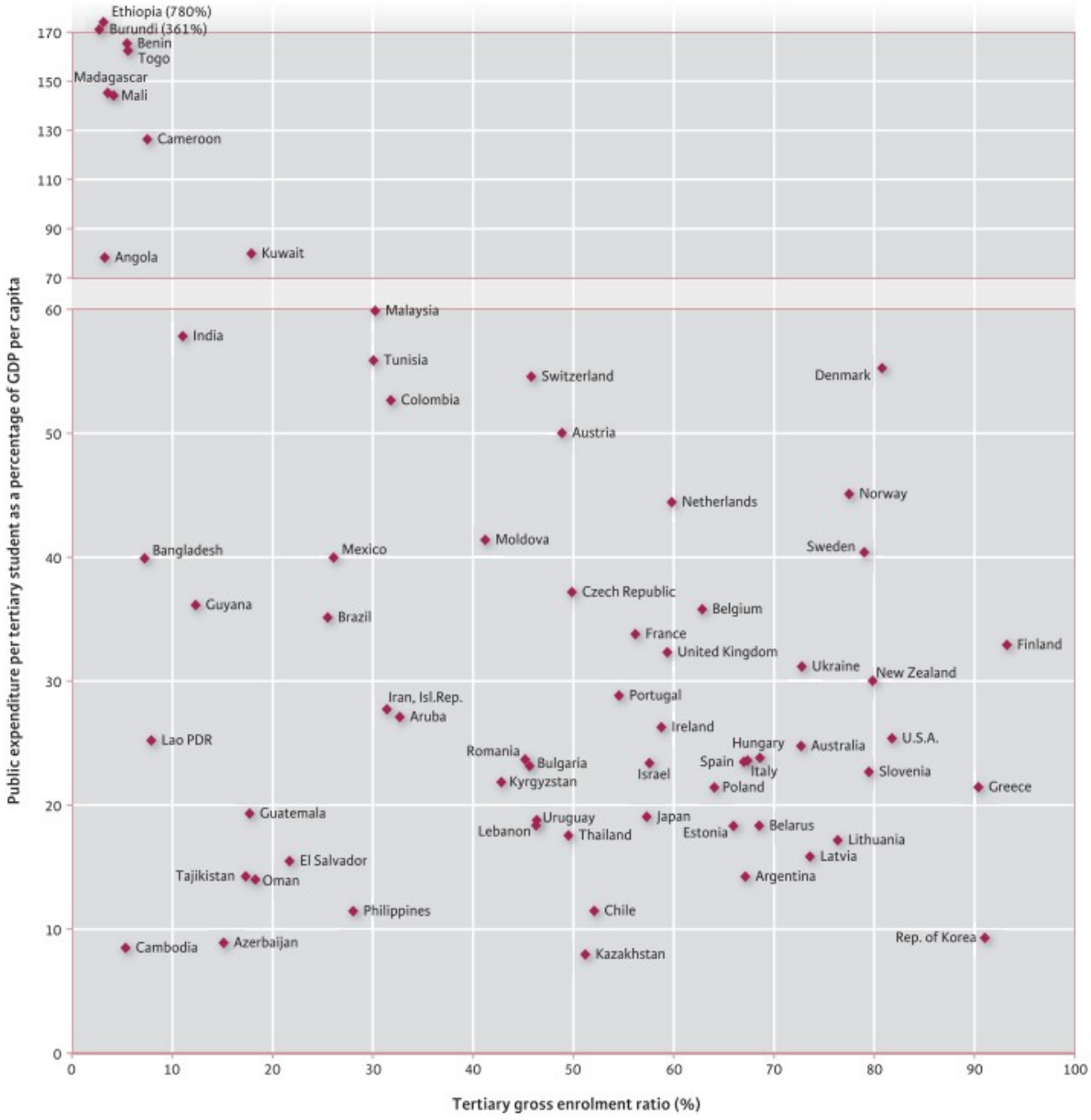

Figure 3: Public expenditure per tertiary student as a percentage of GDP per capita compared to tertiary gross enrolment ratio, 2007 (UNESCO, 2009)

The scenario described above is, paradoxically, a threat as well as an opportunity for higher education. On one hand we have an increasing flow of students that could represent an opportunity for universities thriving in the networked information economy, but on the other hand, a broad access to higher education has massive cost implications for governments, especially in developing countries. Although the Article 26 of the Universal Declaration of Human Rights claims that "*higher education shall be equally accessible to all on the basis of merit*" (Morgan & Carey, 2009), but 'merit', to be shown, requires access and mastery of the tools of education that are acquired at an earlier stage in an individual's education. On a global scale, social, economic, and

cultural circumstances have significant effects upon an individual's ability to acquire these tools and, in turn, on educational outcomes. The basic question underlying the right to education is how to create equal access to the tools of education, and thus the opportunity to show merit (Huijser, Bedford, & Bull, 2008). It is unlikely that sufficient resources will be available to build enough new campuses to meet the growing global demand for higher education like Sir John Daniel argued back in 1996, at least not the sort of campuses that we have traditionally built for colleges and universities (Brown & Adler, 2008).

2.3 Non Formal Education (NFE)

Defining Non Formal Education (NFE) is notoriously difficult. The very term "non-formal education" has lost its meaning and relevance altogether, because of both the current enormous diversity of forms and the difficulties in drawing a line between what is formal and what is non-formal, when so many initiatives show characteristics belonging to both. They prefer to drop both the term 'formal' and 'non-formal' and to either refer directly to different programmes of basic education or to subsume all forms under 'lifelong learning' or simply referring to it as "adult education" (Hoppers, 2006). Carron and Carr-Hill , quoted by Spronk (1999), summarises "*... formal education (...) (is) the institutionalised, chronologically graded and hierarchically structured education system, running from lower primary school to the upper reaches of the university, generally full time and sanctioned by the state; non-formal education ... (comprises) all educational activities organised outside the formal system and designed to serve identifiable clientele and educational objectives ... with all remaining educational activities being categorised as informal education ... (is) the lifelong process by which every person acquires and accumulates knowledge, skills, attitudes and insights from daily experience and exposure to the environment...*" *(Spronk, 1999).*

There are significant contrasts between what is labelled formal and what is labelled non-formal, but there are many features that, rather than defining the characteristics of NFE, are derivatives of a central condition that such learning remain outside the boundaries of direct state control, and that therefore can vary in accordance with the distance from this control (Hoppers, 2006). Spronk (1999) reveals that NFE occupies the middle ground between the traditional school system and informal learning practices, with no particularly clear or sharp edges at the boundaries. In many countries, during the last two decades, governments have established departments of

non formal education as part of their ministries of education focusing their work on adult literacy and continuing education, parallel to the formal system, for school leavers and drop-outs. Most, of this work falls within the non formal sector, but in exemplary cases they may also lead to credentials which enable participants to continue their education within the formal system. On the other side, non formal initiatives often appear to be so "informal" compared with the rigours of the formal system that they tend to merge with the informal sector. However, non formal education is planned, designed, structured and managed, offers opportunities for learning to clearly identified target audiences, and has clearly defined educational objectives. Back to the formal end of the continuum, more recent discussions of NFE have attempted to distinguish non formal from formal education by contrasting their characteristics. For instance, Rogers (1996), offers the following comparison (Spronk, 1999):

Table 2.1: Formal vs Non formal education comparison (Rogers quoted by Spronk, 1999)

	Formal education	**Non formal education**
Target group	mainly young universal compulsory selective	mainly adults those interested voluntary open
Time scale	full time primary activity of participants	part time secondary activity of participants
Relevance	separate from life in special institutions in sole purpose buildings	integrated with life in the community in all kinds of settings
Programme	run by professionals excludes large parts of life	participatory excludes nothing
Curriculum	one kind of education for all set curriculum compartmentalised subject-centred controlled by teacher	education to meet learner defined needs open curriculum integrated problem-centred controlled by learners
Methods	teacher-centred mainly written	learner-centred much is oral
Objectives	conformist set by teachers	competitive individualist promotes independence set by learners collaborative collective
Orientation	future	present
Relationships	hierarchical	egalitarian
Validation	terminal at each stage validated by education profession	continuing validated by learners

This approach reveals drawbacks since most of the features listed under NFE are also virtues claimed by distance educators. But, rather than characteristics of NFE, they are goals toward which NFE - and indeed much formal education and especially distance education - is striving. Nevertheless, it is nonetheless possible to identify some important differences between the two sectors. For instance, NFE courses do tend to be geared more to the immediate needs of learner, they tend to give learners more influence in shaping their experience of teaching and learning. But if teachers control the educational programme, then it is formal, to the extent that control passes to the learners, it becomes a non formal programme. In the early stages of establishing a non formal programme, control may rest largely with the educational provider who is setting up and starting the programme. However, as the programme continues, control can, indeed should, pass gradually from the provider to the learners, who will increasingly take over the programme and shape it to meet their own needs. In this sense, non formal education again becomes a goal to be aimed for rather than a static set of identifying characteristics (Spronk, 1999).

Implicit in these approaches is an ideological commitment to the linking of non formal education to the process of individual and community empowerment, and to the important role played by NFE in the processes of social change and socio-economic development. It represents a significant shift, from a formal and academic approach to education to an action-oriented view of education as an agent and vehicle for community-led social and economic change (Spronk, 1999).

2.4 A New Model of Pedagogy for Higher Education: Collaborative Learning

The modern university pedagogic model is based in the industrial model of student mass production and vigors for more than 150 years, this model where the teacher is the broadcaster is becoming obsolete (Tapscott & Williams, 2010a). Under the slogan “Content is King”, the Web 1.0, the first incarnation of the Web, emphasized building and deploying the basic infrastructure for broadcasting simple HTML web pages. But, like Odlyzko foresaw (Odlyzko, 2001), once a network like the Internet reached a large enough size, point-to-point communications soon provided much higher value than broadcast, changing the focus to interconnectivity and not content – Community was now the King (Iiyoshi & Kumar, 2007). The Web 2.0 operated a shift from an industrial information economy to a networked information economy, where individuals can take a more active role and the line between producers and consumers of content is thinner, giving rise to the so-called “prosumer”, decentralized individual action but also cooperative and

coordinated action that do not depends on proprietary strategies (Benkler, 2007). The networked information economy rests on the connections between people and not just upon the formal infrastructure and government services, and these connections carry capital exchange potential, whether of direct goods and services, information, simple friendship, or knowledge-building opportunities. A common practice in the digital economy is to different groups and companies to band together and find collaborative ways to achieve goals, as evidenced by the early success of open source movements (McAuley & Stewart, 2010).

The Web 2.0 that emerged around 2001, emphasizes participation and interaction, resulting in exponentially growing social networking sites (Iiyoshi & Kumar, 2007) like Facebook, Twitter, MySpace or LinkedIn and massive user-generated content published in Wikipedia, YouTube, Flickr, blogs and so on. The current generation of students, commonly referred to as "NetGen" learners, grew up surrounded by this technology and connected in real time interactive experiences. As result, they have little tolerance for delays, non-interactive environments, or lack of current technology and crave stimulation, support, and immediate feedback and have developed a trial-and-error style of experiential learning that has its roots in computer gaming. They also prefer self-paced, any-time-any-place learning environments in lieu of traditional structured classroom pedagogy. Traditional textbook-based accounting pedagogy which relies on textbook readings, one-way lectures, and passive in-class problem-solving are less effective with this current generation of accounting students (Pergola & Walters, 2011), as one Australian principal puts it, *"the teachers are no longer the fountain of knowledge; the Internet is"* (Tapscott, 2009).

But the answer for universities in not simply to expand distance learning offerings, nor giving access to lectures of world's leading professors. With today's technologies it is possible to embrace new collaborative and social models of learning (Tapscott & Williams, 2010a). The premise for social learning is the understanding that "*content is socially constructed through conversations about that content and through grounded interactions, especially with others, around problems or actions*" (Brown & Adler, 2008). The focus is not so much on what it is learned but on how is learned. A study by Richard J. Light, of the Harvard Graduate School of Education, quoted by Brown & Adler (2008), gathered compelling evidence that supports the importance of social learning in higher education. He discovered that one of the strongest determinants of students' success was their ability to form or participate in small study groups. Students who studied in groups were more engaged in their studies, better prepared for class, and learned significantly more than students who worked on their own. Students in these groups can ask questions to clarify areas of uncertainty, improve their grasp of the material by hearing the an-

swers to questions from fellow students, and perhaps most powerfully, can take on the role of teacher to help other group members (Brown & Adler, 2008).

Brown & Adler (2008) say that mastering a field of knowledge involves not only "learning about" the subject matter but also "learning to be" a full participant in that field. This mastery involves acculturating into a community of practice. Historically, apprenticeship programs have provided students with opportunities to observe and then to emulate how experts function. Students start by learning by taking on simple tasks, under the watchful eye of a master, through a process that has been described as "legitimate peripheral participation" and then then progress to more demanding tasks as their skills improve. A contemporary model that exemplifies the power of this type of social learning is provided by the networked communities of practice in which people work together voluntarily to develop and maintain open source software like Linux or Apache or contributing to Wikipedia. In these open environments, both the content and the process by which it is created are equally visible, enabling a new kind of critical reading—that invites the reader to join in the consideration of what information is reliable and/or important (Brown & Adler, 2008). The tools that have emerged from the Web 2.0 such as blogs, wikis, social networks, tagging systems, mashups, and content-sharing sites are examples of a new non-professional user-centric information infrastructure that emphasizes participation (e.g., creating, re-mixing) over presentation, encouraging focused conversation and the formation of an understanding that emerges from action, not passivity (Brown & Adler, 2008).

However, Geser (2012) affirms that today it is clear that much of the content made available by lecturers, teachers and tutors on institutional Virtual Learning Environments (VLEs), with heavy emphasis on a presentational, knowledge transfer approach and a fundamentally conservative approach to design and interactivity, does not stimulate and inform effective learning processes. In fact, if the "NetGen" students increasingly mediate their daily activities through Web-based and mobile communications and are skilful producers and brokers of information, why not challenge them to address coursework using digital tools and media such as creative software, digital cameras, Weblogs, social networking, amongst other? Among the main reasons for this are that the dominant educational paradigm emphasises knowledge transfer, teachers tend to work with too many students, they are not equipped with the right didactics for moderating learner-centred processes, and there exists little experience in assessing and crediting the results of such study work.

The current methods of teaching and learning don't prepare students for the lives that they lead in this fast-paced and changing world and the knowledge acquired during a course is obsolete at the

time they graduate and when their jobs change, we can no longer expect to send them back to school to be retrained. By the time that happens, the domain of inquiry is likely to have morphed yet again (Brown & Adler, 2008). Students and employers who compete in a global economy need the capacity to lifelong learn, to apply research to problem solving, to collaborate and communicate (Tapscott & Williams, 2010a). In fact, students around the world are choosing alternative models of higher education. In 2007, nearly 20 percent of college students in the United States (3.9 million) took an online course and their number are increasing, but the proportion of institutions declaring that online education is critical to their long-term strategy has actually declined (Tapscott & Williams, 2010a). The traditional supply-push mode of building up students' knowledge like a repository must be replaced by a demand-pull learning that enables participation with the focus placed on "learning to be" through communities of practice and collateral learning. The students' motivation in these communities is fuelled by the need to become a member of that community or to learn something. Learning outcomes come from being embedded in a community of practice that may be supported by both a physical and a virtual presence and by collaboration between newcomers and professional practitioners/scholars (Brown & Adler, 2008).

This approach to learning might appear to be extremely resource-intensive, but it is already happening. There is a rapidly growing amount of open courseware, access to powerful instruments, simulation models, and scholarly websites, as well as thousands of niche communities based around specific areas of interest in virtually every field of knowledge. The Web 2.0 is creating the conditions for the emergence of new kinds of open participatory learning ecosystems that supports active learning - Learning 2.0 - that begins with the knowledge and practices acquired in school but it is equally suited for continuous, lifelong that extends beyond formal schooling to fit the needs of a world in constant shift (Brown & Adler, 2008).

2.5 Opening Up the University: OpenCourseWare (OCW) and Open Education Resources (OER)

My view is that in the open-access movement,
we are seeing the early emergence of a meta-university —
a transcendent, accessible, empowering, dynamic, communally
constructed framework of open materials and platforms
on which much of higher education worldwide
can be constructed or enhanced.
(Vest, 2006)

In the history of higher education is recognizable a linkage between pedagogical tradition with new technologies and increasing access to it ("Course Management Systems in the History and Future of Higher Education," 2003). Like Gutenberg's invention, the Web 2.0 enabled a revolution that, in line with the correlation above, challenges fundamental aspects of the current university model. In a world of unprecedented connectivity universities still operate largely as autonomous islands of scholarship and learning, failing to seize the opportunity to use the internet to break down the walls that divide institutions, professors and students (Tapscott & Williams, 2010a).

The growing open access movement reveals the early emergence of a meta-university as described by Vest (2006), in that model the Web will provide the communication infrastructure, and a global open access library of course materials that would speed the propagation of high-quality education and scholarship and give students and teachers everywhere the ability to access and share teaching materials, scholarly publications, and scientific works in progress, including webcasts of real-time science experiments. If this view is correct, the meta-university will enable, not replace, residential campuses, especially in wealthier regions. It will also bring cost-efficiencies to institutions through the shared development of educational materials, which is particularly important to the developing world. According to Taspscott & Williams (2010b), for universities to succeed they need to cooperate at three levels:

1. **Course content co-innovation:** The step after sharing materials is providing to professors and students better tools for gauging the quality of various assets. Professors could form a community around a field of knowledge and exchange teaching strategies and share insights about course materials and students could provide their ratings too. The platform would support the logistics of true collaboration, a social network like Face-

book, but with much deeper forms of collaboration. The next level in collaborative knowledge creation is the actual co-creation of content. Professors can co-innovate new teaching and then share this newly synthesised content in the world. But the teachers would need course software enabling students to interact with the content, supporting small group discussions, enabling testing and so on. These can be developed using tried-and-true techniques and tools of the open-source software movement. The creation of software itself is a product of co-innovation and then the product in turn helps co-innovate content that can be taught to students with tools like wikis and other social media assets. Rather than being simply the recipients of the professors knowledge, the students, with light supervision, could co-create knowledge as a community of learners who are engaged directly in addressing some of the world's most pressing problems.

2. **Course content exchange:** The lowest level of collaborative knowledge production is simple content exchange where universities post their educational material online, putting into the public domain what would have traditionally been considered a proprietary asset and part of a university's competitive advantage in the global market for students.

3. **The collaborative learning connection:** The digital world, which has trained young minds to inquire and collaborate, is challenging not only the lecture-driven teaching traditions of the university but the very notion of a walled-in institution that excludes a large number of people. It is true that students can obviously learn from an intellectuals around the world through books or via the internet. Nevertheless, in a digital world, a student should be able to take a course at another university and universities should use the Internet to create a global center of excellence, choosing its best courses and link them with best at a handful of other institutions around the world in order to create the best programmes. This global academy would also be open to anyone online providing a custom learning experience from a collective syllabi of the world. The cost of building education programmes from scratch can be prohibitively high, but new models of collaborative education can bring greater efficiency and creativity to the efforts to help graduating students and ageing employees update their skills.

Despite the Web 2.0 being among us practically since 2004, the changes described by Tapscott & Williams (2010b) that will move toward the University 2.0 are still far from its full realization. Many in the educational sector such as university deans, school directors, managers of adult and lifelong learning centres, educational programme managers and teachers/tutors are aware that they cannot keep conducting "business as usual". However, the required changes in educational institutions need systematic and sustained action rather than some pilot projects with little tangible impact on the established educational practices. These include educational policies, curricula, teacher education, student assessment and certification schemes, and many other aspects such as limited budgets that hamper change and innovation (Geser, 2012). The old industrial model of education is hard to change but as budgets shrink, an increasingly common approach is open education, a piece of the strategy to build competitive advantage in the global market for students (Tapscott & Williams, 2010a). Even though at basic level of collaboration - course content exchange - the open-access movement is promoting academic publishing in the form of Open Educational Resources (OER), a concept pioneered by the MIT OpenCourseWare (OCW) initiative. The Internet, especially in recent developments of connective and collaborative applications, is a cognitive extension for humanity, offering a model where the production and reproduction of knowledge is separated from physical objects. But our cultural concept of intellectual property comes from a world in which information and authorship derives from creating new things, where copies involved labour and investment. The sharing of course materials made popular by MIT's OCW initiative has its Return on Investment (ROI) related to binding learners to the MIT brand rather than charge them for educational experience. In a reputational economy built on post-scarcity, value lies in the synthesis, presentation and application of ideas rather than their possession (McAuley & Stewart, 2010).

From the point of view of the learners, this openness offers the opportunity to evaluate the quality of course material before deciding on which university to attend, making this way informed decisions as buyers of educational experiences ("The Future of Higher Education: Beyond the Campus," 2010). Nevertheless, open education can be more than a marketing strategy for thriving in a global market, it can drive improvements in teaching and learning around the world (Oblinge, 2012) and help overcome major challenges that limits the access of international students to universal higher education like geographical/economic isolation (Morgan & Carey, 2009). OERs and OCWs have clearly great potential for providing access to knowledge for the global public, including underprivileged isolated students in developed and developing countries who are excluded from higher educational opportunities. But to achieve efficient learning, these

OCWs and OERs must be supplemented with an academic structure that allows students to receive instruction and credit for these courses. Access to OER and OCW outside the constrains of a university is not enough, what recognition and benefits do students gain if universities still require prior achievement for entry, and employers recognize only those achievements made at universities? Since the financial means to pay tuition and to live at foreign institutions of higher learning remains problematic, new models for global access are needed (Morgan & Carey, 2009).

Next we will take a closer look at two facets of the open-access movement: the Open Educational Resources (OER) and the OpenCourseWare (OCW).

2.5.1 Open Education Resources (OER)

> *"If I give you a penny, you will be one penny richer and I'll be one penny poorer. But if I give you an idea, you will have a new idea, but I shall still have it, too."*
>
> Albert Einstein (Geser, 2012)

The Open Education Resources (OER) is a developing world-wide movement that is focused on promoting and enabling open access to digital resources such as content and software-based tools to be used as a means of promoting education and lifelong learning. At the heart of the OER movement "*is the simple and powerful idea that the world's knowledge is a public good and that technology in general and the Worldwide Web in particular provide an extraordinary opportunity for everyone to share, use, and re-use knowledge*" (Geser, 2012). The Open e-Learning Content Observatory Services (OLCOS) project findings show that OER play an important role in teaching and learning, but that it is crucial to also promote innovation in educational practices so that the OERs don't become a means to an end, but a way to help people acquire the knowledge and skills needed to participate fully within the political, economic, social and cultural realms of society. If the prevailing practice of teacher-centred knowledge transfer remains, then OER will have little effect on teaching and learning innovation (Geser, 2012).

UNESCO has defined open content as part of the broader OER movement being "*digitized educational materials and tools freely offered for educators, students and self-learners to use and*

reuse for the purposes of teaching, learning, and research" (Iiyoshi & Kumar, 2007). Others have defined open content and open educational resources differently and more simply, as digital learning objects that can be reused in different learning contexts, deliverable over the Internet to anyone that can access them. But others, especially members of the digital library world, view open content as anything used for educational purposes, usually free, that someone has posted to a managed collection of learning materials and resources (Iiyoshi & Kumar, 2007). But UNESCO notes that "resources" are not limited to content, but comprise "*three major areas of activity: the creation of open source software and development tools, the creation and provision of open course content, and the development of standards and licensing tools. The outputs of all three may be grouped together under the term Open Educational Resources (OER)*" (Geser, 2012). According to Geser (2012), in the lack of an accredited definition, the definition of OER must based on the following core attributes:

- Access to open content (including metadata) is provided free of charge for educational institutions, content services, and the end-users such as teachers, students and lifelong learners;
- The content is liberally licensed for re-use in educational activities, free from restrictions, designed within open content standards and formats;
- Educational systems/tools software is used for which the source code is available (i.e. Open Source software) and that there are open Application Programming Interfaces (open APIs) and authorisations to re-use Web-based services as well as resources (e.g. for educational content RSS feeds).

Due to these principles, repositories of educationally relevant resources often do not fully abide by them, but it is expectable that the adherence to these principles will bring tremendous benefits for education and lifelong learning in a knowledge society (Geser, 2012). For the educational networks (European, national, regional) and institutions, the OER could provide a long-term conceptual framework for alliances in the creation, sharing and quality control of educational resources based on the re-use of open content. This would allow a higher return on investment of taxpayers' money, through better cost-effectiveness and enrich the pool of resources for teaching & learning practices, including resources from public sector information agencies, libraries, museums and other cultural organisations. Another advantage would be the easy access to resources that may otherwise not be accessible by potential user groups, fostering this way lifelong learning and social inclusion. From the point of view of teachers and students, OER can offer a

broader range of materials for teaching and learning, and flexibility in their choice, saving time and effort in the re-use of resources for which Intellectual Property Rights (IPR) / copyright issues have already been resolved. This can promote user-centred approaches in education and lifelong learning, providing tools to set up collaborative learning environments and communities (Geser, 2012).

However, the OLCOS report (Geser, 2012) notes a critical lack of educational innovation for learner-centred and collaborative learning practices and processes. It also reports an educational "content pipeline" made by publishers, who decide upon which tools and content are most useful for certain study purposes instead of the teachers and learners. This commercial educational content, will not usually allow for learning activities such as re-use, modification, and open sharing of new content, becoming this way a hamper in the learning processes that allow the acquiring of key competences and skills for the knowledge-based society. It is also acknowledged that large-scale educational repositories commissioned by ministries of education, are focused in the availability of educational resources centrally relevant to the curriculum, including the content that is licensed from educational publishers. This vision does not depart definitively from the notion of teachers as perpetuators of traditional practices of learning and teaching where are only mediators of prefabricated educational content, an approach that condemns the OER movement to a mere "upgrade" of the delivery of educational content to the digital era, failing to take advantage of the opportunities opened up by new digital tools and services. This is market view that takes open content for products misses the core philosophy behind open content, a set of learning practices and processes, that among other things, need to be openly shared to thrive. Such view blocks innovation in the development of content services that can be used in constructive and collaborative forms of learning and knowledge creation, reducing it to a service in the domain of education that mainly means to be able to search in a database, select, and download the canned products on the desktop. Content is still seen as fixed products such as articles or presentations in PDF format or high-professional software-based products. Such content cannot be easily re-used, edited, repurposed and enriched, which alongside clear licenses is a major requirement of open content practices.

The following table compares the two content paradigms of "canned" versus "open" content:

Table 2.2: The two content paradigms of "canned" versus "open" content (Geser, 2012).

	Canned content	Open content
Basic notion	Courseware, textbook, supplementary material, among others.	Web of various kinds of information resources (including open courseware, etc.)
Role of teacher	Instructor, dispenser of knowledge	Facilitator of learning processes, coach/mentor; learning context manager
Role of learner	Receive, digest and reproduce knowledge	Active learner who develops competences, knowledge and skills
Status of content	Certified educational material, aligned to curriculum	Content as deemed useful by teachers and learners in a certain learning context
Creation/authors	A few professional authors ("high value products")	Many authors, including professional authors, teachers and learners
Copyright	Rigid ("all rights reserved", exceptions for educational purposes)	Open content licenses (e.g. Creative Commons, "some rights reserved")
Content process model	Create, assemble, package and deliver (one to many)	Create, share, re-use, improve and enrich (collaborative)
Context	Removed from learning process (educational content industry; often mono-disciplinary perspective)	Part of enquiry-based learning process, learners engage with real world, "inter-disciplinary" content, and contribute own ideas and study results
Quality control	By subject and instructional experts	By learners and teachers in the learning process (study group, community of practice)
Access	Restricted, registration and authentication	Open access, but some parts of a project may be for "members only"
Services	Database search and download for preparing courses/classes	RSS feeds for thematically relevant content (text, audio, video), peer-to-peer content services, bookmark sharing, discussion fora, social networking, etc.
Learning objects	Static units, low granularity, seldom updated	Evolving units, various granularity of interlinked material, much "micro content" from content feeds, frequent updates
Metadata	IMS Learning Resource Metadata, LOM (often with lacking educational categories) and others	Traces of use by other learners, recommendations, shared content categories (e.g. on Weblogs) and keywords (e.g. in social bookmarking), RSS summary metadata and others
Tools	Typical desktop tools and presentational "electronic classroom" applications	Wikis, Weblogs, RSS feeders & aggregators, etc., plus content acquisition and creativity tools (e.g. digital camera, sound recording in field work, graphics, etc.)
Content management	Institutional Learning Content Management System	Self-managed by individual and groups of learners; e-portfolios to document, reflect, and present learning progress and results

However, the new generation of Web 2.0 tools and services provides opportunities for creating educational "value chains" or "value webs" in which many teachers and students can participate and add value through their own contributions, and therefore, value is defined in educational terms such as enhancements and outcomes of teaching and learning. In such constructivist paradigm, learners and teachers will explore, discuss, and solve problems collaboratively, and share study results with other learning communities. Collaborative learning practices are most likely to allow for such value chains to emerge and progress, because the learning community will use some existing digital content or courseware as a starting point or consult other available content from e-learning repositories or other relevant sources of information. Devine, quoted by Geser (2012), claims that the value chain emerges when "*the process of content creation takes precedence over product. In this context content is ephemeral and apart from a personal project portfolio/archive, what is produced may be of little or no archival value. We should not lose sight of this and the focus on 're-use' should not extinguish opportunities to support this most active form of learning*".

The activities involved in the production, provision and use of open content show important differences from the traditional life cycle of educational content. It is a cycle characterised by a strict separation of tasks in which specialised educational authors and publishers (who hold the copyrights and IPR) produce the content and teachers and learners are only considered as users of the content such as textbook or course material, and left out of the content update, change and addition processes. In open educational practices, it is expected to teachers and students themselves increasingly become producers of content through active and constructive learning processes. According to Geser (2012), such activities include:

- **Manage:** A large part of open digital content will reside in open access repositories, it is important that the metadata of which will be exposed to harvesters and used for searching, alerting and other services. However, open e-learning practices content require that teachers and learners be the managers themselves, hence it is important that the users have available easy-to-use content management tools and acquire skills in effectively managing content.
- **Create:** In collaborative open e-learning practices content is created by many and often distributed groups of authors. These authors are educational and subject experts, teachers and learners who form learning communities (or communities of practice) and share an evolving corpus of content that is relevant for certain open learning practices.

- **Re-use / modify:** Open content should allow for easy re-use and modification based on open content formats and clear licensing agreements. In open educational practices content will often be drawn from different sources for re-use according to different learning goals, designs, contexts, etc. Re-use requires disaggregating the original content and including parts such as texts, links, images, diagrams, etc., in a new piece of content, and often this requires modification of some parts to adapt them for the new learning purpose. All this work can be done more easily if the original content is provided in an open content format, for example a diagram that should be updated with new statistical figures.
- **License:** Licensing must be considered throughout the open content life cycle. Authors who have created new content must provide appropriate information on the copyrights and incorporate a license that imposes very few restrictions regarding re-use (e.g. by attaching a Creative Commons Attribution–NonCommercial–ShareAlike license). On the other hand, authors that re-use content created by others, must check what uses they may legitimately make of the content, and adhere to these when incorporating the content into their product.
- **Search:** Searching for useful content is an important part of the learning process. Hence, the mechanisms that support the search process have an important role to play, and must not be limited to repositories of educational content, but will also include many other sources that may hold useful information.
- **Use:** Teachers and learners will often just use available content as found and judged to be useful. However, as this content will increasingly stem from collaborative learning processes, this may stimulate them to share their results with others.

OE 2.0 projects like Connexions, the British Open University's OpenLearn LabSpace, ISKME's OER Commons, and Wikibooks and Wikiversity have emphasized community building and participation, and admit user-generated content that is continually remixed into new OERs (Iiyoshi & Kumar, 2007). However, the growth in volume of European open e-learning resources has been rather slow due to reasons that relate with the educational fragmentation that derive from the different languages, educational frameworks and aspects of cultural diversity. There is a predominance of material in English, originated from the efforts of countries such as the USA (e.g. MERLOT – Multimedia Educational Resource for Learning and On-Line Teaching), Canada

(EduSource – Canadian Network of Learning Object Repositories), Australia (EdNA Online) and, United Kingdom.

On a global level, we have initiatives like the recent establishment of the Global Learning Objects Brokered Exchange (GLOBE), which is a collaboration of ARIADNE (Europe), Education.au (Australia), eduSource Canada, MERLOT (USA) and NIME (Japan) (Geser, 2012).

2.5.2 OpenCourseWare (OCW)

An OpenCourseWare (OCW) is a free and open digital publication of high quality university-level educational materials – often syllabi, lecture notes, assignments, and exams – organized as courses, under a Creative Commons license (Vladoiu, 2011). The development of the Open Courseware (OCW) movement started in 2001. When online distance-education programs were proliferating, a faculty committee at the Massachusetts Institute of Technology (MIT) recommended that MIT use the Internet not for paid educational programs, but to openly share resources of its full curriculum, using an open license similar to that used by the open and free software movement (Forward, 2012). This initiative made freely available MIT's teaching materials and manuals to teachers and students throughout the world, "*reminding everyone of the democratic and civilizing possibilities inherent in the information age, and our* (their) *desire to fulfil those possibilities by making our information public and free*" (Abelson, 2008). Though, OCW has not aimed to provide full-fledged, for-credit courses online, the course materials have been thought as support instructional materials to be studied as such, or to be combined with student-teacher interaction wherever (Vladoiu, 2011). In 2011, the OCW site reported 127 million visits from 90 million visitors from all over the world (Figure 4).

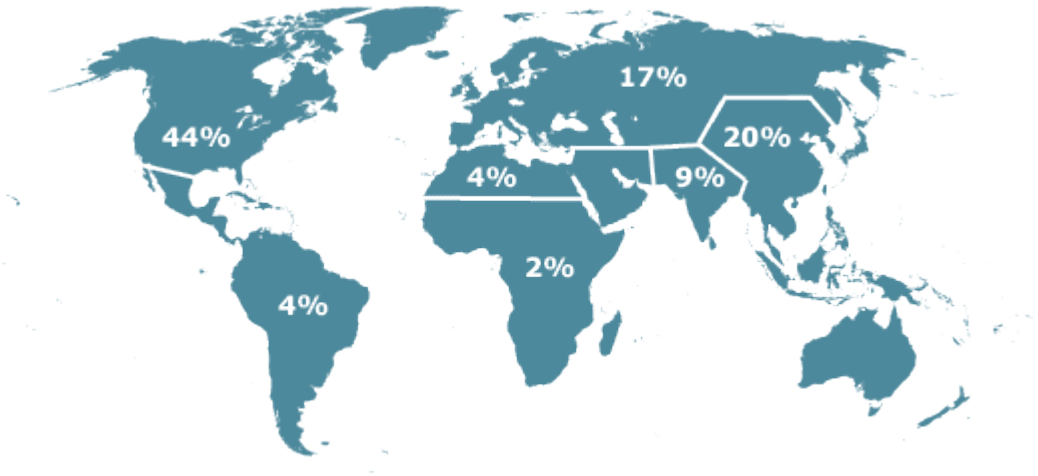

Figure 4: MIT OCW visitors map ("MIT OCW - Site Statistics," 2011)

In terms of OCW usage, the majority of these users are self learners (43%), followed by students (42%), and only 9% of educators (Figure 5). Self learners use it mainly to explore interests outside of their professional field (40%), while students use OCW to enhance their personal knowledge (46%), to complement a current course (34%), or to plan a course of study (16%). The educators use it to improve personal knowledge (31%), learn new teaching methods (23%) or to incorporate OCW materials into a course (20%). In terms of impact, 80% of visitors rate it as extremely positive or positive, 91% expect that level of future impact, while 96% of educators say the site has/will help improve courses and 96% of visitors would recommend the site. The majority of MIT faculty contributes to the OCW project (78%), and most of them have published two or more courses, making a total of 2,083 courses. Only 3% of those participating report subsequent drops in class attendance or inappropriate use of their materials, and 12% have reported unwanted outside contacts. However, 30% of participating faculty report OCW has positively influenced their professional standing, with 19% saying that has publication increased the quality or organization of their materials ("MIT OCW - Site Statistics," 2011). The OCW staff managed to limit the time that faculty members typically spend on getting materials for a course online to under five hours. There is considerable peer pressure at work, some of that movement is driven by faculty members' own competitive pride of looking at what their colleagues work, and some results from students asking faculty members why their courses aren't up (Geser, 2012)

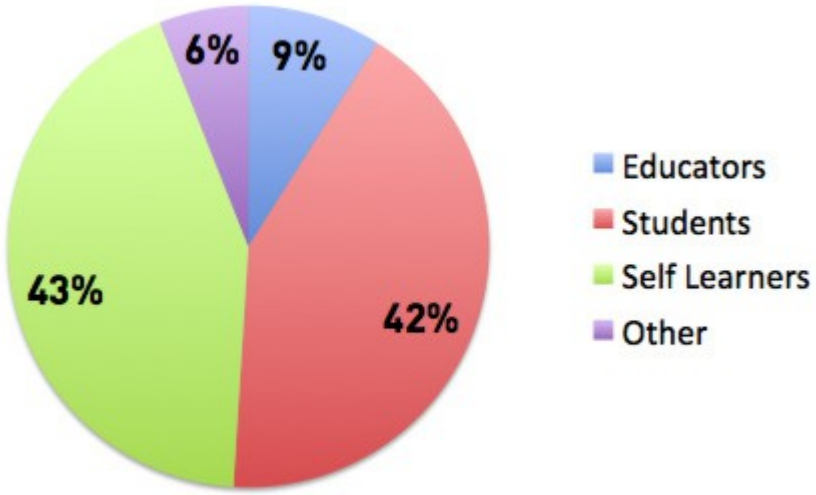

Figure 5: MIT OCW visitors' role ("MIT OCW - Site Statistics," 2011)

The OCW initiative also provided extensive media coverage for the MIT, and report survey results showed that in 2011 31% of their new students were aware of the OCW website prior to making their decision to apply to MIT and, of those, 35% said that the website was a very significant (5%) or significant (30%) influence on their choice of school (Geser, 2012). The 2011 reports corroborate the previous results showing that 27% of freshmen aware of OCW before deciding to attend MIT were influenced by it (*MIT OpenCourseWare's Impact: 2011 Program Evaluation Findings Summary*, 2011), and diverse media mentions from The MIT Tech , Indo-Asian News Service , New York Times , HackEducation.com , Shanghai Daily , among others (*MIT OpenCourseWare's November 2011 Report Summary*, 2011).

Moreover, the OCW movement has seeded the stimuli for creating an ever growing body of available courseware, more than 15,000 courses have been published globally, 86% of them come from other institutions than MIT with 1,018 courses translated in 20 languages and 296 mirror sites globally (*MIT OpenCourseWare's Impact: 2011 Program Evaluation Findings Summary*, 2011). The world main universities created the OCW Consortium (http://www.ocwconsortium.org) engaging more than 250 worldwide universities in advancing OCW sharing and its impact on global educational opportunity (Tovar, 2010). The OCW Consortium's envisions a world in which the desire to learn is met by the opportunity to do it, everywhere in the world, by everyone, by having open access to affordable, educationally and culturally appropriate opportunities to gain whatever knowledge or training they desire ("About the OCW Consortium," 2012). To fulfil this vision the consortium works to coordinate and support those who use, produce, and in-

novate with OCW and OER around the world (Oblinge, 2012). The members of the OCW Consortium are from three categories: institutions of Higher Education, associate consortia, and affiliates (OCW). Most of the OCWC's members come from USA (52 members), Spain (40 members), Japan (27), Taiwan (19) and South Korea (12). Each of the other 45 participating countries is represented by less than 10 members (OCW Consortium Members, 2011) (Vladoiu, 2011). Currently, the search index contains 5,910 courses from 62 sources and 25 languages ("OCW Consortium - Advanced Course Search," 2012). Beside the OCW Consortium, there are also other similar projects like the OCW Universia Consortium, Japan OCW Consortium, Taiwan OCW Consortium and Korea OCW Consortium. The Taiwan OCW Consortium is singular by fact that his self-learning process can lead to an official certification from the university, even for external students, after passing a certification exam, which is also free of any charge (Vladoiu, 2011).

Despite this world-wide adherence to the OCW movement, many educational institutions still ask why they should invest in OCW or OER. Geser (2012) quotes a workshop of the OECD–CERI (2006) survey on OER one argument put forward was "*that if we look 7-10 years back, the same question was asked by many institutions regarding websites. Today it is almost impossible for a well-established institution to be without a good website, even if very few can show that this is a sound economic investment. It was suggested that the same will be true regarding Open Educational Resources in maybe 7-10 years ahead*". Being engaged in OER raises the visibility and esteem of educational institutions, but in the competition for recognition, educational "brands", state-of-the-art websites, quality of resources and services and, in particular, active user communities will be of key importance (Geser, 2012). More innovative approaches in open resources are required, rather than treating OpenCourseWare as just simple online library where users pick and choose what material they want, it could be a platform for users to collaborate, share experiences, and help improve and add to the content over time. For example, from 2,083 MIT OCW courses, only 48 are full video courses, the rest are mostly lecture notes (in PDF) and readings, but the November 2011 report summary showed that the number of YouTube views (1,677,080) exceeded the overall site visits (1,622,614), and the total YouTube views (25,941,423) are superior than .zip downloads (14,187,363) (*MIT OpenCourseWare's November 2011 Report Summary*, 2011). These numbers reveal the users' demand for richer media, video in this case, but each course costs MIT $10,000 to $15,000 to put online, and video content costs about twice as much (Tapscott & Williams, 2010a). The total annual cost of MIT OpenCourseWare is about $3.5 million, where 47% is spent on faculty liaisons, Intellectual Property clear-

ance, publication planning, data entry, video, meta-data, Quality Assurance and editorial ("Free Online Course Materials | Why Donate? | MIT OpenCourseWare," n.d.). Although the MIT OCW access statistics configure a huge success in the dissemination and democratization of knowledge, they come attached with a severe financial downside, a hamper in educational innovation.

Fortunately, the MIT seems to be aware of the need to embrace collaborative learning. To fulfil the MIT's goal for the next decade of reaching a billion minds, the MIT plans to create communities of open learning that goes beyond content, taking advantage of new technologies to ensure people can interact around OCW. It will also place OCW everywhere, making OCW content easy to find and adapt to distribution methods such as mobile phones, and develop new approaches to reaching underserved populations, to meet the needs of people across a wide range of cultures and backgrounds. The educators are also taken into account, and MIT will strive to provide educators everywhere h the tools they need to put OCW materials into their classrooms, so they can share it content with millions of students. It is the aspiration of MIT that, by 2021, open educational resources like MIT OCW be the tools to bridge the global gap between human potential and opportunity, so that motivated people everywhere can improve their lives and change the world ("The Next Decade of Open Sharing: Reaching One Billion Minds," 2011).

2.5.3 Massive Open Online Courses (MOOC)

A Massive Open Online Course (MOOC) is a model for delivering learning content online freely and with no limit on attendance (Siemens, 2011). MOOCs integrate social networking and accessible online resources facilitated by leading practitioners in the field of study and they build on the engagement of learners who self-organize their participation according to learning goals, knowledge and skills. A central web address usually consolidates the registration process, outlines the suggested course schedule, and supports communication. From this point, students may use the central site to consolidate their participation or they may spin it off into other activities, which might include watching videos, posting on discussion boards and blogs, and commenting via social media platforms, having the potential to continue sustainable and relevant personal and professional connections beyond the boundaries of the course itself (McAuley & Stewart, 2010).

The term came into being in 2008, when George Siemens and Stephen Downes co-taught a course, called "Connectivism and Connective Knowledge," was presented to 25 tuition-paying students at the University of Manitoba and offered at the same time to around 2,300 students from the general public who took the online class at no cost (Siemens, 2011). MOOCs have been offered in conjunction with academic institutions and independently by facilitators: to date, topics have remained within the E-learning and educational technologies fields. The MOOC model is a new educational phenomenon, and it has been subjected to little research, but McAuley & Stewart (2010) settled that is defined by:

- High levels of learner control over modes and places of interaction;
- Weekly synchronous sessions with facilitators and guest speakers;
- The daily email newsletter as a regular contact point for course participants, which includes a summary of collaborative activities held by participants as Moodle forums, course participant blogs, Twitter discussions, etc.;
- Uses RSS-harvesting to track blogs of course participants;
- Emphasis on learner autonomy in selecting learning resources and level of participation in activities;
- Emphasis on social systems as means for learners to self-organize and wayfinding through complex subject areas;
- Learners create and share their understanding of the course topics through blogs, concept maps, videos, images, and podcasts, re-centring the course discussion on a more personal basis.

Although MOOCs may share some conventions of an ordinary course, such as a predefined timeline and weekly topics, they generally have no fees or other prerequisites rather than Internet access and interest, so no one who wishes to participate is excluded for reasons of time, geographic location, formal prerequisites or financial hardship. The large scale of the community maximizes the occurrence of the "long tail" effect will enable someone to find people with whom to collaborate. Participation in a MOOC is emergent, fragmented, diffuse, and diverse, with no predefined expectations for participation, the students can participate in any extent and nature according to their individual needs, trough "legitimate peripheral participation" (McAuley & Stewart, 2010). MOOC's flatten hierarchy allows the connection between teachers and

learners, and the students have a significant proportion of responsibility for learning goals and processes, but the facilitators don't have to commit to the impossible task of responding individually to each student's needs. The community negotiates and defines collaborative topics, working networks, and goals, resulting in a network negotiation that is just as important as the topic covered, if not more (McAuley & Stewart, 2010). However, at a conceptual level, people who are most comfortable in a formal environment will likely find the MOOC challenging and may self-limit their own participation, or they may struggle to get beyond a critical position in relation to the course, simply because of the structural lack of fit (McAuley & Stewart, 2010).

Gutenberg permitted content to scale, but today's web permits social interactions to scale, and learning is a social trust-based process. MOOCs are global events, not regional ones in the way that university courses tend to be, and the experience of negotiating knowledge in a network, being able to perform and build reputation online, developing relationships and networks is a key requirement for success in the digital economy (McAuley & Stewart, 2010). MOOCs embody the digital economy in terms of their reputational, relational, and networked operations, in same way social media does. The digital economy is in part a reputational economy, one in which social capital is related with actual monetary value and is a fragile asset centred around the concept of belonging, taking time to build but easily damaged. Reputation and belonging are determined by the scale of attention an entity can gather and is represented by audience, number of followers, and amplification of one's contributions. Authority within social media can be established through traditional credentials but is primarily performative, and will not garner the same attention, capital, or amplification unless it is combined with overt demonstration of knowledge or skill, and also with connection to others (McAuley & Stewart, 2010).

In their beginning, MOOCs had no centralized organizational structure or set of credentials, but recent MOOC university filliated initiatives like Coursera or edX offer paid certificates on completion (Figure 8), with the traditional limitations of credentialism like time constraints. Other initiatives, like Khan Academy or P2PU are also exploring other types of reputation building rather than performance with the implementation of gamification features within their platforms. Gamification is the use of game-like thinking and elements like badges, challenges, leaderboards, and actions to improve motivation. Gamification can motivate students to engage in the classroom, give teachers better tools to guide and reward students, blurring of boundaries between informal and formal learning. However, gamification might absorb teacher resources, or teach students that they should learn only when provided with external rewards. On the other hand, by making play mandatory, it might create rule-based experiences that feel just like the tra-

ditional school, therefore, gamification can't be a panacea (Lee & Hammer, 2011). Nevertheless, other MOOC initiatives, like Udemy, that don't offer formal accreditation or certificate offered on completion may also limit participation, both in terms of people perceiving the course as less worthy, and people sticking with the course but not participating visibly, on the basis of their own individual investment. This leads to higher drop/attrition rates , and the fact that the courses are free, so people are not required to make an extensive financial commitment before embarking. At the same time, MOOC facilitators report that many non-completing learners continue to register, and participate in new offerings. It is assumed within the MOOC environment that completion of all course assignments is neither necessary nor the goal of every student (McAuley & Stewart, 2010).

Table 2.3: Comparison of MOOCs and MOOC-like initiatives (Sonicfoundry, 2012)

MOOC initiatives	Launch	Credential	Taught by	$	Pace	Known for	Early critiques	Backing	Experience
Open Learning Initiative	2001		Carnegie Mellon Univ and others	$ for academic version	Asynch	Instructional design, research on results	Lack of instructor interaction	Hewlett and Gates Foundations, CMU	Custom web
iTunes U	2007	Varies by contributing school	Degree-granting institutions	0	Asynch	iTunes integration, Apps	Limited interactivity/ social tools, podcast focus	Apple	iTunes, Apple, Piazza
Khan Academy	2008	Badges	Khan and others	0	Asynch	Video chunk library, analytics	Not interactive, lacks learner support	Grants including Google and Gates Foundation	Screencasts, video, forums
Udemy	2010		Professors and professionals	Mix	Asynch	Giving instructors monetization option	Affiliate marketing	Venture funds + 30% of paid course sales	Various digital assets
P2PU (Peer to Peer University)	2010	Badges	Anyone, facilitators not instructors	0	Asynch	Peer learning	Guide on the side isn't expert	Mix of university and foundations	Web forums
Udacity	2011	Certificate	Stanford profs	0-$ for certified exam	Synch but self-paced	Stanford experiment turned startup, connect talent with companies	Robot graders, lack of active learning	Venture funds	Short videos, quiz, feedback

MOOC initiatives	Launch	Credential	Taught by	$	Pace	Known for	Early critiques	Backing	Experience
Bonk CourseSites for Blackboard	2011		Curtis J. Bonk, Indiana University	0	Synch	The World is Open author	Blackboard interface	Blackboard	Blackboard, Elluminate
TED-Ed	2012		TED presenters and other authors	0	Asynch, but can be assigned	TED quality, turning videos into lessons	Lack of interactivity	TED, Kohls, YouTube	Video plus lesson plans, quizzes
Coursera	2012	Certificate	Profs from big name schools	$ for cert	Synch but self-paced	Andrew Ng's spinoff from MOOC test at Stanford; peer eval voting	Lack of active learning, instructor interaction; long boring videos	Silicon Valley venture funds	Videos, question ranking
edX (Harvardx and MITx)	2012	Certificate	Harvard and MIT profs	$ for cert	Synch but self-paced	edX open source delivery platform, research outcomes	Essay grading software	$60M from MIT and Harvard	edX open source, videos

Information literacy is privileged and rewarded in social media and specifically in MOOCs, and creative skills are arguably the most critical since innovation is rewarded and participation needs to be performed visibly. Being able to search, evaluate, blend and re-frame multiple information sources into some form of communicable knowledge is necessary. The simple skills of blogging/micro blogging, commenting and engaging in other forms of interactive discourse are key to the initial development of voice online, and the lack of familiarity with these skills will limit participation. When a participant in a MOOC creates an insightful blog post, a video, a concept map, or other resource/artifact it is more likely to get attention than a simple synopsis. The lack of experience with both the software/platforms and the content may be limiting, because MOOCs operate on the assumption that people know how to make them in an appropriate manner. MOOCs are voluntary and participatory, but people new to the experience and the network may not find the level of scaffolding and support they require in order to orient themselves to that type of engagement, because support structures are not formalized. So will a lack of access to the basic tools necessary to participate, specifically a computer and broadband access. Technology ownership and bandwidth present additional barriers, especially for participants from developing countries. Streaming video requires broadband access, and North American participants in rural and remote communities may face bandwidth challenges similar to their African peers. Other challenges still arise with respect to such things as the possession and use of and a

computer with good quality video/graphics card, microphones, webcams, and headsets (McAuley & Stewart, 2010).

Successful participation in a MOOC parallels and scaffolds participation in the larger digital economy. MOOCs exist in a contested cultural space in which business interests infiltrate the web as much as the standardized-skills lobby, and the participatory and even democratic features of social media behaviours are nonetheless tied to the movement of capital, both social and financial. Even though MOOCs are free and open and grounded in the tradition of the open-source movement, they serve an economic purpose, and their viability from an economic perspective is also a challenge (McAuley & Stewart, 2010). Recent initiatives derive from for-profit companies that will be expected to generate money for investors and the other of from a nonprofit that will be expected to stand on its own feet eventually. The Massachusetts Institute of Technology and Harvard University to have committed $60 million to edX, Coursera has raised $16 million in venture funding, and Udacity is funded by an undisclosed infusion from Charles River Ventures. But, by declining to charge for content, instruction and assessment, these providers will have to find new ways to cover their overheads and pay back investors (Kolowich, 2012).

While the current examples of MOOC are interesting, their real potential will be revealed in future generations. The barriers that must be overcome for the MOOC concept (in future generations) to become self-sustaining are (Hill, 2012):

- Developing revenue models to make the concept self-sustaining;
- Delivering valuable signifiers of completion such as credentials, badges or acceptance into accredited programs;
- Providing an experience and perceived value that enables higher course completion rates (most today have less than 10% of registered students actually completing the course);

Authenticating students in a manner to satisfy accrediting institutions or hiring companies that the student identify is actually known.

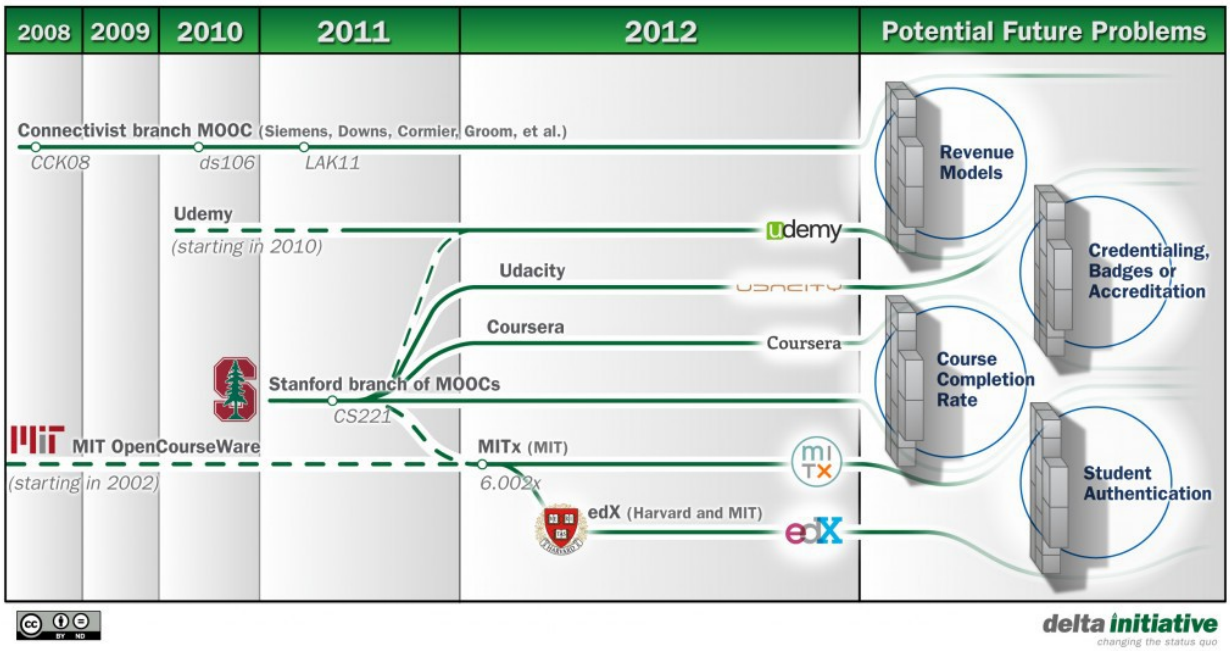

Figure 6: MOOC evolution branches (Hill, 2012)

The two current branches of MOOCs are have different aims and methods, and they are still early prototypes or pilots. The current generation of courses has proven the feasibility of massive online enrolments, but it is based on a form of adult continuing education. The majority of students in the Udacity and Coursera courses analysed were professionals in the software industry, hardly the target audience for those seeking a change in higher education (Hill, 2012). According to Bates (2012), MOOCs are an important development that supports well established tradition of continuing adult education that has been offered by universities since the turn of the 19th century and critically important in the 21st century, but is not well done by most universities. However, MOOCs are more a threat to current university continuing education departments than they are to the traditional credit programs. In recent years, most university departments have been forced to move away from providing a free (or very low cost) public service to adult learners in order to provide profit to support the more formal side of the university. However, MOOCs themselves are highly dependent on students already having a high level of understanding and ability to learn independently, and to think critically. This is exactly what formal education should be doing: developing and fostering such abilities so that learners can participate meaningfully in MOOCs and other forms of self-learning. Therefore, the demand for formal education programs has never been higher, so Bates (2012) doesn't see MOOCs as a replacement for formal education, they are rather playing a different game (Bates, 2012).

But the threat to conventional universities doesn't reside only on the open access to high quality courseware. Beside course publishing, Coursera is also offering placement services for their students, providing a page where students can share their resume and other information with Coursera's partner companies, in order to find matching professional opportunities. According to Lewis (2012), if MOOCs demonstrate the ability to hook students up with employers in a broad and general way this will transform them in true competition to traditional higher education. People pay for college because they see it an investment in their futures that investment pays off when they get better, higher paying jobs. When the job benefits are taken away from college, only a small, elite subset of the population would continue to pay for college, and that subset is far smaller than the number of students that need for the current number of institutes of higher education to survive. If most of the faculty in the US want to actually keep their jobs, they need to also appreciate the fact that they are imparting skills, qualities, and abilities in their students that do help them to get better jobs. If MOOCs can provide similar benefits while costing between nothing and a tiny fraction of the cost of college, they will have a remarkable edge (Lewis, 2012).

2.6 Learning Management Systems (LMS), Personal Learning Environments (PLE) and the Open Learning Network

Back in 1984, Bloom and his colleagues, quoted by (Mott & Wiley, 2009), through a series of comparative studies established that the *average* student instructed individually by a tutor outperformed 98% of students instructed in a conventional classroom setting. This study highlighted the need for formal education decrease the delta between student potential and achievement. In the mid-1990s, innovative faculty members and students at universities throughout the world began thinking about ways to leverage the Internet and the World Wide Web to improve teaching and learning. The result was the creation of a new category of web-based software, the "Course Management System" or CMS, alternatively labelled Learning Management Systems (LMS), and Virtual Learning Environments (VLEs) (Mott, 2010). However, usage patterns suggest that the LMS is primarily a tool set for administrative efficiency (e.g., distribute documents, make assignments, quizzes, discussion boards, assign students to working groups, etc.) rather than a platform for substantive teaching and learning activities. This teacher-centred approach comes despite the best intentions and efforts of all who sought that these systems would trans-

form the dominant learning modality of higher education from traditional, classroom-based instruction to online and hybrid courses (Jon Mott & Wiley, 2009).

Nevertheless, LMSs have dominated the teaching and learning landscape in higher education for the past decade, and thousands of institutions have a standardized, institutional LMS implementation. While the LMS has become a symbol of the higher learning status quo, many students, teachers, instructional technologists, and administrators consider the LMS too inflexible and are turning to the Web 2.0 tools that support their everyday communication, productivity, and collaboration needs that are supplanting the teaching and learning tools previously found only inside the LMS (Mott, 2010). The proponents of open-source LMSs like Moodle and Sakai contend that some LMS options are more flexible and more consistent, with an open, dynamic learning model. And the for-profit LMS companies are rapidly adding what they call "Web 2.0" features to their products, integrating with Facebook, YouTube, and other applications. Mott (2010) claims that LMSs continues to impede significant teaching and learning innovations in three specific ways:

1. LMSs are generally organized around discrete, arbitrary units of time — academic semesters. Courses typically expire and simply vanish, disrupting the continuity and flow of the learning process.
2. LMSs are teacher-centric. Teachers create courses, upload content, initiate threaded discussions, and form groups, and the opportunities for student-initiated learning activities are severely limited.
3. Courses developed and delivered via LMS are limited to those officially enrolled in them. This limitation impairs content sharing across courses, conversations between students.

Some educators argue that the next requirement is a Personal Learning Environment (PLE) that interoperates with an LMS, due to PLE's greater flexibility, portability, adaptability, and openness (Mott, 2010). Generally, a PLE is understood to be managed by the learner, not by an educational institution, and it is an environment of applications on the learner's devices as well as Web-based applications and services, which is used for individual learning and for communication and collaboration with other learners, and for accessing institutional courseware in addition to many other interesting resources (many of which are brought by RSS feeds). An open PLE would include: a personal blog, social networking, social bookmarking, a personal file repository

and online content sharing, access to networked repositories. A part of the PLE would also form an e-portfolio for documenting, reflecting on and presenting learning progress and results (Geser, 2012). PLEs are infinitely configurable to meet individual needs and preferences, they are, "personal". This approach represent a shift away from the model in which students consume information through isolated sources like libraries, textbooks, or LMSs. Through the use of PLEs, users may create their own Personal Learning Networks (PLN) to manage information, create content, and connect with others, and when multiple individuals create PLNs, they benefit from the "network effect," which magnifies their value. But PLEs have its weaknesses too, there are plenty of potential security and reliability concerns. Providing training and support is also more complex and expensive because every learners' PLN is different, compared to LMS' integrated stack of common tools. Additionally, in respect to "free" web-based applications, users have very little leverage with application providers when performance degrades, applications crash, or data is exposed or lost. The following summarizes the relative strengths and weaknesses of LMSs and PLEs, according to Mott (2010):

Table 2.4: Strengths and Weaknesses of the LMS versus PLE (Mott, 2010).

LMS Strengths	**LMS Weaknesses**
Simple, consistent, and structured	As widely implemented, time-bound (courses disappear at the end of the semester)
Integration with student information systems (SISs), with student rosters automatically populated in courses	Teacher, rather than student, centric
Private and secure	Courses walled off from each other and from the wider web, negating the potential of the network effect
Simple and inexpensive to train and support (compared to supporting multiple tools)	Limited opportunities for students to "own" and manage their learning experiences within and across courses
Tight tool integration (such as quiz scores populated in gradebooks)	Rigid, non-modular tools
Supports sophisticated content structuring (sequencing, branching, adaptive release)	Interoperability challenges and difficulties
PLE Strengths	**PLE Weaknesses**
Almost limitless variety and functionality of tools, customizable and adaptable in multiple configurations and variations	Complex and difficult to create for inexperienced students and faculty members
Inexpensive — often composed of free and open source tools	Potential security and data exposure problems
No artificial time boundaries: remains "on" before, during, and after matriculation	Limited institutional control over data
Open to interaction, sharing, and connection without regard to official registration in programs or courses or particular institutions	Absent or unenforceable service-level agreements; no ability to predict or resolve web application performance issues, outages, or even disappearance
Student-centric (each student selects and uses the tools that make sense for their particular needs and circumstances)	Lacks centrally managed and aggregated group rosters (such as class rolls)
Learning content and conversations are compilable via simple technologies like RSS	Difficult and potentially expensive to provide support for multiple tools and their integrations with each other and with institutional systems

Teachers and learners have started moving forward on their own in their efforts to find and use the most appropriate and effective tools outside the LMS. Several institutions are experimenting with blogging platforms, like Wordpress, as an alternative to the traditional LMS, as the University of British Columbia (http://blogs.ubc.ca), the College of Wooster (http://voices.wooster.edu), and the City University of New York (http://commons.gc.cuny.edu). The instructor of one CUNY course claims that the course blog is intended to be an "open LMS," configured to give students both a protected private space, and an open collaborative one (Jonathan Mott, 2010).

In the debate about pedagogy and the future viability of higher education, polarized technology arguments are brewing. On the one hand, the nearly ubiquitous LMS dominates the teacher-centred paradigm. On the other, there is the PLE, a looser, non-institutional collection of tools aggregated by individuals to support their own learning activities. Mott (2010) argues that in an increasingly sophisticated technology environment, we can bring together the best of both the LMS and the PLE paradigms to create a learning platform more ideally suited to teaching and learning in higher education — an "Open Learning Network" (OLN). An OLN is intended to be, at the same time, secure and open, integrated and modular, private and public, and reliable and flexible (Mott, 2010):

1. The OLN is *malleable*: it is modular, flexible, interoperable, and open. The LMS paradigm comprises a single, vertically integrated technology stack with all teaching and learning tools. In contrast, the OLN is *modular*, consisting of stand-alone applications that perform core teaching and learning functions. This makes the OLN *flexible*. Institutions, and even individual faculty members and students can use additional modular tools or replace the default tools with ones more appropriate for their needs. This requires that its modules be *interoperable*, exchanging user information and data without the need for complicated integration projects. Finally, the OLN is *open*. While institutions, faculty members, and students retain control over who can enter and participate in the OLN, there are no technology-driven, artificial barriers to openness.
2. While the LMS succeeded in providing tools for building simple course creation and communication sites for teachers, the technology used first-generation web technologies with proprietary databases, data schemas, and authentication protocols. The OLN is built on web services from the ground up. This facilitates authentication federation and data portability. It also allows for granular authentication and rights management within and across OLN modules.
3. The LMS paradigm assumes that since some data must be kept private and secure, all data must be kept private and secure. The OLN rejects this premise and instead seeks to keep data that must be private and secure as private and secure as possible. All other data — at the option and discretion of teachers and students — can exist in the cloud. Proprietary applications and data such as the student information system (SIS), secure online assessment tools, and a university gradebook should be situated inside the private, secure

university network. Personal publishing space, social networking, and collaboration tools live in the open, flexible cloud.

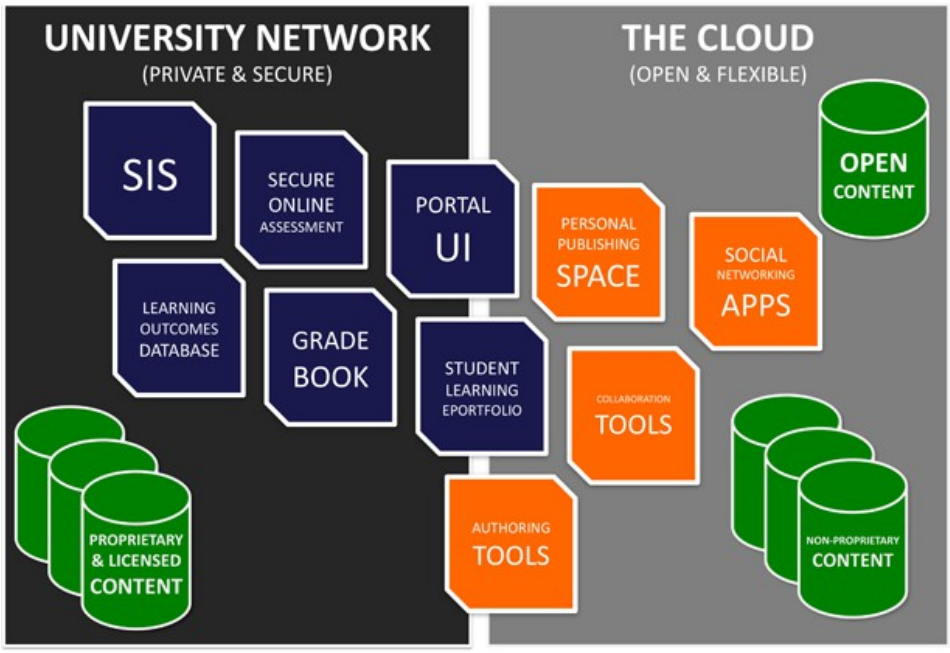

Figure 7: The University Network and the Cloud (Mott, 2010)

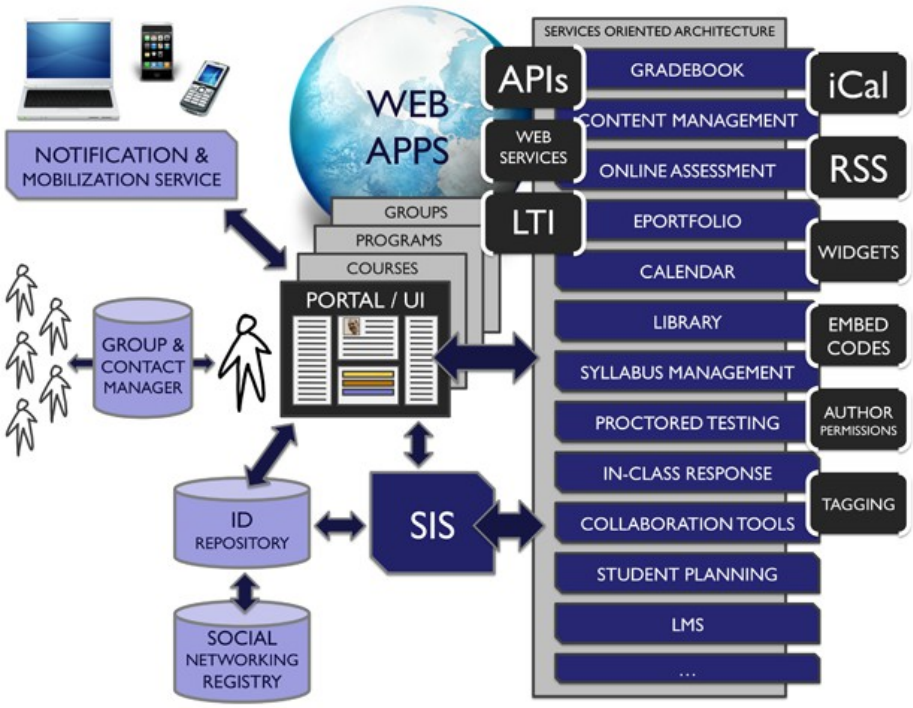

Figure 8: A Full-Featured OLN (Mott, 2011)

Mott's OLN tries to bridge the gap between students potential and learning outcomes but the built-in proprietary and "secure" logic frames his model in the current higher education paradigm of universities operating as islands of scholarship and learning. Tapscott & Williams (2010), on the other hand, argue that for universities to succeed, they need to cooperate, at three levels (as stated before), to launch a Global Network for Higher Learning. Both approaches trap collaborative learning and teaching at a formal and institutional level. Wheeler (2012) refers that informal and self regulated learning are defining characteristics of 21st century education, and various commentators suggest that as much as 70% of learning occurs outside of formal education. These statistics present a major challenge to universities. The self regulation of learning is thought to be a characteristic of individual students and has been shown to improve learning outcomes, enabling learners to achieve their full potential. Collaborative and social networking tools regularly play a role within the average student PLE, giving the sense that technologies encourage learners to be self-determined in their approach to education. All of this happens outside the formal surroundings of university, with no time or location constraints. Hase and Kenyon's (2007), quoted by Wheeler (2012), conceptualise self determined learning - or heutagogy - placing the emphasis on non-linear, self-directed forms of learning, and embraces both formal and informal education contexts. The dogma of heutagogy is that people inherently know how to learn, and the role of formal education is to enable the confidence to develop these skills, encouraging critically evaluate and interpret reality according to own personal skills and competencies. This may be extended to learners' choice to create their own programmes of study, a feature often seen in some Massively Open Online Courses (MOOCs). Heutagogy's focus on 'learning to learn', and sharing rather than hoarding knowledge, place it in the same constructivist paradigm of the OER movement, and likewise, such sharing of knowledge can be easily achieved through social media and the use of personal digital technologies (Wheeler, 2012).

2.7 CMS, LMS and LCMS

Organizations benefit from a variety of applications available to manage courses and learner administration, content, and key organizational information. Finding a way to organize, present, store and efficiently update learning experiences promoted the evolution of three enterprise-wide applications (Irlbeck & Mowat, 2005):

- Content management systems (CMS)

- Learning management systems (LMS)
- Learning content management systems (LCMS)

As more corporations and universities look to reusable learning objects (RLO) to support the capture, control, and management of learning and information, a desirable characteristic would be the capability to store and manage these objects. Designs using RLO allow parts of learning to be reused rather than recreated from scratch each time the content is needed, supporting this way fast, cost-effective development of learning that provides a consistent message while reducing learning maintenance costs. The economies are relentless and it makes no financial sense to produce multiple versions of similar learning objects when the same objects could be shared at a much lower cost per institution. There will be sharing, because no institution producing its own materials could compete with institutions sharing learning materials. The challenge in RLO use is understand how these information "chunks" can be systematically managed for efficient and optimum application within content management systems (Irlbeck & Mowat, 2005).

2.7.1 Content Management System (CMS)

Content management systems (CMS) are data repositories that may also contain authoring, sequencing, and content aggregation tools, with an objective to simplify the creation and administration of online content. Originally developed and used by the newspaper industry and adapted in the mid-1990s to manage large volumes of content required for robust websites. CMS incorporate a workflow process and manage information based on search and retrieval criteria, and support the creation and reuse of content (like RLO p.e.). The focus of a CMS is to provide centralized storage for small information chunks for easy retrieval, revision and distribution. Content is created in a format that is compatible with the content repository system and a digital presentation format enables the users to search and view the content chunks (Irlbeck & Mowat, 2005). CMS's support educative or academic courses, allowing the instructor to create a course website, where documents can be uploaded in popular formats without having to convert them to a web format such as HTML. Basically a CMS is a collection of procedures used to describe processes in an environment that requires collaboration between different actors, managing the following procedures (Ninoriya, 2011):

- Data access, based on user roles;
- Collecting and sharing information;
- Data storage assistance;
- Content redundancy check;
- Reporting.

The CMS stores and manages the content, but does not analyse, organize, or distil content into knowledge. Those tasks are the function of a Learning Management System (LMS) and/or Learning Content Management System (LCMS) (Irlbeck & Mowat, 2005).

In terms of CMS software solutions, according to W3Techs (www.w3techs.com) the three most popular platforms are Wordpress (17.2% of all the websites and market share of 54.8%), Joomla! (2.8% of all the websites and market share of 8.9%) and Drupal (2.2% of all the websites and market share of 7.0%) and 68.6% of the websites use none of the CMS monitored by W3Techs.

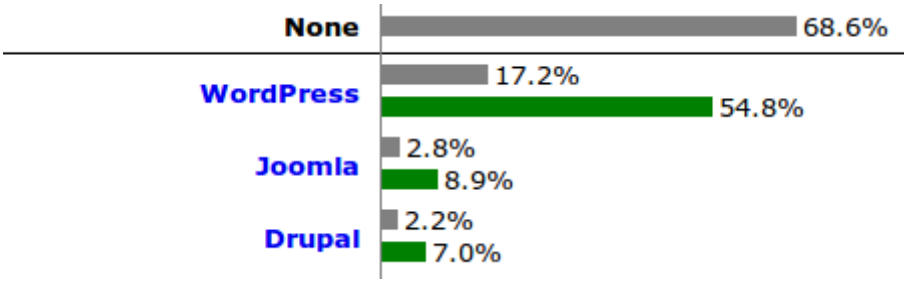

Figure 9: Usage of content management systems for websites ("Usage Statistics and Market Share of Content Management Systems for Websites," 2012)

When analysing the CMS distribution according to website traffic at BuiltWith (www.builtwith.-com), Drupal takes Joomla's place amongst the Top 100.000 visited sites (Figure 11), a prevailing and rising trend in the Top 10.000 visited sites. BuiltWith considers that the top 10k the websites which may be more readily updated to latest technologies than others and therefore set a benchmark for the rest of the web ("Frequently Asked Questions," 2012).

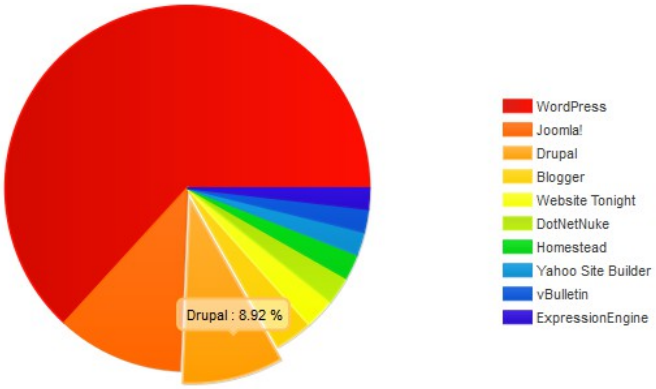

Figure 10: CMS Distribution in Top Million Sites ("CMS Technology Web Usage Statistics," 2012)

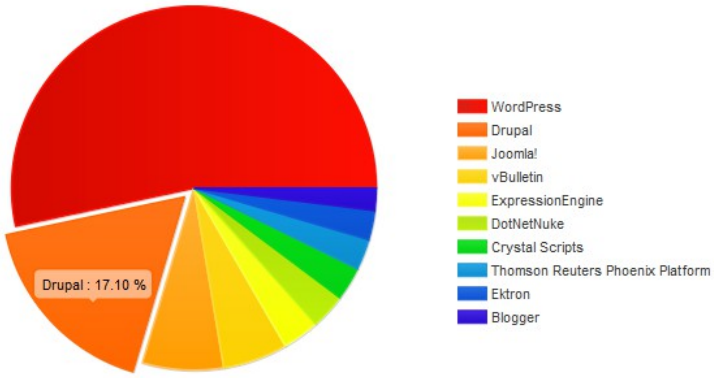

Figure 11: CMS Distribution in Top 100.000 Sites ("CMS Technology Web Usage Statistics," 2012)

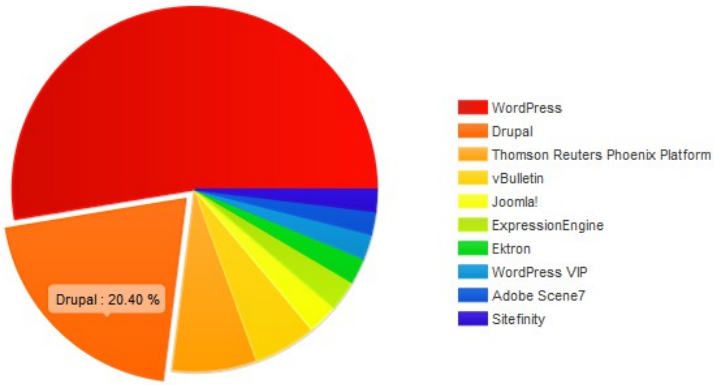

Figure 12: CMS Distribution in Top 10.000 Sites ("CMS Technology Web Usage Statistics," 2012)

All three solutions are open-source software, each developed and maintained by a community of thousands. Wordpress seems to be the best choice for a simple blog or brochure-type site, it is very friendly for non-developers, but an also a flexible platform capable of very complex sites. For a complex, highly customized site requiring scalability and complex content organization, Drupal might be the best choice, and for something in between that has an easier learning curve, Joomla may be the answer ("CMS Comparison: Drupal, Joomla and Wordpress | Knowledge Center | Rackspace Hosting," 2012).

The next table sums up the main differences of these top content management systems:

Table 2.5: CMS comparison: Drupal, Joomla! and Wordpress ("CMS Comparison: Drupal, Joomla and Wordpress | Knowledge Center | Rackspace Hosting," 2012)

	Drupal	Joomla!	Wordpress
Homepage	www.drupal.org	www.joomla.org	www.wordpress.org
About	Drupal is a powerful, developer-friendly tool for building complex sites. Like most powerful tools, it requires some expertise and experience to operate.	Joomla offers middle ground between the developer-oriented, extensive capabilities of Drupal and user-friendly but more complex site development options than Wordpress offers.	Wordpress began as an innovative, easy-to-use blogging platform. With an ever-increasing repertoire of themes, plugins and widgets, this CMS is widely used for other website formats also.
Ease of Use	Drupal requires the most technical expertise of the three CMSs. However, it also is capable of producing the most advanced sites. With each release, it is becoming easier to use. If you're unable to commit to learning the software or can't hire someone who knows it, it may not be the best choice.	Less complex than Drupal, more complex than Wordpress. Relatively uncomplicated installation and setup. With a relatively small investment of effort into understanding Joomla's structure and terminology, you have the ability to create fairly complex sites.	Technical experience is not necessary; it's intuitive and easy to get a simple site set up quickly. It's easy to paste text from a Microsoft Word document into a Wordpress site, but not into Joomla and Drupal sites.
Features	Known for its powerful taxonomy and ability to tag, categorize and organize complex content.	Designed to perform as a community platform, with strong social networking features.	Ease of use is a key benefit for experts and novices alike. It's powerful enough for web developers or designers to efficiently build sites for clients; then, with minimal instruction, clients can take over the site management. Known for an extensive selection of themes. Very user-friendly with great support and tutorials, making it great for non-technical users to quickly deploy fairly simple sites.
Best Use Cases	For complex, advanced and versatile sites; for sites that require complex data organization; for community platform sites with multiple users; for online stores	Joomla allows you to build a site with more content and structure flexibility than Wordpress offers, but still with fairly easy, intuitive usage. Supports E-commerce, social networking and more.	Ideal for fairly simple web sites, such as everyday blogging and news sites; and anyone looking for an easy-to-manage site. Add-ons make it easy to expand the functionality of the site.

2.7.2 Learning Management Systems (LMS)

A Learning Management System (LMS), also called a virtual learning environment (VLE), is software that enables course sites to be created (Meishar-Tal, Kurtz, & Pieterse, 2012). While the goal of a CMS is to store and distribute content, the goal of a learning management system (LMS) is to simplify the administration of learning/training. LMS integrate (Irlbeck & Mowat, 2005). The course environment is typically managed by the educator, that has the authorization to upload content to the site, organize the course materials, open discussion groups, and manage newsgroups. The educator can view reports of the users' activities and receive students' work in order to assess it, and in many LMSs the system is linked to other administrative systems in the organization, such as the registration system, payments system, and so on. Students registered for the course can view the content and download it, but usually have more limited permissions than educators. They can take part in interactive activities like in forums and may also contribute content to specific parts of the site, such as wikis or collaborative repositories defined by the course manager. Different LMS have different user interfaces and features, however, they all share three key functions (Meishar-Tal et al., 2012):

1. **Content management system:** Allowing the creation or uploading of a variety of content items, such as texts, presentations, scanned articles, and audio-visual materials. The content management system also enables the material to be organized in a structure planned by the course administrator, creating folders for topics and content.
2. **Tools for managing interactions:** Different LMS allow the instructor to open different forums. Some systems allow the opening of asynchronous spaces for collaboration, such as wikis and blogs, and some can provide synchronous communication using chat and other online conferencing tools.
3. **Tools for managing and assessing learners:** Some systems provide administrative tools for recording tasks, grades, and feedback, providing user reports that support the instructor in measuring the level of the learners' participation and in assessing the students' achievements.

An LMS should provide a space where learning can take place independently of the instructor's presence, and the students must cope with the content and the tasks themselves, providing a social space aimed to create interaction between learners, and encouraging motivation for learning, mutual support among students and constructive learning (Meishar-Tal et al., 2012). Nevertheless, studies exploring the use of LMSs in higher education show that the use of these systems is usually limited. Only a minority of instructors are using these environments in innovative ways and many professors make only a basic use of them, uploading teaching materials, publishing one-way messaging to students and using a multiple-choice questionnaire without the incorporation of alternative assessment. These findings suggest that an LMS does not in itself produce new models of teaching and learning, their organizing principal is actually the traditional centralized and hierarchical structure, preventing the innovative and cutting edge pedagogy to appear in these environments. Moreover, LMSs are very expensive systems, even the so-called "free" open source systems require adaptation and ongoing maintenance by skilled technical staff.

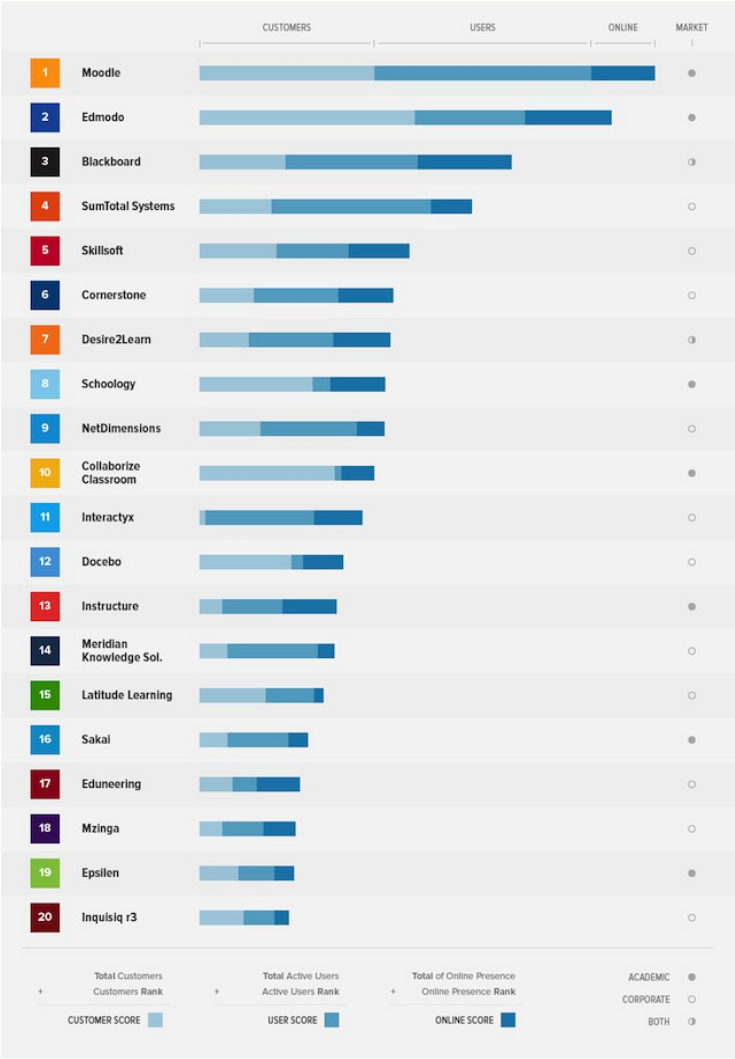

Figure 13: Top 20 LMS software solutions ("Trends | Infographic: Top 20 LMS for Education | edtechdigest.com," 2012)

Both open source and commercial LMS exist. The commercial packages currently available include Blackboard, WebCT, and Desire2Learn, on the open source side we have solutions such as Moodle and Sakai. In terms of adoption, the LMS market share change according to source. The Campus Computing project revealed that US institutions prefer Blackboard/WebCT (Figure 13) while CAPTERRA reports a more complex scenario with Moodle and EdmodoEdmodo as most popular solutions (Figure 14) amongst academics.

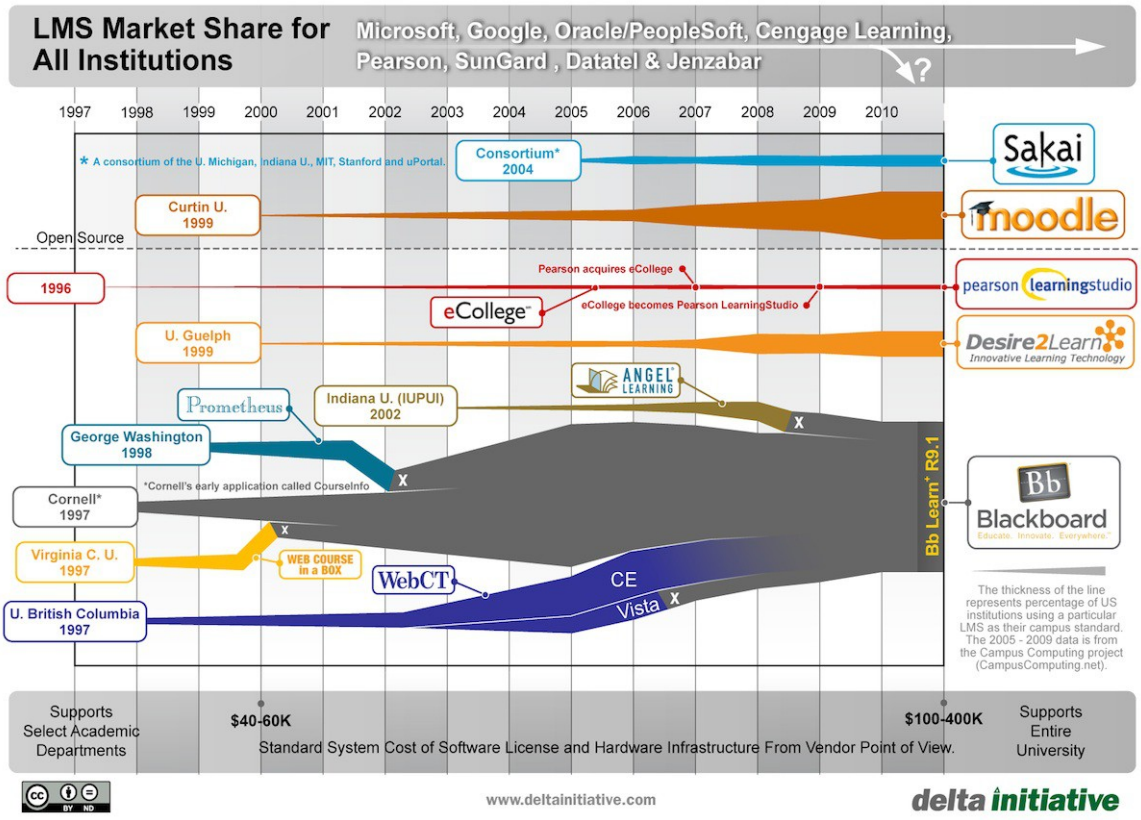

Figure 14: LMS Market Share for US institutions (2005-2009) (Hill, 2011)

2.7.3 Learning Content Management System (LCMS)

Learning Content Management System represents a multi-user environment where learning developers can create, store, reuse, manage and deliver digital learning content from a central object repository (Jurubescu, 2008). The terms LMS and LCMS are not mutually exclusive and most LCMS provide basic LMS functionality, and many LMS include some aspects of CMS as well. The LCMS enable an organization to organize courseware without programming expertise, providing a database called a learning object repository that will save courses as learning objects, which can be later modified and reused, workflow information, course authoring capability, collaboration tools to enable course authors and learners to work together, and ways to create and administer tests and quizzes (Jurubescu, 2008). LCMS are based on a reusable learning object model allowing content to be reused within or across courses or programs. RLO are assembled into learning chunks or accessed as individual pieces of information or instruction and delivered to the learner. LCMS are particularly suited to handling large amounts of content for e-learning

efforts but were not created with the intention of replacing LMS, they can be complementary and each solves a uniquely different challenge (Irlbeck & Mowat, 2005).

In terms of LCMS software solutions, each product is unique and is not easily categorized and any attempt to categorize things, it is a rather artificial distinction. LMS's designed to serve the education market like Blackboard, Desire2Learn and Moodle are actually more like LCMS's because they provide course authoring tools and some content management and come equipped with communication tools like e-mail, discussion groups, and even wikis and blogs. This is because in education, the model is that an instructor builds the course and then is available by e-mail while students take the course as in the corporate environment, the emphasis has been more on asynchronous, self-directed courseware and there is usually no "instructor" available (McIntosh, 2007).

2.7.4 Comparing applications

Each of the three categories of applications increases the amount of information available to decision makers, and all have individual capabilities that make them appropriate for specific situations, but all should meet certain criteria including (Irlbeck & Mowat, 2005):

- Authoring tool neutrality, meaning that content can be authored using any tool;
- Vendor neutrality, meaning that the application can manage content authored by any vendor;
- Browser neutrality, meaning that the application must appear and function the same no matter what browser is being used;
- Platform neutrality, meaning that the application can run on any platform (PC, MAC, etc.) with any operating system (Windows, Linux, among others);
- Scalability, meaning that the application can scale larger or smaller to meet the organization's needs;
- Provides security to organization's internal systems by blocking unauthorized access;
- Includes an intuitive interface.

The following table is a compilation of possible features and impact learners, content presentation, competencies, delivery assessment, and integration with other applications in the organization (Irlbeck & Mowat, 2005).

Table 2.6: Features of CMS, LMS and LCMS (Irlbeck & Mowat, 2005)

Feature	**Functionality**		
	CMS	**LMS**	**LCMS**
Manage Learners		R	L
Manage Content	R		R
Create Content	L		R
Manages Instructor-led Sessions		R	
Course Catalogue		R	L
Registration System		R	L
Competency Management		R	L
Launch and Track eLearning		R	L
Assessment Creation, Evaluation and Feedback		R	R
Searchable Library of Reusable Content	R		R
Collaboration / Synchronous Learning Tools		L	R
Integration with Human Resources Applications		R	
Locate and Deliver Specific Content to a Learner	R		R

R = Robust Functionality

L = Limited Functionality

3 The Open Education Ecosystem

3.1.1 OpenCourseWare (OCW)

The current chapter presents the state of the art in OpenCourseWare (OCW) website publishing. The OCW website comparison table (Appendix A) results from the analysis made of the OCW websites featured in the OCW Consortim page ("OCW Consortium - OpenCourseWare Websites," 2012) and Open Yale website (that doesn't belong to the OCW Consortium but was included due to its relevance), making a total of 55 analysed websites. The present study doesn't pretend to be an extensive state of the art of the subject, as the OCW Consortium gathers 5,910 courses, an exhaustive approach would fall out of this thesis focus.

In order to understand the main features in OCW website publishing, we've established our analysis according to the following items and criteria:

- **Course structure:** In this item we've tried to understand the key elements underlying the OCW course publishing;
- **Media:** The media type in which the content is published provides the information to perceive if the content is treated as canned, fixed products like Geser (2012) discerns;
- **Social activities and networks:** The presence of social tools and networks will help to understand if the educational content is following Geser (2012) premisses of open content;
- **Technology:** Determining what course management systems are in use is important to realize the impact on content strategy, and the infrastructure required to collect, build, and manage course content ("OCW Consortium Toolkit: Technology," 2012). To know the technology in use, it was used Chrome Sniffer extension (www.nqbao.com/chrome-sniffer) for Google Chrome that allows a web developer to inspect a web framework / CMS on current browsing website. The extension displays an icon that indicates the frameworks, and detects more than 100 popular CMS. The extension doesn't detect Sakai, one of the CMS featured in the OCW platform comparison ("OCW Consortium Platform Comparison," 2012) but its use is confirmed in two universities (Cañero, 2009).

In terms of course structure, due to high nomenclature dispersion across the visited sites and better statistic data treatment, we had to group terms according to similarity (e.g. schedule and course plan filed as calendar) and managed to narrow the key elements to the ones present in Chart 1:

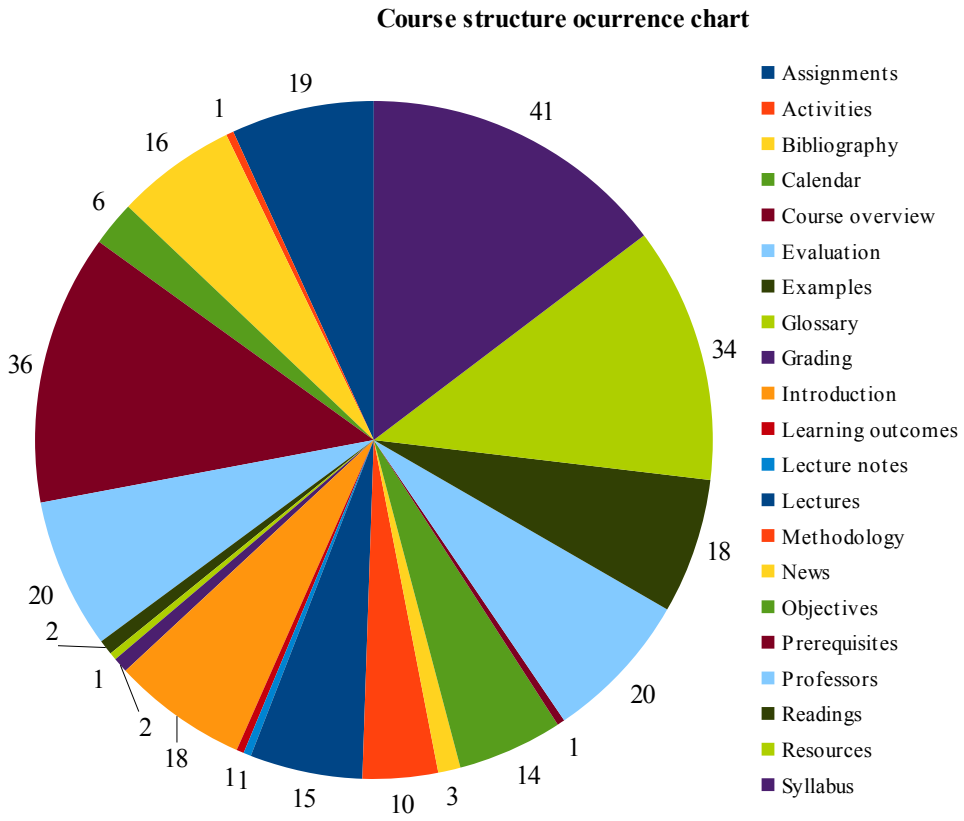

Chart 1: Course structure ocurrence chart

The numbers in Chart 1 represent the quantity of occurrences for that structural item. Analysing course structure it is recognizable a traditional courseware publishing with many "canned" content characteristics. Dynamic items like "News" appear in a very low frequency, revealing a publishing model where the courseware is a static entity, with content created, assembled, packaged, delivered in low-granular units, seldom updated, and available for database search and download.

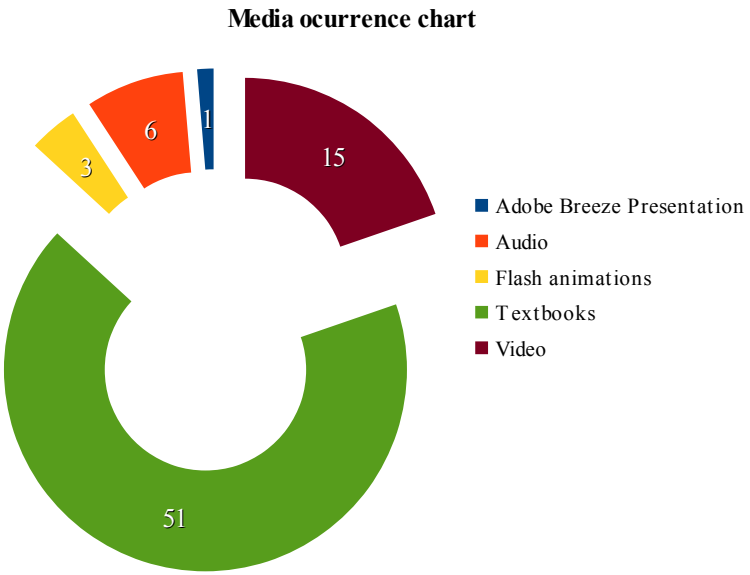

Chart 2: Media occurrence chart

The data from Chart 1suggests an administrative LMS like style of publishing, as described by Mott (2010), directed to educational content delivery as we can see in Chart 2, where the numbers represent the quantity of occurrences for media type, that shows a predominance of textbooks as media content-sharing type, in detriment of richer media as video.

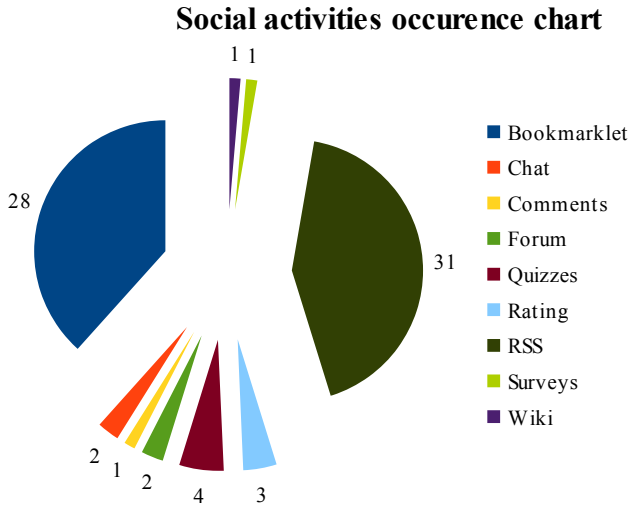

Chart 3: Social activities occurence chart

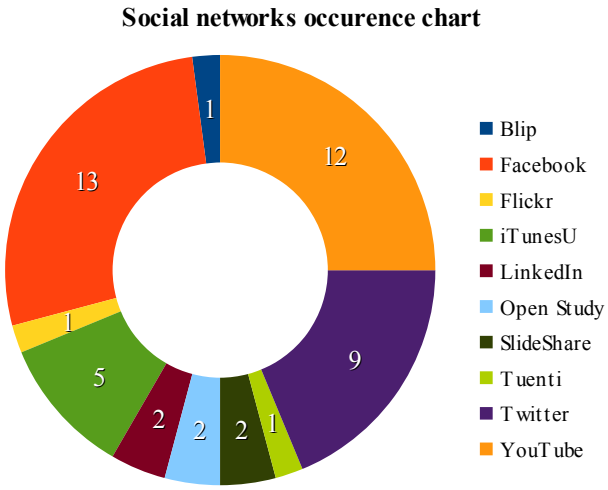

Chart 4: Social networks occurence chart

Regarding the social tools, Chart 3, where the numbers represent the quantity of occurrences for the referred social networks, indicates a weak engagement in collaborative teaching and learning practices, like forums, chats, wikis, surveys or quizzes. Following this tendency, there is also a very low level of quality control through user feedback as we can perceive from the reduced implementation of rating widgets and user comments. In Chart 4, we can follow this trend in terms of social networks, with only 18 out of 55 institutions using social networks and most of this usage is related to institutional marketing, through the presence in Facebook and Twitter, rather than to support collaborative activities or students, although there are some few exceptions referring to the use of Open Study or YouTube p.e.

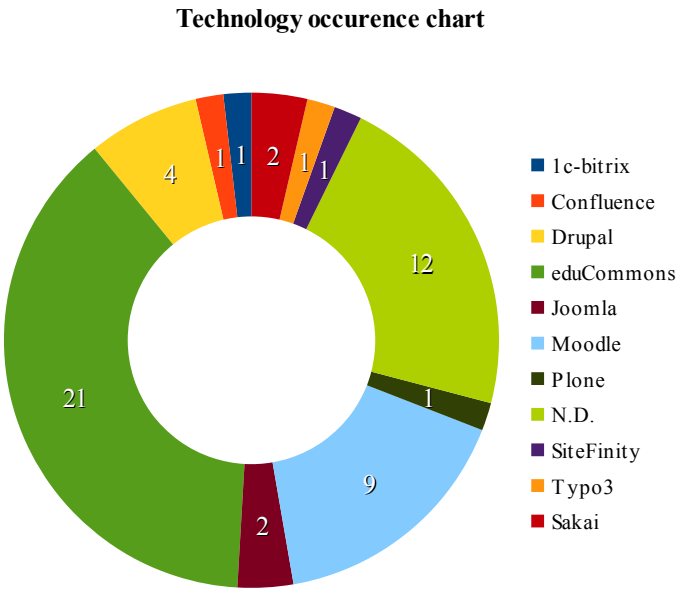

Chart 5: Technology occurence chart

In the technology occurrence chart (Chart 5), we can observe that more than half of the websites uses eduCommons (21), a derivative from Plone like MIT's OCW CMS, or Moodle (9). These results may be explained by the fact that the OCW Consortium's Technology Working Group has been collaborating to develop some conventions and standards to foster greater cooperation and interoperability amongst OCW participants, being the eduCommons platform amongst the suggested open source tools featured in OCW Consortium comparison table ("OCW Consortium Platform Comparison," 2012), as well as Moodle and Sakai. In 12 cases, signalled as N.D., the Chrome Sniffer extension didn't detected the framework, which it could indicate the presence of proprietary software of CMS out of the range of the 100 CMS's detected by the extension. The dispersion in terms of type of technology adopted may depend from institution's different publishing goals, system infrastructure on campus, publication processes, timelines for publication, number of end users and their geographical distribution, and budgets, among other factors ("OCW Consortium Toolkit: Technology," 2012).

Although some institutions use robust LMS's like Moodle and Sakai, the social activities analysis reveals that, in most cases, the tools to support the management of learning and tracking results are stripped from the websites, functioning basically like a CMS aimed to content delivery.

3.1.2 Massive Open Online Courses (MOOC)

The current chapter presents the state of the art in Massive Open Online Courses (MOOC) initiatives. The items and criteria are equal to the ones followed in the above OCW analysis for the same reasons. The MOOC initiative comparison table (Table 6) was built upon the registering and enrolment on courses from the different initiatives websites'. Again, it is not an extensive study but rather an overall view of the current MOOC ecosystem.

Table 3.1: MOOC initiative website comparison table

MOOC Initiative	Course Structure	Media	Social activities	Social networks	Technology
Open Learning Initiative oli.web.cmu.edu	Courses Syllabus Outline MyCourses MyScores	Video Textbooks	RSS Bookmarklet Quizzes Gradebook User accounts	Facebook Twitter YouTube LinkedIn	N.D.
Khan Academy www.khanacademy.org	Fields of study Topics	Video	User accounts E-mail subscription Bookmarklet Quizzes Gradebook ePortfolio Questions Comments Userpoints Forum Student management Class reports Student coach	Facebook Twitter YouTube Reddit	N.D.
Udemy www.udemy.com	Courses Curriculum Sections Lectures	Video Audio Presentation Document Text Mashup	User accounts Learning feed MyCourses User messages User notes Follow users Library Create course Course promotion Rating Announcements Bookmarklet Questions Quizzes Gradebook ePortfolio Questions	Facebook Twitter YouTube Vimeo Slideshare	N.D.

MOOC Initiative	Course Structure	Media	Social activities	Social networks	Technology
			Comments Userpoints Forum Student management Class reports		
P2PU (Peer to Peer University) p2pu.org	Schools Courses Study Groups Challenges Tasks	User defined (WYSIWYG editor)	User accounts Tasks Create and clone course, study groups and challenges Mentors Bookmarklet Activity wall Follow users User messages Chat Discussions	Facebook Twitter	N.D.
Udacity www.udacity.com	Courses Overview Syllabus Classroom Discussion Wiki Announcements Progress	Video	Bookmarklet User accounts MyCourses Forum Quizzes Wiki	Facebook Twitter YouTube	N.D.
TED-Ed ed.ted.com	Series or Subjects Lessons	Video	Bookmarklet Questions Flip lesson User accounts	Facebook Twitter YouTube	N.D.
Coursera coursera.org	Courses Announcements Pre-Course Survey Syllabus Schedule Grading Policy Video Lectures Discussion Forums Quizzes Online Library Faculty Join a Meetup Course Wiki	Video Slides	User accounts Announcements MyCourses Course records Placement services Progress Library Bookmarklet Quizzes Gradebook ePortfolio Forum	Google Forms Meetup Facebook LinkedIn Git Twitter Google Plus	N.D.
EdX www.edx.org	Courses Course info Courseware Textbook Discussion Wiki Progress	Video Textbooks	User accounts News MyCourses Course records Progress Bookmarklet Quizzes Gradebook ePortfolio	Facebook Twitter Google Plus YouTube	N.D.

MOOC Initiative	Course Structure	Media	Social activities	Social networks	Technology
			Forum		
Class2Go class.stanford.edu	Courses Course Materials Forum Video	Video Slides Spreadsheets	User accounts MyCourses Announcements Progress Quizzes Gradebook ePortfolio Forum	Piazza Facebook Twitter Google Plus YouTube	Class2Go

In terms of course structure, all MOOC's develop around the classic course structure, subdivided in lectures. Exceptions to this are Khan Academy and TED-Ed who reveal a less hierarchical approach, elaborating around fields of study and topics, and series or subjects and lessons, respectively. Another exception is P2PU, who encloses content around 6 predetermined Schools and introduces gamification (Lee & Hammer, 2011) items in structure like challenges and tasks.

Regarding media types involved, there is a strong investment in video lectures/lessons and all initiatives present more or less complex built-in video players, except P2PU that only has a WYSIWYG editor for content building. Khan Academy, Coursera and EdX have even video subtitles, with Khan Academy and Coursera sharing their translating effort with the community.

The social activities engaged in the different initiatives reveal a LMS like approach, providing the tools to learning management and tracking results, but still in a teacher-centred paradigm. In all cases, students have complete user accounts linked to ePortfolios to track their learning progress with gradebooks or manage their participation in the platform, can get help on their study and feedback through course forums, questions and comments, and contribute to the course knowledge base via wikis. Udemy and P2PU, not being providers of educational content from other institutions, take a closer stance in collaborative learning and teaching, and have a LCMS approach on content. They enable users to create their own courses and content, collaboratively if they wish, with Udemy providing users the option to reuse their learning objects previously uploaded. In fact, these two initiatives have a basic features of social networks like the functionalities to send messages to users or to follow their activity, while the other MOOC initiatives seem have a more individual approach to learning. Another relevant social feature is the Coursera's Placement Services, which we already stated above. On the teachers side, all platforms provide students learning assessment mainly through quizzes and gradebooks.

Relating social networks, all platforms are with bookmarklets for sharing within content mainly in Facebook, Twitter and Google Plus, with Udemy having an app that integrates with Facebook users' profile. For content publishing, YouTube and Vimeo are used for video broadcasting, while Slideshare is used in Udemy for slides, and Google Forms in Coursera, for some surveys. On Coursera's Placement Services there is also the option for users to reveal their LinkedIn and Git accounts, being the last one clearly aimed for the software industry learners. On Class2Go the forum functionalities are outsourced to Piazza, while in Coursera are transferred to Meetup.

On technology matters, none of the MOOC initiatives have a platform recognized by Chrome Sniffer extension. Class2Go uses an open source platform developed by Stanford university that is currently available in GitHub. According to MIT News, EdX plans to release its learning platform as open-source software so that anyone around the world can adopt and improve this shared tool but the timing of the release has not yet been determined .

4 Solution Design

4.1 Conceptual Model

As stated before, Taspscott & Williams (2010b) argue that for universities to succeed they need to cooperate at three levels to create an a Global Network for Higher Learning. The first level is course content exchange where universities post their educational material online. The next level is course content co-innovation, where teachers and students collaborate to build course content in a social network platform. And for last, in a collaborative learning connection open to anyone online, where a student should be able to take a course at another university and universities should use the Internet to create a global center of excellence, bringing greater efficiency and creativity to the efforts to help graduating students and aging employees update their skills.

Some of actual MOOC initiatives share a few of the characteristics envisioned by Tapscott and Williams, but as they derive from individual initiatives, being institutional or corporate related, they fail in the creation of a real network for collaborative teaching and learning, being still in a teacher-centred paradigm. In addition, this MOOC initiatives seem to be oriented to adult education, as said by Bates (2012), and confirmed by Coursera's audience (Hill, 2012). This orientation is revealed in their course (or topic) centred structures, focused on present learning, ignoring that higher education is not only made at course tier, but also at programme level, a broader context that represents the students' learning journey. At this time, MOOCs are eroding the boundaries between formal and non formal education. On one side, we have universities, formal education institutions, providing non formal education but certainly aiming for formality (Coursera, as stated above, is passing certificates and working on placement services). On the other side, we have corporate initiatives like Udemy providing support for paid course publishing, and teaming with top professors, entering this way in direct competition with formal higher education institutions (“Udemy Unveils Five Top Teachers Making Six Figures Per Year On Open Online Courses | WiredAcademic,” 2012).

In response to this scenario, the conceptual model takes the concept of meta-university, created by Vest (2006), to propose a Global Network for Higher Learning (Taspscott & Williams, 2010b) a collaborative network of meta-universities – Metaversia. To create a meta-university, or metaversity, we have to add two extra tiers to the traditional course – programmes and metaversity. Therefore, we will have metaversities with programmes, in which we have courses with lectures inside.

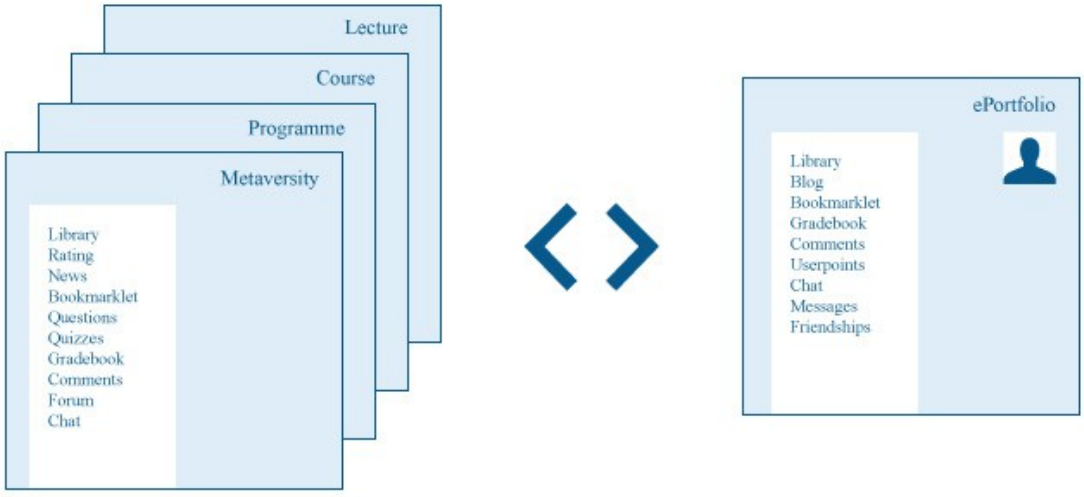

Figure 15: Metaversia's main structure and features

In order to harness both the formal, in the hands of the academia, and the non-formal knowledge possessed by anyone with an internet connection, any user in Metaversia will have the option to create and manage metaversities, programmes, courses and lectures, and collaborate in all social activities within these, or may choose to participate peripherally. Borrowing the LCMS concept of creation and reuse of learning objects, users may built their programmes, courses and lectures from other users learning objects, e.g. they may build a course from a panoply of lectures from other metaversities.

By these means, the model intents to reproduce the Nonaka and Takeuchi's model of Knowledge Management that has its roots in a holistic model of knowledge creation, where there isn't a clear distinction between knower and known (Nonaka & Takeuchi, 1995). According to these authors, knowledge creation always begins with the individual, like a middle manager that as an intuition about market trends that becomes a new product concept, or a shop floor worker that draws upon

years of experience to come up with a process innovation that saves the company millions of dollars. In these scenarios, an individual's personal, private knowledge (predominately tacit in nature) is translated into valuable, public organizational knowledge (Dalkir, 2005). This is also the idea behind the first MOOCs and collaborative teaching and learning. Nonaka and Takeuchi, distinguish four modes of knowledge conversion that constitute the "engine" of the entire knowledge-creation process, as illustrated in the next figure (Dalkir, 2005):

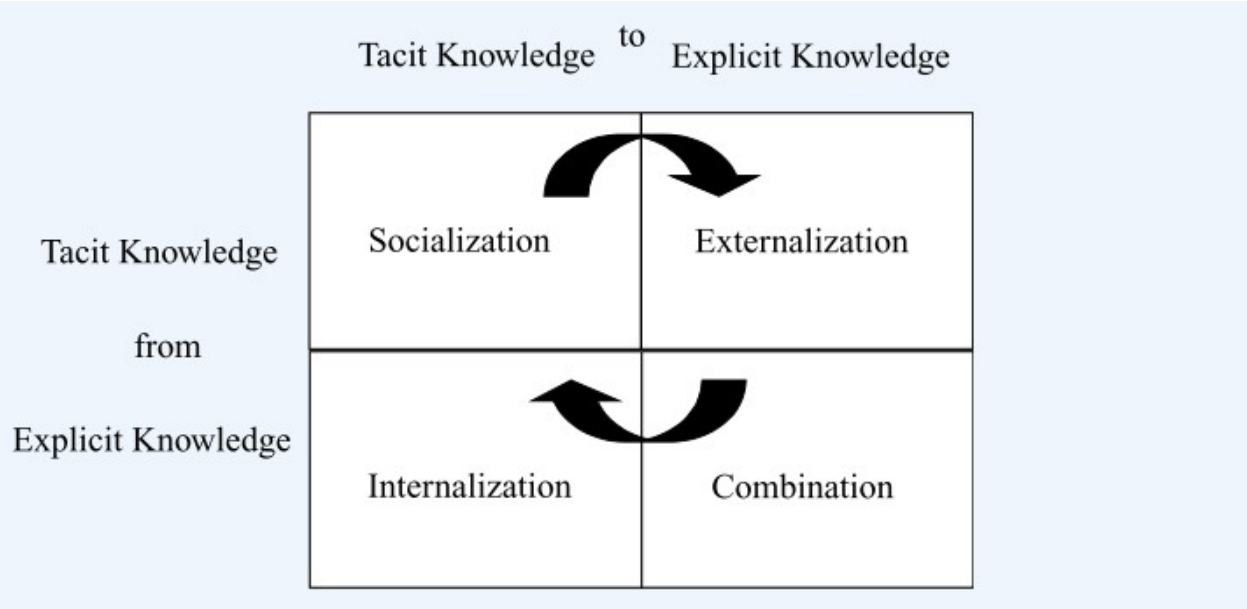

Figure 16: The Nonaka and Takeuchi Model of Knowledge Conversion (Dalkir, 2012)

1. **From tacit knowledge to tacit knowledge: the process of socialization** - It consists of sharing knowledge in typically social interactions. It involves arriving at a mutual understanding through the sharing of mental models, brainstorming to come up with new ideas, apprenticeship or mentoring interactions, and so on. To enable this process it will be introduced:
    - Forums and comments: To enable discussions and asynchronous support on learning and teaching;
    - Chat: To enable synchronous communication amongst the users;
    - Events: To schedule community related events;
    - User messages and friendships: To promote communication between users.

2. **From tacit knowledge to explicit knowledge: the process of externalization** - In this mode, individuals are able to articulate the knowledge and know-how. Previously tacit knowledge can be written down, taped, drawn, or made tangible or concrete in some manner. Once externalized, knowledge is tangible and permanent. It can be shared more easily with others and leveraged throughout the organization. Good principles of content management will need to be brought into play in order to make future decisions about archiving, updating, and retiring externalized knowledge content. To feed this process it will be implemented:

    - Lectures: Video, audio, Audio Presentation Document Slide media types can be used to build lectures
    - Blogs: To user share their thoughts;
    - Publications: A place for publishing the scientific production of the community;
    - Library: A repository for learning objects;
    - Tutorials and textbooks: WYSIWYG HTML editor to build rich media tutorials and textbooks
    - Wiki: A wiki will enable users to collaborate to the content knowledge base.
    - Tagging: Assign keywords or terms to content in order to be found again by browsing or searching.

3. **From explicit knowledge to explicit knowledge: the process of combination** - The process of recombining discrete pieces of explicit knowledge into a new form. No new knowledge is created per se, rather it is a new combination or representation of existing or already explicit knowledge. The following tools and options will be implemented to meet this purpose:

    - Build programmes and/or courses from lectures from all available metaversities;
    - RSS: Feeds to syndicate content from other sources;
    - News: A section to publish new information about community related events;
    - Rating: In order for users assessment and content quality content control, the rating widgets will be available for all content types;

4. **From explicit knowledge to tacit knowledge: the process of internalization** - The last conversion process, internalization (explicit-to-tacit), occurs through diffusing and embedding newly acquired behaviour and newly understood or revised mental models. Internalization is strongly linked to "learning by doing". Internalization converts or integrates shared and/or individual experiences and knowledge into individual mental models. Once internalized, new knowledge is then used, extended, and reframed within existing tacit knowledge bases. To accomplish this it will be provided:

    - The option to all users create and manage metaversities, programmes, courses and lectures;
    - Quizzes and Gradebooks: To assess teaching and learning;

The following table summarizes the features of Metaversia's conceptual model:

Table 4.1: Metaversia's feature table according to Nonaka and Takeuchi's Knowledge Management

Socialization	Externalization	Combination	Internalization
User messages Friendships Comments Forum Chat	Lectures Blogs Publications Library News Tutorials and textbooks Wiki Tagging	Build programmes and/or courses from lectures from all available metaversities RSS Rating	The option to all users create and manage metaversities, programmes, courses and lectures Quizzes and Gradebook

Nonaka and Takeuchi, quoted by Dalkir (2005), also pointed the mechanisms by which individual knowledge gets "amplified" into and throughout the organization. To provide these mechanisms we'll insert bookmarklet widgets in all content types for sharing in the main social networks, and connection to YouTube, Vimeo, Flickr and Slideshare for easy content publishing, and userpoints, a gamification item to motivate users' collaboration and participation, that may be turned off, if users choose so.

Nonaka and Takeuchi argue that an organization has to promote a facilitating context in which the organizational knowledge-creation process and the individual one can easily take place, acting as a spiral. They describe the following "Enabling Conditions for Organizational Knowledge Creation" (Dalkir, 2005):

1. Intention: an organization's aspiration to its goals.
2. Autonomy: condition whereby individuals act autonomously, according to the "minimum critical specification" principle, and are involved in cross-functional self-organized teams.
3. Fluctuation and Creative Chaos: condition that stimulates the interaction between the organization and the external environment and/or creates fluctuations and breakdowns by means of creative chaos or strategic equivocality.
4. Redundancy: existence of information that goes beyond the immediate operational requirements of organizational members; competing multiple teams on the same issue; and strategic rotation of personnel.
5. Requisite Variety: internal diversity to match the variety and complexity of the environment, and to provide everyone in the organization with the fastest access to the broadest variety of necessary information; flat and flexible organizational structure interlinked with effective information networks.

Relating these conditions with Metaversia's model characteristics, we can confirm the model's adequacy to knowledge creation:

Table 4.2: Enabling Conditions for Metaversia Knowledge Creation

Enabling Condition	Metaversia's model
Intention	Provide a network for global collaborative teaching and learning.
Autonomy	Any user can create a metaversity, programme, course or lecture and enrol freely in each one of these and its related activities.
Fluctuation and Creative Chaos	Being intrinsically open to everyone with an internet connection, the platform interacts fully with its global environment.
Redundancy	There isn't any kind of restriction in terms of number or thematic of the metaversities, programmes, courses or lectures that can be created.
Requisite Variety	Any user can create a metaversity, programme, course or lecture and enrol freely in each one of these and its related activities.

Knowledge creation depends on a continuous and dynamic interaction between tacit and explicit knowledge throughout the four quadrants, and organizations produce and develop tools, structures, and models to accumulate and share knowledge (Dalkir, 2005). Therefore, this model must rely in open source software with a large community of developers to assure its continuous development and improvement.

4.2 Prototype

The proposed model was prototyped in Drupal open source PHP-based content management system. Drupal provides the tools to make custom content management solutions, and can be described both as a CMS and a Content Management Framework (CMF). Most CMS's are stuck on specific assumptions have been made about their use that are hard to override. Frameworks, on the other hand, require the knowledge of a programming language. Drupal is like a Lego kit, where skilled developers have already made the building blocks, in the form of contributed modules, needed to create a site, whether that is a news site, an online store, a social network, blog, wiki, or something else altogether ("The Drupal overview | drupal.org," n.d.).

Drupal treats most content types as variations on the same concept: a *node*. Static pages, blog posts, and news items (some possible node types) are all stored in the same way, and the site's navigation structure is designed separately by editing menus, views (lists of content), and blocks (side content which often have links to different site sections). In Drupal, nodes hold the structured information pertaining to a blog post (such as title, content, author, date) or a news item (title, content, go-live date, take-down date), while the menu system, as well as taxonomy (tagging of content) and views, create the information architecture. Finally, the theme system, along with display modules, controls how all this looks to site visitors. Since these layers are kept separate, you can provide a completely different navigation and presentation of your content to different users based on their specific needs and roles. Pages can be grouped differently, prioritized in a different order, and various functions and content can be shown or hidden as needed.

Creating an informational website that broadcasts from "one to many" is something that most CMSs do right out of the box. However, where Drupal really shines is when you want to empower site users to create content, and connect with each other - moving from "one to many" to "many to many." Drupal is designed from the ground up so site builders can delegate content creation, and even site administration, to users. All you have to do is define who gets to do what on your site (through user permissions), and then you can start collaborating.

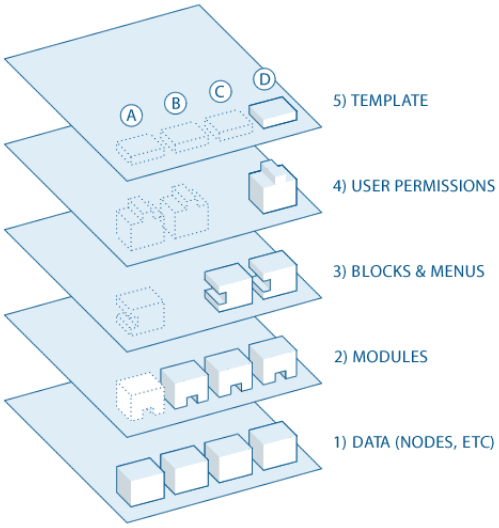

Figure 17: Drupal system layers ("The Drupal overview | drupal.org," n.d.)

Beside the core modules, these were the modules used to implement the different features of the conceptual model:

Course: Enables e-learning courses;

Book: Allows users to create and organize related content in an outline;

Certificate: Awards a Certificate on course completion;

Credit: will allow an admin to assign and map credit types to learner profiles and courses. Learners will then be able to receive or claim credit that they are eligible for on completion of a course;

DrupalChat: Allows users to chat with each other privately or together in a public chatroom;

Five star: Enables fivestar ratings on content, users, etc.

Flag: Create customized flags that users can set on content, like bookmarking and adding to favorites;

Forum: Provides discussion forums;

Poll: Allows to capture votes on different topics in the form of multiple choice questions;

Profile2: Enables user profiles;

Media: Provides an extensible framework for managing files and multimedia assets;

Organic Groups: Allow associating content with groups.

Quizz: Allows the creation of graded quizzes;

Requirements: For requiring completion of other courses for enrolment in another;

Relationships: For tracking completion of other courses to satisfy completion of a Course;

Social Media: Helps integrate social media sites such as Twitter, Facebook and Google+;

Statuses: Creates context-sensitive social streams.

Rules: React on events and conditionally evaluate actions.

Views: To create customized lists and queries from database.

Webform: Allows the submission of forms;

In terms of the theming layer, it was used the Omega Drupal 7 Base Theme is a highly configurable and responsive HTML5/960 grid base theme. The template is divided in zones that represent blocks of content, that can be assigned and organized within 12, 16, 24 layout columns like a puzzle. The Delta, Context and Omega Tools modules were also added for contextual layout and extra Omega theme functionalities. The following figures show the resulting interface.

Figure 18: Metaversia's frontpage

The frontpage was designed in order to satisfy the requisite variety of the conceptual model. From this page users can search and access metaversities, programmes, courses or lectures. The top row is destined to the most visited in each one of these categories.

Figure 19: Metaversia's metaversity page

In order to promote redundancy in the platform, the metaversity, programme and course pages show all the items in a drill down category approach. This also implements requisite variety and reduces dead-ends in user navigation, enabling the users to access all levels of categories independently of the current navigated level.

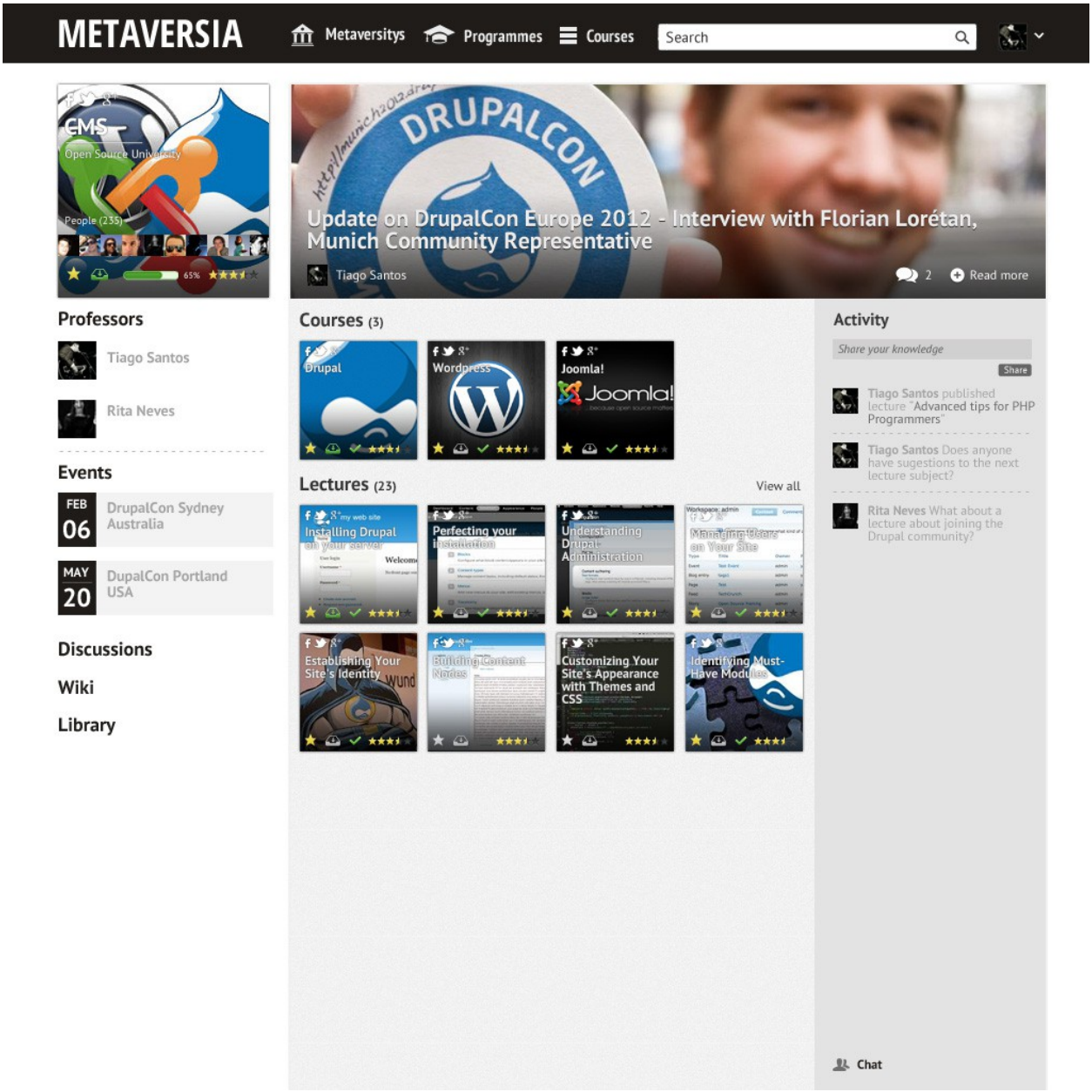

Figure 20: Metaversia's programme page

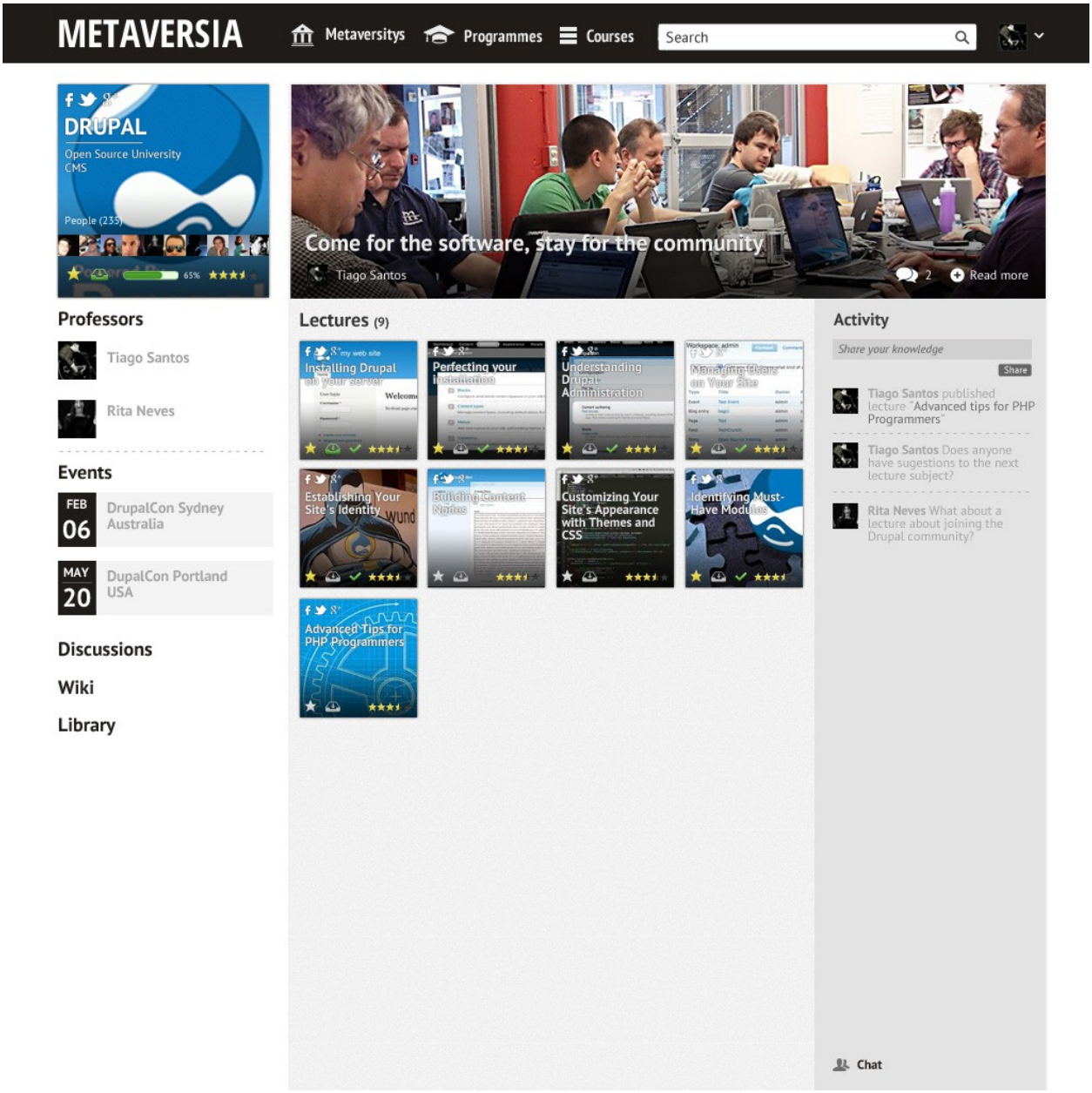

Figure 21: Metaversia's course page

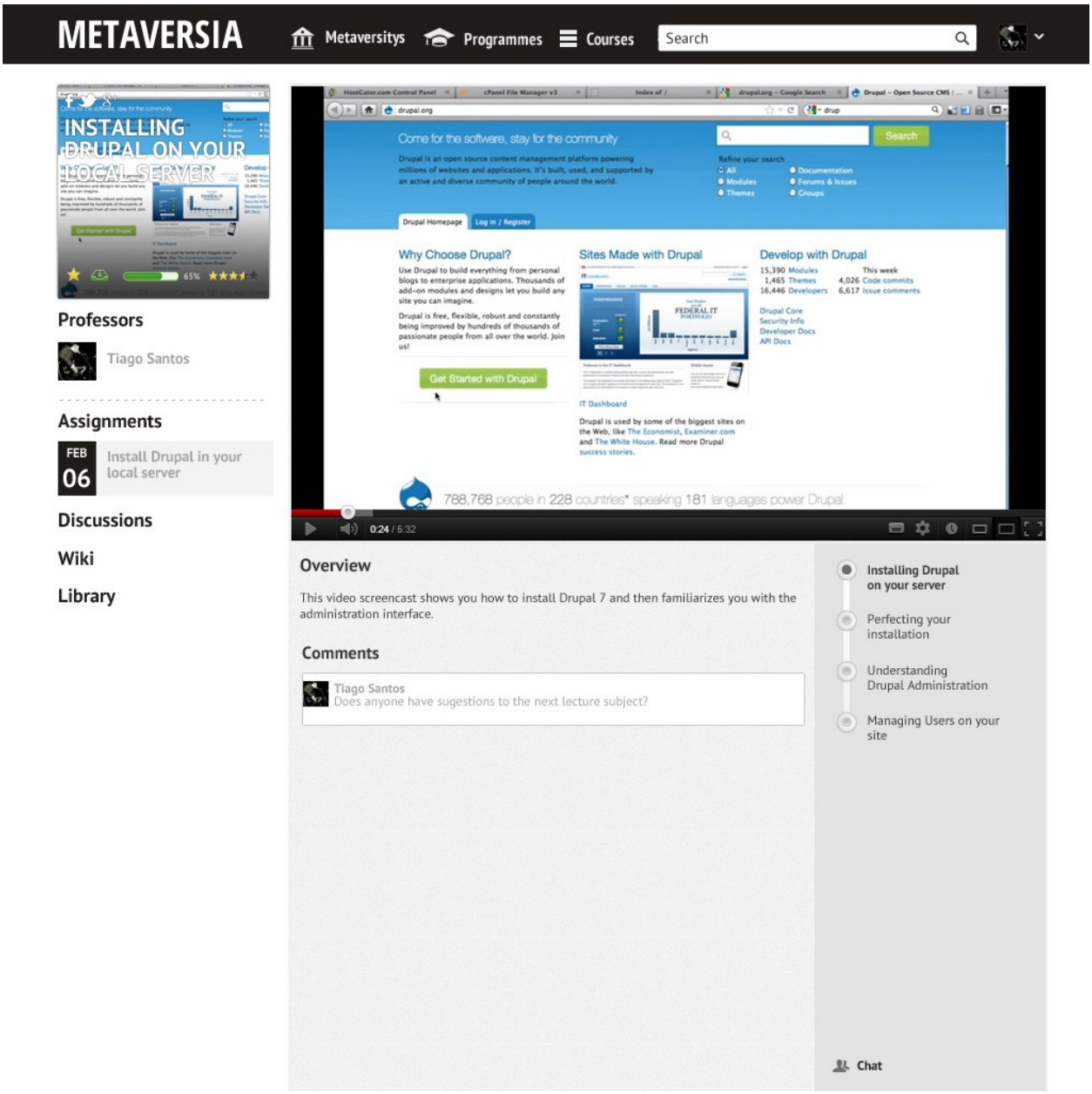

Figure 22: Metaversia's lecture page

The lecture page is the main space for the fluctuation and creative chaos, externalization and internalization processes to happen. The users will externalize their knowledge, publishing their experience and making it tangible and permanent in the form of video, audio, among others, but this can also be a way to convert or share knowledge into individual mental models. Internalization processes can also be started through participation in discussions, wikis and events. The combination process can be initiated through by bookmarking and grabbing any lectures in order

to create new courses, programmes and ultimately, new metaversities. These custom item will them appear in users' profiles under the “Owned” category, as visualised in user profile pages.

Figure 23: Metaversia's user profile page

After the full development and testing of this prototype, the site can be bundled in a downloadable Drupal Distribution. In Drupal, the Distributions provide site features and functions for a specific type of site as a single download containing Drupal core, contributed modules, themes, and pre-defined configuration. They make it possible to quickly set up a complex, use-specific site in fewer steps and can be publicly released, collaboratively developed and maintained in a Drupal.org project.

5 Conclusions

As seen throughout this work, globalization and economic interdependency of a post-modern society point toward an internationalization mission for the university, focused on a new global international curricula, and on increasing foreign student populations, international exchange of students and faculty members, and research collaborations between institutions in different nations. The increasing flow of students and faculty can represent an opportunity for universities thriving in the networked information economy, but this broader access to higher education has massive cost implications for governments, especially in developing countries. On a global scale, social, economic, and cultural circumstances have significant effects upon an individual's ability to acquire educational outcomes and the basic question underlying the right to education is how to create equal access to the tools of education, and thus the opportunity to show the merit required in higher education. It is unlikely that sufficient resources will be available to build enough new campuses to meet the growing global demand for higher education but non formal education, in the form of open access movements can help to overcome major challenges that limits the access of international students to universal higher education like geographical/economic isolation.

The growing open access movement reveals the early emergence of a meta-university that bring cost-efficiencies to institutions through the shared development of educational materials, which is particularly important to the developing world. Through the Open Education Resources (OER), a world-wide movement is developing under the simple and powerful idea that the world's knowledge is a public good and that technology is an extraordinary opportunity for everyone to share, use, and re-use knowledge. One branch of this movement is the OpenCourseWare (OCW) movement that promotes free and open digital publication of high quality university-level educational materials under a Creative Commons license. But despite the huge success in the dissemination and democratization of knowledge provided by OCW, it has attached a severe financial downside, and configures a hamper in educational innovation due to its failure in harnessing Web 2.0 collaborative technologies. The Learning Management Systems (LMS) implementations of in higher education institutes had the same result, despite the best intentions and efforts of all who sought that these systems would transform the dominant learning modality of higher education from traditional, classroom-based instruction to online and hybrid courses.

Informal and self regulated learning are defining characteristics of 21st century education, and 70% of learning occurs outside of formal education. The dogma of heutagogy states that people inherently know how to learn, and the role of formal education is to enable the confidence to develop these skills, encouraging critically evaluate and interpret reality according to own personal skills and competencies. This focus on 'learning to learn', and sharing rather than hoarding knowledge, place it in the same constructivist paradigm of the OER movement, and likewise, such sharing of knowledge can be easily achieved through social media and use of personal digital technologies, as recent MOOC initiatives have being doing. MOOCs embody the digital economy in terms of their reputational, relational, and networked operations, in same way social media does. Reputation within social media can be established through traditional credentials but is primarily performative, and will not garner the same attention, capital, or amplification unless it is combined with overt demonstration of knowledge or skill, and also with connection to others. Therefore, successful participation in a MOOC parallels and scaffolds participation in the larger digital economy. But, like OCW, the current generation of courses has proven the feasibility of massive online enrolments, but it is based on a form of adult continuing education. However, MOOCs themselves are highly dependent the information literacy that enables social media performance and demonstration of knowledge and skills. This is exactly what formal education should be doing: developing and fostering such abilities so that learners can participate meaningfully in MOOCs and other forms of self-learning. Therefore, the demand for formal education programs has never been higher, like we've stated in the beginning of this work.

There is no clear distinction between formal and non formal education, but at this time, MOOCs are definitely eroding its boundaries. On one side, we have universities, formal education institutions, providing non formal education but certainly aiming for formality in the form of certificates and skill validation through job market approval. On the other side, we have corporate initiatives providing support for paid course publishing, and teaming with top professors, entering this way in direct competition with formal higher education institutions. Until now, the definition of formal education was somehow related to the distance from state control. But transnational capital is eroding not only the nation-state, but also the university, which the actual internationalization mission makes resemble a transnational corporation that serves global consumers rather than national subjects. Therefore, formal education is becoming further away from its original definition that was related to state, to become deeply tied to global markets.

In order to universities to succeed, they need to cooperate to launch a Global Network for Higher Learning. The proposed model, Metaversia, reproduces the Nonaka and Takeuchi's model of Knowledge Management that has its roots in a holistic model of knowledge creation and was prototyped in open source CMS Drupal. It aims to be a collaborative network that harness the capital exchange potential, and knowledge-building opportunities that rests on the connections between people, enabling citizen's full participation in the actual networked information economy. With this modest contribute we hope to take a step forward in order to overcome the major challenges that limits the access to universal higher education, so, like stated in the Article 26 of the Universal Declaration of Human Rights, it can be equally accessible to all on the basis of merit.

5.1 Future Works and Limitations

The actual work presents an unevaluated prototype so, in terms of possible future work, it is suggested an evaluation of the platform by a community of students and teacher, of formal and/or non formal education, comparing the behavioural and usage patterns of users and observe its changes across a time span.

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7 Appendix A – OpenCourseWare website comparison table

Table 7.1: OpenCourseWare website comparison table

University	Course Structure	Media	Social tools	Social networks	Technology
University of Southern Queensland	Objectives Introduction Assignments Syllabus Course overview Resources Modules Lectures Examples Readings	Textbooks Adobe Breeze Presentation Audio	-	-	N.D.
ESAGS -Escola Superior de Administração e Gestão	Introduction Course overview Syllabus Readings	Adobe Flash Player w/ audio and video	Quizzes	-	N.D.
Universidad del Valle - Colombia	Course overview Objectives Methodology Syllabus Resources Readings	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad Icesi	Introduction Course overview Syllabus Resources Evaluation Professors	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad Nacional de Colombia	Introduction Course overview Syllabus Resources Readings	Textbooks	-	-	N.D.
Universidad Estatal a Distancia	Introduction Course overview Syllabus Resources Readings	Textbooks	RSS Bookmarklet	-	eduCommons
VIA University College - Denmark	Introduction Resources Readings	Video Presentations Textbooks HTML page	-	YouTube	Joomla
Instituto Tecnológico de Las Américas (ITLA)	Introduction Syllabus Resources Readings	Video Presentations Textbooks	-	YouTube	Moodle
Universidad Tecnica Particular de Loja	Introduction Course overview Syllabus Resources Evaluation Professors Readings	Textbooks	RSS Bookmarklet	-	eduCommons
Helsinki Metropolia University	Introduction Course overview	Presentations	-	SlideShare	Confluence

University	Course Structure	Media	Social tools	Social networks	Technology
of Applied Sciences	Syllabus Prerequisites Grading Resources	Textbooks			
University of Sumatera Utara	Introduction Lectures Resources Professors	Presentations Textbooks	RSS	-	N.D.
Universiti Teknologi Malaysia	Introduction Syllabus Semester Professors	Textbooks	RSS	-	Moodle
Tecnológico de Monterrey	Introduction Syllabus Documents Professors	Textbooks	-	-	Joomla
Universidad de Monterrey	Introduction Syllabus	Textbooks	RSS Bookmarklet	-	eduCommons
TU Delft	Introduction Lectures Assignments Readings Activities	Videos iTunesU Textbooks	Bookmarklet Chat	ItunesU Open Study SlideShare Twitter Facebook	Typo3
Virtual University of Pakistan	Course Overview Resources Readings Lectures Assignments Grading	Videos Textbooks	-	-	SiteFinity
AGH University of Science and Technology	Introduction Syllabus Resources	Textbooks	RSS	Facebook Blip	Moodle
Moscow Architectural Institute	Calendar Lectures Assignments Examples Readings News	Texbooks	RSS	-	1c-bitrix
University of the Western Cape	Syllabus Calendar Assignments	Texbooks	RSS Bookmarklet	-	eduCommons
Hanyang University	Course overview Syllabus	Video	RSS Bookmarklet	-	eduCommons
Korea University	Syllabus Lectures Assignments	Video Texbooks	RSS Bookmarklet	-	eduCommons
Pusan National University	Course overview Professors Syllabus Lectures Assignments	Video Texbooks	-	-	N.D.
Korea Education & Research Information Service	Course overview Syllabys Lectures	Video Texbooks	Rating	-	N.D.
Fundación Universitaria San Pablo CEU	Syllabus Readings Professors	Textbooks	RSS Bookmarklet	-	eduCommons

University	Course Structure	Media	Social tools	Social networks	Technology
	Assignments Evaluation				
IE University	Course overview Professors Objectives Methodology Syllabus Lectures Readings Evaluation	Textbooks	Bookmarklet	Facebook Youtube iTunesU	N.D.
Universidad Carlos III de Madrid	Syllabus Bibliography Lectures Assignments Resources Professors	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad de Alicante	Course overview Objectives Methodology Evaluation Bibliography Resources	Textbooks Flash animations Video Audio	RSS Bookmarklet	-	eduCommons
Universidad de Cantabria	Course overview Objectives Methodology Evaluation Bibliography Resources Evaluation Syllabus	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad de Granada	News Introduction Syllabus Resources	Textbooks	RSS Forum Quizzes Wiki	-	Moodle
Universidad de Malaga	Course overview Objectives Methodology Evaluation Bibliography Evaluation Syllabus Resources	Videos Textbooks	RSS Bookmarklet	Youtube	eduCommons
Universidad de Murcia	Course overview Objectives Resources Methodology Evaluation Bibliography Evaluation Syllabus	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad de Navarra	Course overview Objectives Syllabus Resources Methodology Evaluation Bibliography Evaluation Professors	Textbooks	RSS	-	Sakai
Universidad de Oviedo	Course overview Objectives Syllabus Resources Methodology	Textbooks	RSS	-	Moodle

University	Course Structure	Media	Social tools	Social networks	Technology
	Evaluation Bibliography Evaluation Professors Readings				
Universidad de Salamanca	Course overview Syllabus Bibliography Evaluation Professors Resources	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad de Zaragoza	Course overview Calendar Syllabus Resources Methodology Assignments Bibliography Professors Readings	Video Flash presentation Textbooks	RSS Bookmarklet	-	eduCommons
Universidad del Cádiz	News Introduction Syllabus Resources	Textbooks	RSS	-	Moodle
Universidad Internacional de Andalucía	Course overview Calendar plan Resources Assignments Professors	Textbooks	RSS Bookmarklet	-	eduCommons
Universidad Nacional de Educacion a Distancia	Course overview Objectives Resources Bibliography Assignments Evaluation Professors	Textbooks Audio	RSS Bookmarklet	-	eduCommons
Universidad Politécnica de Cartagena	Course overview Objectives Syllabus Bibliography Course materials Assignments Evaluation	Video Textbooks	RSS	Facebook Twitter YouTube	Moodle
Universidad Politécnica de Valencia	Course overview Objectives Syllabus Resources Assignments Evaluation Bibliography Professors	Textbooks	RSS	-	Sakai
Universidad Politécnica Madrid	Course overview Syllabus Course materials Assignments Glossary Bibliography Professors	Textbooks	RSS Bookmarklet Rating	Facebook Twitter Youtube LinkedIn Tuenti	eduCommons
Universitat Politècnica de Catalunya. BarcelonaTech (UPC)	Course overview Objectives Methodology Syllabus Resources Assignments Bibliography Professors	Textbooks	RSS Bookmarklet	-	Drupal

University	Course Structure	Media	Social tools	Social networks	Technology
Eastern Mediterranean University	Course overview Objectives Resources	Textbooks	Quizzes Assignments News forum Chat	-	Moodle
Middle East Technical University	Course overview Calendar plan Syllabus Resources Assignments Exams Bibliography	Textbooks	RSS Bookmarklet	-	Moodle
The Open University Learning Space	Introduction Learning outcomes Resources Bibliography Readings	Video Audio Textbooks	RSS Bookmarklet Rating Comments Quizzes	Facebook Twitter YouTube iTunesU	Drupal
Massachusetts Institute of Technology	• Course overview • Syllabus • Calendar • Lecture Notes • Assignments • Exams	Video Audio Textbooks	RSS Bookmarklet	Facebook Twitter YouTube iTunesU OpenStudy	Plone
New Jersey Institute of Technology	Syllabus Lectures	Video Textbooks	-	-	N.D.
Tufts University	Course overview Syllabus Calendar Lectures Evaluation Readings Image Gallery Popular Content	Textbooks	-	-	N.D.
UC Berkeley	Lectures	Video	-	Youtube	N.D.
University of California, Irvine	Course overview Lectures Resources	Video Textbooks	-	Facebook Twitter LinkedIn	N.D.
University of Massachusetts Boston	Course overview Professors Syllabus Schedule Readings Resources	TextBooks	RSS Bookmarklet	Facebook	eduCommons
University of Michigan	Course overview Resources	Textbooks	RSS	Facebook Twitter Flickr Youtube	Drupal
University of Notre Dame	Course overview Professors	Videos Textbooks	RSS Bookmarklet	Facebook Twitter	eduCommons

University	Course Structure	Media	Social tools	Social networks	Technology
	Syllabus Calendar Readings Resources Assignments				
University of Wisconsin- Eau Claire	Resources Calendar Syllabus	Videos Textbooks	-	Facebook Twitter Youtube	N.D.
Open Yale	Course overview Syllabus Lectures	Videos Textbooks	Bookmarklet Surveys	Facebook Youtube iTunesU	Drupal