The Internet's potential in the field of education is widely known. Currently, more than a quarter of Internet users carry out training courses online, allowing the public to access information and content. However, these courses are generally mere copies of their offline equivalents, digitalizing the material and distributing it online. The fact is there is a long way to go: offering personalized training, improving contact between teacher and students, finding appropriate means of evaluation, measuring attendance, and attesting the level of completion through certificates, etc.

In the case of MOOC (Massive Open Online Courses), finding answers to these issues is even more pressing as offering courses to as large a number of students as possible is at the heart of its purpose, with student numbers sometimes exceeding 100,000.

This monographic tackles this dilemma, but above all it covers how new technologies can offer solutions. Ideas such as social media, big data, learning analytics, adaptive platforms, open content, and immersive technologies are taking their place as the new skeleton for said solutions. However, we need to bear in mind that this is not merely a technological movement, but rather the beginning of a more general trend that might transform the models that have been in place for the last century, making way for new pedagogical methods such as learning through exploration or even gamification. What we have before us are much more than tools for the massive dissemination of content; it is actually a phenomenon with the potential to disrupt, whose final impact cannot be accurately predicted, which is why various scenarios are contemplated in the monographic.

All of this content is further enhanced by a transcription of a meeting by a think tank made up of experts in various fields of knowledge related to MOOC, which undoubtedly offers a rounded view of this phenomenon.

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MOOCs in the Education of the Future: Digitizing Training

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Ariel

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Introduction

Everybody agrees that education is the foundation of a developed society. Parents make it abundantly clear to their children from a tender age: education will open doors for you; it will allow you to grow both personally and socially, to make money.... too many responsibilities for a single word. Improving education has become a magical mantra that is repeated over and over in both families and institutions.

It is therefore quite striking to witness how the procedures and structure of the educational system in developed countries have remained fairly stable almost since its creation as a public service and its subsequent universalization. The reason for this is that education has been very successful in its main goal: spreading general knowledge among the population to allow citizens to get by in their everyday lives, and providing a more specialized knowledge so they can perform a specific job. Thus, the university education system teaches students to be, for instance, doctors, so they can replace other doctors who are retiring in any part of the country or they can work in newly opened health centers. The traditional view of higher education is to create somewhat interchangeable pieces that try to fit into a stable society.

However, times are changing. Organizations need to adapt faster; knowledge is more specialized; and technology constantly modifies jobs. The traditional educational system therefore faces increased difficulties to remain a fundamental reference for training.

Technology is behind many of the changes that seem to challenge society, and with it, the educational system. This monograph provides compelling arguments about how it can also be the solution. Although online training, and MOOCs in particular, have so far only been a reflection of in-class teaching, and a virtual reflection where many of the most important qualities are lost, there are currently enough elements to suggest that things will be different in the future.

Speaking of technology as the element that prompts change does not include merely the Internet or improved interfaces. It also refers to new concepts such as big data, which will allow a staggering amount of data to be collected about users and behaviors to provide to adapt education in real-time; it refers to immersive technologies such as those developed for virtual reality environments, which will allow laboratory environments to be recreated for the users (the so-called remote laboratories); it refers to technologies that support the Open Content movement in the educational world. It therefore refers to the convergence of a large number of technologies that are much more powerful when combined than applied separately.

Furthermore, the disruptive capabilities of these educational models do not lie simply in the adaptation of traditional methods to new technologies, but on the possibility of applying new pedagogical practices. Students will be able to explore, either through the use of simulators or of other technologies such as 3D printers. Additionally, peer-to-peer collaboration models could be used, whereby the core of the learning process is transferred from the teacher to the community itself, which uses teamwork and interaction to make its own deductions.

MOOCs are already a reality, as proven by the fact that MiriadaX, launched in 2013, managed to have 188,802 students enroll during its first year, or that Coursera has 22 million subscribers from 190 countries. However, this report will try to reach even further and analyze what these courses may yield in the future, and what their relationship with traditional education models will be.

In view of the uncertainty surrounding an innovative concept such as this, it seems pointless to make predictions about the mid- and long-term future of this trend. Nevertheless, it is interesting to present different scenarios showing the potential evolution of the MOOCs to try and shed light on their future development, their implications, and the factors they depend on. Thus, this monograph should not be viewed as a definitive document containing conclusions that need to be strictly adhered to, but as an initial document, a document that is open to discussion and that will be a source for more questions and new insights.

Chapter 1

The Evolution of the Educational Model

1.1 Industrialization of Education

The current educational model in western countries is based on the principle of universality, and is the result of an evolution through different stages. In Spain, this model was boosted in the 19th century by the 1812 Cadiz Constitution, which devoted all of Chapter 9 to the educational model. Following the events in other neighboring countries, this Constitution was the first to establish the universal nature of primary education for the entire population, without exception, and the standardization of educational programs throughout the country. The evolution and structure of education is very similar in all western countries, so the facts in this study that refer to Spain can actually be extrapolated to the evolution of global education, especially in the western world.

Making education reach all the citizens of a country requires an enormous amount of resources, and especially the establishment of processes and procedures to guarantee that education is similar throughout the country. This means creating institutions, schools and universities to guarantee certain standards of quality and knowledge. Therefore, students starting their education in one location can continue in a different one, since curricula standardization ensures, to some extent, the knowledge that every student needs to have in each level of education. The same principle applies to universities and to the different subjects in each degree. This system can only work if the whole educational system, starting with the teachers, who are the key of the whole system, is homogenous. In view of this, centers devoted exclusively to teacher training first appeared in Spain in 1838 for men and in 1858 for women, although before that, in 1588, Phillip II had already established a requirement for all teachers to pass an exam and get a degree.

This system, which can be termed 'industrial model of education', allows all students of a given subject to be somewhat interchangeable. This has yielded a number of benefits, such as encouraging the training of many professionals that have furthered social development. This educational effort has yielded professionals that built a universal health system and a similarly universal justice system and brought on the industrial revolution.

The benefits of this model are not only limited to the capability of preparing a large number of professionals with standardized training, but also of minimizing the costs of the process by following a model that mimics industrial manufacturing.

However, this model does have some drawbacks. Using the same system for all students does not take into account the diversity of their capabilities, so most of the talent slips through unnoticed. Furthermore, it is hard for this system to cater to the special needs of certain students. It is optimized for production, but it views students as merely another resource.

While this problem has been tackled in a variety of ways (development of different academic paths, specialization, special classes for students with different needs, etc), the current model still does not take into consideration the specific learning characteristics of each student, and lessons are mainly designed for 'average' students.

This scenario is currently being reconsidered: firstly, to cover the new requirements of an increasingly demanding labor market that seeks professionals that can add differential knowledge or value instead

of interchangeable workers; and secondly, because new technologies allow for a large-scale customized teaching that could be termed 'customized industrial education.'

1.2 The Current Educational System

The educational system in Spain and in other developed countries is divided into different levels that are linked to the age of the population: pre-school, primary education, secondary education, basic and intermediate vocational training, high-school and university education, postgraduate learning, master's degrees, etc. These correspond not only to different stages, but also to different training paths, and are not independent, since they can be connected in many ways. The Spanish system, as well as the European system, is therefore a complex one that provides different alternatives depending on the capabilities and preferences of each student, and where university and postgraduate studies represent the highest level. All countries also make a distinction between two stages depending on whether they are compulsory or not: all European models have a compulsory first stage for the youngest students, that lasts several years. It generally starts at 6 years of age, as in the case of Spain, but in other countries, such as Luxembourg, it starts one or two years earlier. The compulsory education stage is at least eight years long in all European countries. In Spain it is ten years long (up to 16 years of age), and the change to secondary education coincides with that in most of the European countries.

1.2.1 Tertiary Education throughout the World

Tertiary or higher education comes after secondary education in all countries. Its structure and duration may vary from one country to another, but the concept is similar everywhere, since it refers to the higher studies to specialize in a specific field of knowledge, such as finance, engineering, etc., and which are usually designed with the labor market in mind. This educational period encompasses several stages that may vary from one area to another but correspond overall to the concepts set out by the Bologna process for the creation of a single educational framework in Europe: degrees (replacing the old-style university degrees), master's degrees and post-graduate degrees (doctoral degrees and doctoral dissertations). The institutions in charge of these degrees vary from one country to another, and may range from the colleges in Anglo-Saxon countries to the universities and institutes of technology of the French system or even to specialist schools. Despite the diversity of centers and studies, all higher education systems share the focus on specialization and in-depth teaching, as well as a series of admission requirements that guarantee that students will be capable of pursuing those studies. In view of the importance of this education, the UN stated in its 1966 International Covenant on Economic, Social and Cultural Rights[1] that «Higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular by the progressive introduction of free education.» The First Protocol to the European Convention on Human Rights[2] had been introduced in Europe in 1950, establishing the right to a higher education.

1. http://www2.ohchr.org/spanish/law/cescr.htm
2. http://www.hri.org/docs/ECHR50.html

One of the main goals of all countries in the field of education is therefore to ensure a high percentage of the population reaches this level. This is already the case in western countries, where the percentage of students that proceed to higher studies after they have completed their secondary education is greater than 70%.

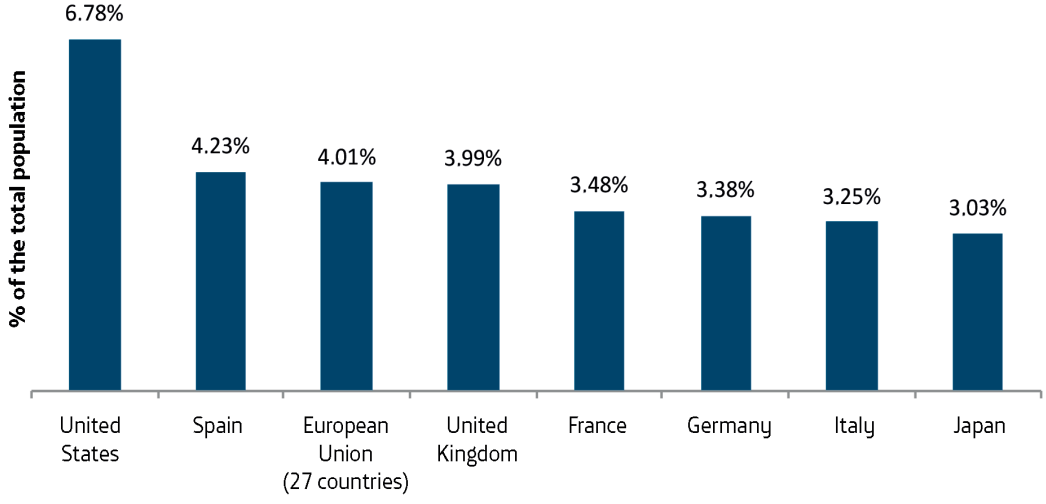
Table 1.1 Countries with the Highest Number of Students Moving from Secondary Education on to the University System (in the five years after they have completed secondary education)

Country	Percentage of Students
United States of America	72.6 %
Finland	70.4 %
Norway	70.0 %
Sweden	70.0 %
New Zealand	69.2 %

Source: Nationmaster.

In Europe, where university education has traditionally been considered an essential part of its culture, the number of university students continues to grow, albeit at a slower pace than in other areas: 7%, which is the average for the 27 countries in the European Union, and 9% in Spain between 2006 and 2011. The situation is different in the U.S., with a 20% growth in this period, thereby outnumbering Europe's total number of students in this level in the year 2010 (21.02 million students versus 20.13), in spite of the smaller population. The variable number of higher education students over total population sheds more light in this respect. It shows that the percentage of higher education teachers in the U.S. is much greater than in Europe (69% greater). Of the five largest countries in the E.U., Spain is the country with the highest percentage of these students.

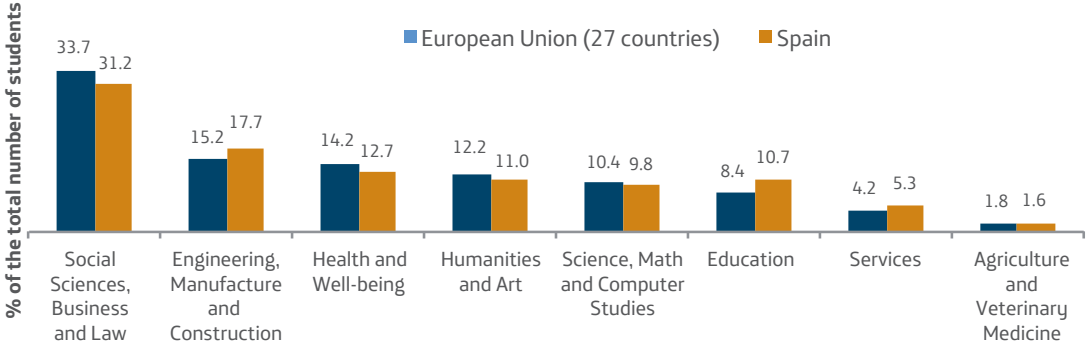
Figure 1.1 Higher Education Students in the E.U.-5, Japan and the U.S., Over Total Population



Source: Eurostat. 2011 data.

The distribution of students by area of knowledge is very similar in Spain and Europe. Social Sciences, Business and Law are most prevalent, followed by engineering, manufacture and construction (see Figure 1.2).

Figure 1.2 Distribution of Higher Education Per Field of Knowledge



Source: Eurostat. 2011 data.

This trend towards an increasing number of university graduates to promote social development is widespread throughout the planet, so the population attending this type of course has grown significantly. There are currently 200 million university students around the world, and this figure is expected to grow by 25% over the next 12 years to up to 250 million. This will undoubtedly put a strain on higher education systems.[3] This increase has been much sharper in developing countries. Table 1.2 shows that there are five universities in the world that boast more than one million registered students, more than the whole university population of the Netherlands, and none of them are in western countries.

Table 1.2 Universities with More Than One Million Students

University	Location	Students	Source
Indira Gandhi National Open University	Delhi, India	3,500,000	«Milestones». National Open University; «Nigeria: NTI Management's Trip to India Not to Jamboree»
Allama Iqbal Open University	Islamabad, Pakistan	3,305,948	Allama Iqbal Open University
Anadolu University	Eskishir, Turkey	1,974,343	The 2011-2012 Academic Year Higher Education Statistics (PDF)
Isamic Azad University	Teheran, Iran	1,900,000	On the main page of the IAU website
Bangladesh National University	Gazipur, Bangladesh	1,000,000	On the main page of the IAU website

1.2.2 Challenges Faced by Education

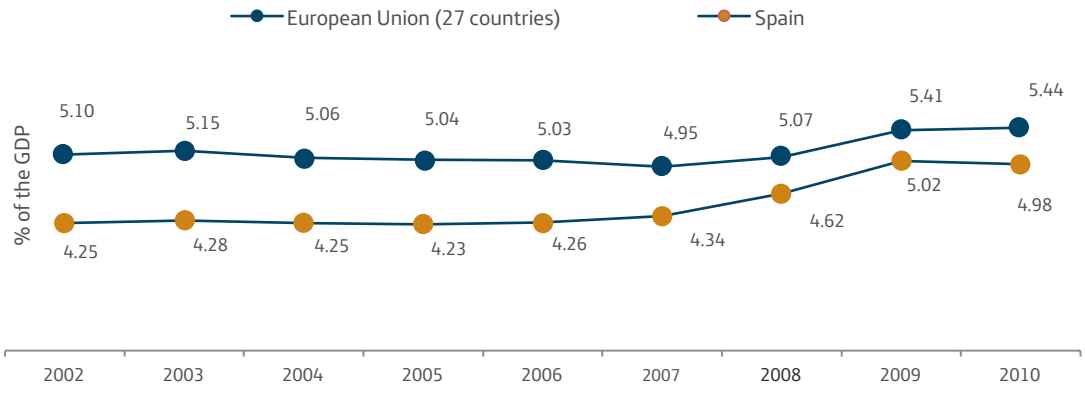
The Need for Optimizing Resources

All of the above leads to a deep-seated change in the outlook of higher education throughout the world. On the one hand, the new reality of more technological and advanced and, ultimately, complex societies calls for a better education for the people. On the other hand, large investments in teaching are required, and this is a burden for national budgets, especially those in a dire economic condition, where public expenditure needs to be prioritized. This investment in teaching adds up to approximately 5% in the European Union and in Spain, as shown in Figure 1.3. In this sense, it is important to highlight that higher education is twice as expensive per student (9,900 € as opposed to 5,481 €),[4] so the impact on the budget is significant. The increase in the university population and the need to constantly adapt educational systems as knowledge and the labor market progress strain the national budgets, especially during periods of economic hardship. It is therefore important to start a debate on

3. World Bank.
4. Data for Spain, 2012.

the efficiency of university expenditure. This debate is even more pressing in the U.S., where the burden of teaching costs falls more on the students. A survey sponsored by the Texas Policy Foundation shows that 81% of the population believes education should operate much more efficiently, while another study[5] states that 57% of U.S. students feel the price they pay for their university education is not worth it.

Figure 1.3 Investment in Education in UE27-Spain (as a percentage of the GDP)



Source: Eurostat.

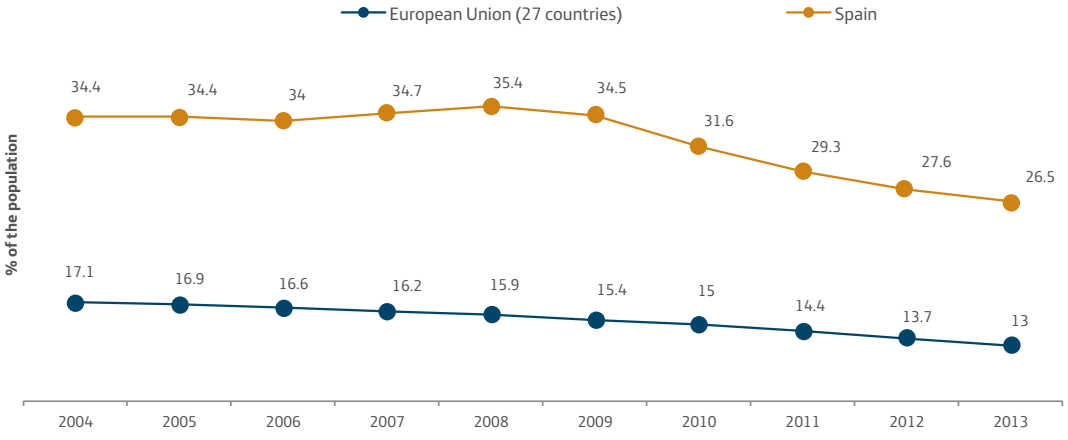
Other areas of the world that are further behind in educational development have even more problems with resources, since they also need to create infrastructures that are currently either non-existent or woefully inadequate. For instance, in Africa alone, four universities with enough capacity to accommodate 30,000 students per week would be required to cover teaching needs up to 2025. In India, where there are 235 million youngsters between 15 and 24 years of age, significant resources will be needed over the coming years to allow the university system to grow enough.

Ongoing Training

A shifting environment such as the one we live in now, where professional development will involve a better adaptation to different types of activities and a better updating of knowhow due to the rate of change of the environment, underscores the need for ongoing training throughout the professional life of the workers. Education, thus, needs to apply a global approach to support the population over the course of its life taking into account the different scenarios that are encountered in a diverse society. One of these scenarios is dropping out from the formal educational system. This situation is more widespread in Spain than in the rest of Europe, as shown in Figure 1.4, so it is necessary to devise solutions to return this population to learning activities, even if they do not follow the traditional academic format.

5. Pew Internet. Data for May 2011.

Figure 1.4 Percentage of Drop-outs between 18 and 24 Years of Age



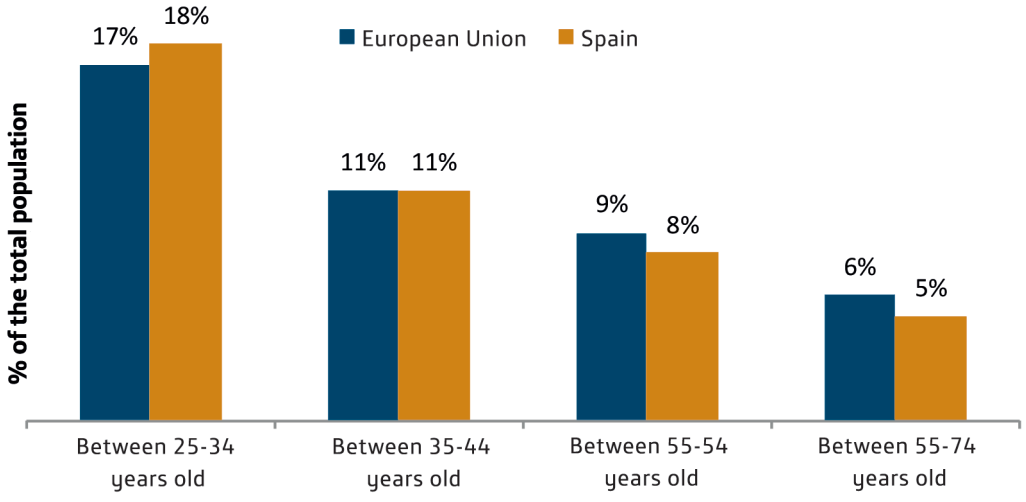
Source: Eurostat.

This need to integrate the population into learning activities includes more groups beyond this one. As stated above, there is a general consensus that one form or another of ongoing training will be required throughout the professional life of workers, even if this training is not official. This phenomenon is already somewhat in place, as shown in Figure 1.5, and a certain percentage of all age brackets have people participating in learning activities. Although participation is lower among older workers, the need to train throughout our lives is starting to take hold.

Flexible Training

Another of the current needs of training is the possibility of overlapping it with other activities and personal situations that are often more vital for citizens, such as work. In this sense, part-time training systems are a sign that we are moving in the right direction, since they offer users the possibility of continuing with other activities. In a way, this can be considered the first step towards the customization of training, even if it only concerns the hours of use. Figure 1.6 shows that Spain is the third country in the E.U. as regards the number of part-time students, with a growth of 160% between 2003 and 2011. The high degree of acceptance of this format in Spain is clear to see when compared with other countries such as Japan, which has a population three times greater but only half a million part-time students (half the number of Spain).

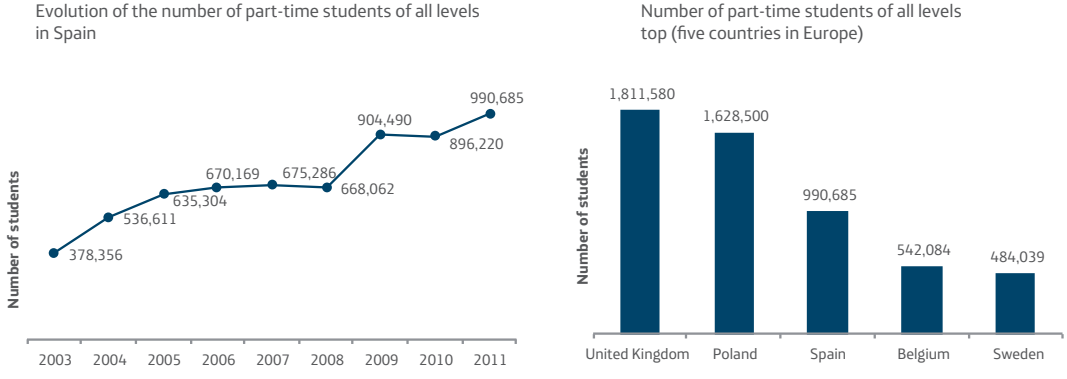
Figure 1.5 People Participating in Training Activities at Different Stages of Their Lives (four weeks duration)



Source: Eurostat

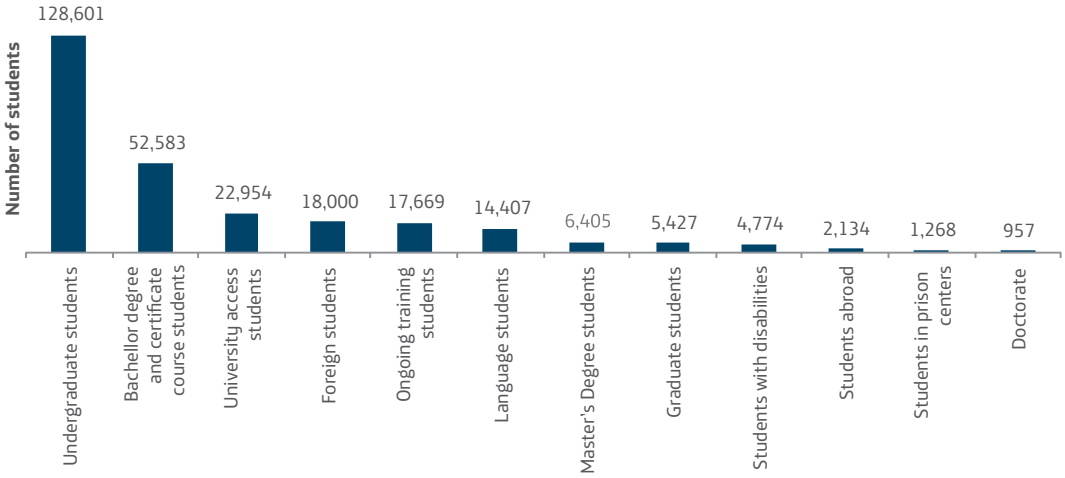
One of the most important initiatives in the field of flexible education the world over is distance education. In Spain, this model is deeply-rooted, and the UNED is the largest university in Spain, with a total of 260,000 students. Figure 1.7 shows that this distance learning university includes a wide variety of students, ranging from those accessing university to those enrolled in doctorate courses, which is the highest level of learning. It also includes groups with special needs, such as disabled students.

Figure 1.6 Part-time Students in Spain and Europe



Source: Eurostat.

Figure 1.7 UNED Students



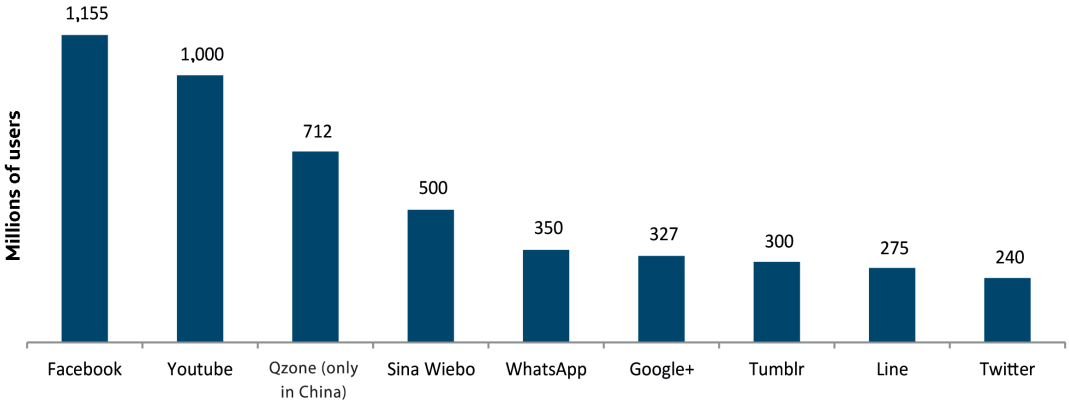
1.3 Technological Causes for Change

As explained in the previous section, education is currently facing several major challenges, such as customization, the need for greater flexibility, and economic restrictions. A change is necessary. This change is based on two aspects: one is the technological evolution that allows things that were hitherto inconceivable, and the other is the evolution of the pedagogical models. The latter aspect shall be discussed later.

1.3.1 Social Media as a Collaborative Tool

A decade on from the advent of the first social networks, they have clearly become one of the key elements of the Internet, or even of human relationships. Tools such as Facebook, Twitter or LinkedIn have become a reflection of the everyday activities of their users. Despite the plethora of social networks, users apply network economy and focus on a few, so the number of users in the leading networks is larger than the population of most countries (see Figure 1.8). The great level of acceptance as regards number of users and devoted time, which is up to thirty-seven minutes in the U.S. (more than for any other Internet activity), make this the most interesting channel for reaching users and for bridging the gap between real sectors such as trade or the media and Internet users.

Figure 1.8 Main Social Networks in the World



Source: Business Insider. Data from November 2013.

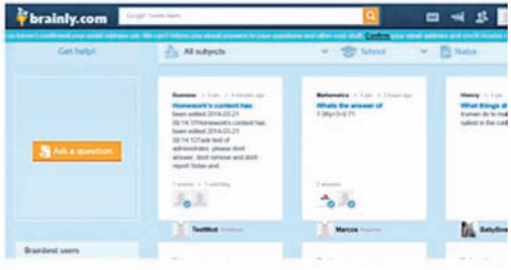
Besides, social networks have cemented their place as a key tool for collaboration and interaction: from the large general networks, such as Facebook, to the more specialized, such as LinkedIn, which targets the professional world, communication has become one of the basic tools, since it allows interaction and especially the creation of groups around a common interest. In fact, Figure 1.8, above, shows that instant messaging tools are also considered social networks, and three of the ten major social networks fit this bill: WhatsApp, Line and WeChat.

Apart from these global social networks, there are other more specific ones that are used exclusively to create networks of students. These students find that the Internet is the ideal tool for this purpose. These networks include examples such as Red Alumnos or Brainly (see Figure 1.9) and are used to establish educational communities and cooperation among students.

Figure 1.9 Social Networks Targeted at Inter-Student Collaboration

Red Alumnos

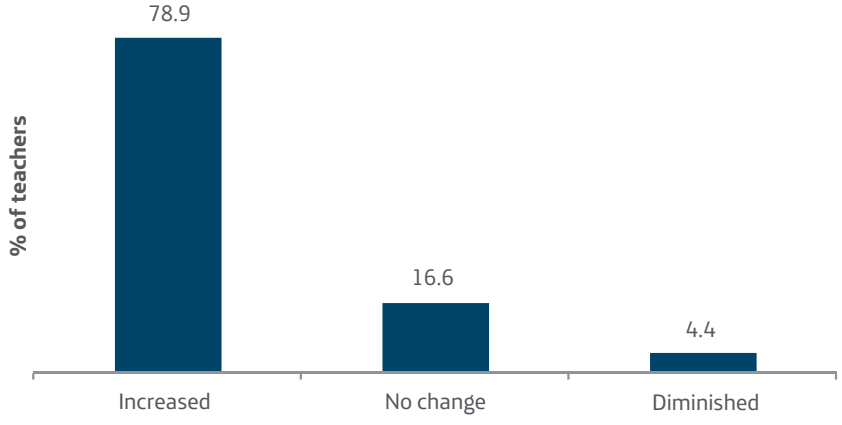
Brainly



Another extremely important characteristic of social networks is their global scale. 86% of Facebook users live outside the U.S., while 25% of LinkedIn users are in India. In fact, there are more LinkedIn or Google+ users in India than in the U.S.[6] This grants social media a capacity for collaboration that goes beyond the proximity or surroundings of an institutional environment and that overcomes physical distances. The alliance between Murdoch University, in Australia, and Duke University, in the U.S., is a clear illustration within an educational environment. Their students can contribute their observations to the study of the Australian northern and eastern ecosystems and can even connect with experts that provide their insight. This type of application is interesting in an environment such as the one proposed in this report, where there is an ever-growing competition among institutions to attract the largest number of users and where global points of view are required.

One of the keys to introduce social networks into the traditional models is to get teachers and institutions more involved so that they can use these elements as an extra channel. A study performed by the University of Massachusetts showed that 100% of the universities surveyed use social media in some form. Videos and blogs are the most common social applications used for teaching. Moreover, another study, undertaken by Babson Research Group and Pearson among faculty members, showed that 70.3% of teachers use social media in their private lives, and 55% use social networks specifically in professional contexts. This same study also explained that most teachers were of the opinion that their relationship with their students had grown thanks to social networks, as seen in Figure 1.10.

Figure 1.10 Influence of the Use of Social Networks in the Relationship between Teachers and Students



Source: Babson Research Group and Pearson. Data from 2013.

However, most of these teachers (86.6%) had concerns that were mostly related to privacy issues, both for the students and for themselves (83.5%), because they considered that classrooms need to

6. Business Insider.

be safe havens for free debate where privacy is respected. It is therefore necessary to create guidelines that establish behaviors to tackle the challenges of using social media in class.

1.3.2 Big Data and Learning Analytics

One of the major capabilities of online applications is the ease with which it is possible to gather data about their use. The amount of data at the disposal of these applications grew enormously as they evolved and became more interactive and, especially, as they focused increasingly on their social aspect, so it became easier to know the users. The concept of big data is therefore starting to gain importance: it is an umbrella term for all the technologies used to analyze large amounts of data, both structured and nonstructured, and often in real time.

Within the field of education, big data techniques will allow teachers to learn more about their students: when they sign in, what type of content they prefer, what subjects they find harder, their most common mistakes, their style of learning, etc. All this information is extremely valuable to place users at the center of the whole educational system and to have the rest of the elements revolve around them.

The analysis and aggregation of these data into different levels may be relevant for different education-related institutions. Data taken with a high level of aggregation can be used to detect global behavior patterns that may be useful for education authorities to plan resources and to research into new educational models. An intermediate level of aggregation can be valuable for educational institutions as a planning tool. A lower level of aggregation may be helpful for individual teachers and for the students themselves.

At this point it is important to stress the difference (or at least the theoretical difference) between big data, which is a data mining technology designed to work out patterns in the data, and learning analytics, which refers to the use of large-scale techniques and tools, in many cases with a predictive intent (for instance, in courses or teaching institutions). Despite this difference in their nature, both techniques are normally used for the same purpose because they are closely related, and often used together.

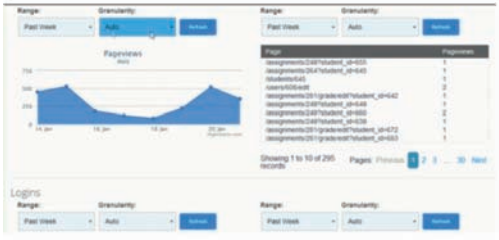
Control panels are one of the basic tools of these technologies, but also one of the most important to follow up on the educational process of the students. This tool can be used in several ways: first and foremost, it displays a summary of the main information about a teaching initiative. It also provides insight into the students and guidance throughout the learning process. From this point of view, control panels can be considered a learning analytics tool, even if their engine uses big data techniques. Figure 1.11 shows an example of each of these utilities. The first example, the GradeCraft[7] system of the University of Michigan, displays information on the way students use the learning systems. The second example, the competencies system of Capella University[8] goes even further and performs a more complex analysis that can detect the competencies students acquire as they complete their

7. http://gradecraft.com/
8. http://www.capella.edu/online-learning/

course activities. This information provides insight into the capabilities and competencies of students instead of into their acquired knowledge, so students can receive more accurate guidance throughout their learning process.

Figure 1.11 MOOC Control Panel

GradeCraft
University of Michigan



Competencies System
Capella University

These tools can be used to develop analytical models that detect situations where students are at risk of dropping out of the learning process. This is a crucial aspect, because one of the biggest problems faced by online training systems is the high drop-out rate. Finding a way to detect the early signs of this situation is, therefore, a crucial element to remedy it. Furthermore, this capability coincides with one of the main goals of all countries in the educational field, which is to reduce the drop-out rate, especially during the initial stages of education. Educational authorities are, therefore, extremely interested in the progress made in the algorithms to detect these students.

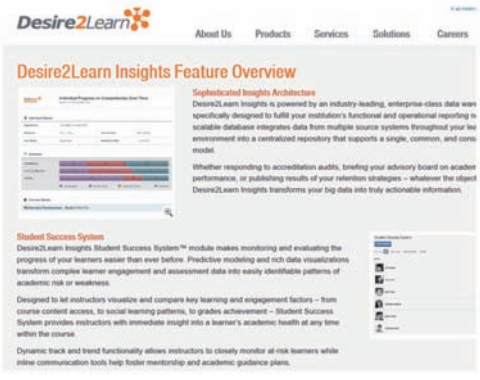
Several market-available products are geared towards increasing these student retention ratios by means of signal detection models. For instance, companies such as Ellucian and Desire2Learn have developed the Course Signals[9] and Student Success System,[10] respectively. The former displays a traffic light signal to indicate whether a given student is adequately completing their course, whether they are at the limit or their performance is showing a drop-out risk. The latter uses a predictive and data display model to identify risk or academic weakness patterns in the students, in which case the system proposes a series of corrective actions.

9. http://www.ellucian.com/signals/
10. http://www.desire2learn.com/products/insights/features/

Figure 1.12 Student Drop-Out Signal Detection Systems

Ellucian – Course Signals

Desire2Learn – Student Success System



Nevertheless, the goal of analysis tools reaches even further. Progress is being made in the development of solutions to customize training activities by providing counselling and guidance to students depending on their tastes and needs. In fact, this is an adaptation to education of a phenomenon that is already present in other contexts such as e-commerce and video consumption. Companies such as Amazon and Netflix have invested large sums of money in developing analytical tools to gain a better understanding of their clients and provide customized service.

These techniques are starting to garner attention within the education field, since mass attendance of new online courses such as MOOCs, with thousands of students signing up for each course, requires formulas to industrialize customization. Stanford University is making inroads in this respect: researchers in the Stanford Lytic Lab[11] are studying how to manage the data to provide solutions that are adapted to each user. The Bill & Melinda Gates Foundation provided $200,000 in funding to develop training for researchers and teachers in this field, and also funded the higher education analysis project known as Predictive Analytics Reporting Framework. This project includes sixteen public and private institutions and has followed up on 1.7 million students participating in 8.1 million learning activities. Private companies such as XRay are also undertaking research into the fundamental variables that determine student behavior.

The techniques that have been identified as learning analytics will, therefore, provide an in-depth knowledge of the behaviors and attitudes of the students. They will also provide new ways to customize their learning processes. This customization should not be understood as merely establishing what subjects each student should work harder at or what exercises would be more appropriate, but will go even further, by taking into account the capabilities of each student and how they acquires knowledge. Learning platforms that fit the needs of every user will then appear, as shown in the following section.

11. http://lytics.stanford.edu/

1.3.3 Adaptive Learning Platform

This is an evolution or rather an adaptation of the aforementioned tools for the improvement of Learning Management Systems (LMS). It will serve to create not only a customized environment, but also one that fits the needs of every student. It is thus not an independent technology, but instead a mix of technologies to attain a series of functionalities to materialize this concept. An adaptive platform needs to take several issues into consideration, including the following:

- A content management, maintenance and delivery component that interacts with students and provides material to support their learning process.
- A study learning database (generally using big data technology) that stores data related to the behavior of students in their learning activities.
- A predictive model that combines demographic data (normally from external information systems) with historical data to establish a relationship between learning and behavior. This will serve to follow-up on the progress of every student and make predictions about future behavior and performance, such as, for instance, the marks they may attain and the potential for dropping out.
- A reporting server that uses the results of the predictive model to generate a control panel where different user groups can obtain information.
- An adaptation engine that controls the delivered content by means of variables such as compliance level, results of the predictive model or student interests.
- An engine that allows all entities involved in learning (teachers, administrators, mentors, etc) to intervene and gain control of the system to introduce specific corrective measures.

There is no one way to implement this concept. Instead, teaching platforms will incorporate all or some of these components, resulting in platforms that are adaptable to a greater or lesser extent. One example of an adaptive platform is Knewton, which is used in the training activities of companies such as Pearson or Microsoft. Figure 1.13 shows that this platform includes functionalities such as allowing both teachers and students to have a global view of all the activity within the platform, as well as to schedule activities depending on everybody's personal needs. It even recommends what exercises should be done and what lessons should be reviewed depending on the learning style of the students and their results.

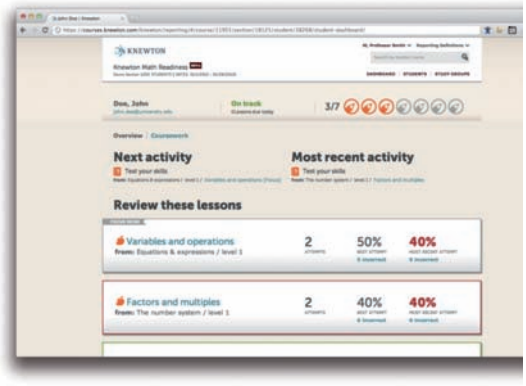
These technologies provide a holistic view of the learning process, even for distance education, so institutions are clearly behind this type of platform. Other examples of this type of platform are Assistments[12] or Dreambox:[13] the former is targeted to teachers, while the latter is used to support school teachers and administrators.

12. http://www.assistments.org/
13. http://www.dreambox.com/

Figure 1.13 Knewton Functionalities

Global View

Activity Scheduling



1.3.4 Open Content

One of the most important movements of the late 20th century from the point of view of content management is the open concept. This model appeared in several fields to counteract a culture that was dominated by, or even based on, intellectual property. Thus, within a short time span, new trends started to appear under the Open designation: open source, open source software, open source hardware, open standards, open access, open design, open knowledge, open data, open information, etc. Most of these instances can fall within the term *open information*, since this applies to different types of information.

It is therefore more of a social, rather than technological, movement, although it is true that different general-purpose technologies are required for its implementation. The Open movement, therefore, has two main foundations:

- Technological: the data are in an open format that may be accessed by other computers. This is achieved by means of technologies such as cloud storage, APIs or standard data representation formats.
- Legal: an explicit license that allows unrestricted commercial and non-commercial use and reuse is provided.

The field of education is not alien to this evolution of the open concept, and there are some variations of this phenomenon that are especially adapted to this field, such as open content, open courseware, open educational resources and open education. These concepts intersect at certain points, but have different nuances:

- Open content. This content is licensed to users more openly than what intellectual property legislation allows. These permits are guaranteed for users without any payment. The open content concept includes permits for reuse in five different ways: retain, reuse, revise, remix, redistribute.

There are also some forms that include certain restrictions (such as commercial use of the content) or requirements (such as explicitly mentioning the author of the contents).

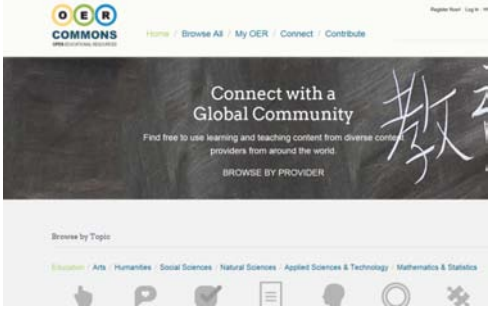
- Open educational resources. These open contents are developed by teachers and are available for use, display and editing (including translation) by anybody anywhere in the world.
- Open courseware. This is the name given to open educational resources that are submitted in course format. They generally include course scheduling material, such as syllabuses and calendars, and any support material, such as text books, classes, presentations, notes and simulations.
- Open education. This concept aims to transfer the above concepts to the development of communities and educational networks, and it requires all forms of open content, platforms and the voluntary contribution of teachers. Open education is not a new concept. In some countries it is even considered a right, and public education guarantees this right for all citizens. Open education aims to extend this concept to a global sphere under the principle that knowledge needs to be shared and needs to reach every corner of the Earth.

These approaches are positive for the development of nations, especially in the case of those that lag behind in securing education for all their citizens. UNESCO, therefore, regards the whole open education movement as a significant initiative and is lending it its full support.[14]

Figure 1.14 Global Initiatives Related to the Open Education Concept

Open Courseware Consortium

Open Educational Resources Commons



Open Education Resources University

Open Educational Quality Initiative

14. http://www.unesco.org/new/en/unesco/themes/icts/open-educational-resources/

In view of the positive effect and magnitude that this movement is expected to have in coming years, there is currently a wide array of global platforms that strive to channel and encourage the creation and distribution of this form of educational resource. Figure 1.14 shows some of them: Open Courseware Consortium[15] is a community that boasts having many universities among its participants and aims to create open courses for the whole population; Open Educational Resources Commons[16] allows users to create their own content; Open Education Resources University[17] acts as a counselor or intermediary to access free courses from prestigious institutions; Open Education Quality Initiative[18] is designed to guarantee the quality of the content provided.

One of the key aspects of this whole process is guaranteeing the quality of the content, which is one of the main hurdles that needs to be overcome. It is important to avoid untrue, biased or prejudiced content, or content that presents values that go against the principles of modern societies, such as racism or xenophobia. This hazard has become even greater since the moment technology made it possible for everybody to create content and distribute it in platforms, and thus to become the creator of a course. This functionality is available for any Internet user in forms ranging from the most basic (using, for instance, YouTube to upload lessons to the cloud) to the most sophisticated (such as Google's Course Builder[19]).

1.3.5 Immersive Technologies

Immersive technology is used to replicate real environments that may be useful for student education. It uses software applications, online applications or other tools to create scenarios that simulate reality. Therefore, as in the above case, it does not refer to a specific form of technology, but rather to a whole range of technologies that can be used to replicate these scenarios or ILEs (immersive learning environments). A wide variety of technologies is used: simulation tools, 3D, augmented reality, telepresence, etc. The main purpose of these technologies is to allow interaction with the IT systems and to adapt the way in which information is presented by imitating the sensory experiences of the real phenomena.

This technology has been making important strides recently, and new technologies are under development and will be progressively incorporated into teaching applications. Below are some examples that are at an earlier stage and are the focus of greater research activity.

Augmented reality and virtual reality goggles. In the first case, the idea is to transfer the concept of augmented reality, that is, digital information that is superimposed over the real information, to a device (goggles, in this case) that is used to see reality. This allows users to be permanently connected and to receive a continuous stream of digital information so as to avoid having to change focus from the digital world (computer, smart phone, etc) to the real world and vice versa. This type of device, al-

15. http://www.ocwconsortium.org/
16. http://www.oercommons.org/
17. http://www.openuniversity.edu/
18. http://www.oer-quality.org/
19. https://code.google.com/p/course/builder/

ready in existence in prototype format as Google Glass[20] or Recon,[21] is a commercial reality in 2014. It will be possible to enhance reality with digital information, and this will be especially useful for certain activities including, possibly, education. The concept of virtual reality goggles is different, because it involves immersing users into a virtual environment. The Oculus VR goggles[22] are the best-known example in this case. Both types of technology can be used to create immersive environments for education.

Figure 1.15 Models of Augmented and Virtual Reality Goggles

Google Glass Recon Oculus

Other wearables. Wearables bring IT closer to our own bodies. Adding sensors to our clothes or accessories can be useful to monitor certain body reactions and variables. In addition, the connections allow users to intuitively, even unconsciously, send commands to the systems. An example of this is the Key Glove,[23] which captures movement and gestures to interact with applications simply by hand movements.

Gesture recognition systems. In some cases, these are related to the above and are based on the use of easily-wearable devices, while in others they are based on gesture recognition models that apply patterns to identify movements (the user raising their hand, moving their body, etc). This type of technology was initially used in the world of gaming, since it allows computers to interpret the movements of the users, thus eliminating the need for unintuitive input interfaces such as joysticks.

Holographic projection. Holographic imaging is an attempt to replace traditional screens in communications among users. They add a feeling of presence, which is not the case with traditional videoconferences. MIT's Media Lab has produced a holographic projector that uses a spatial light modulator (SLM), the key component of digital holography to create holographic videos. New products will be incorporated as this technology is perfected so it will be possible to recreate immersive environments. In the same way as other technologies discussed in this section, many developments use devices related to gaming, which is highly advanced in the field of human-machine interfaces. For instance,

20. http://www.google.com/glass/start/what-it-does/
21. http://www.reconinstruments.com/
22. http://www.oculusvr.com/
23. http://www.keyglove.net/

Queen's University has undertaken research to use the Kinect console to develop holographic systems[24] (see Figure 1.16).

Figure 1.16 Holographic Systems

Holographic system in Dubai International Airport

Telehuman system, Queen's University

Haptic interfaces. These interfaces create tactile feelings that blur the line between real and virtual. Once again, the gaming industry was the first to incorporate this technology: Sega introduced the first haptic interface in its 1976 motocross game, which caused the controller to vibrate whenever there was a collision during a race. These interfaces have been refined and are currently used in everyday applications. For instance, the Samsung Galaxy SIII telephone includes tactile feedback capabilities that mimic the feeling of pressing a button even on a flat screen.

Brain-to-brain interfaces. This technology, which is designed to establish interactions with a system or a person directly by means of a user's thoughts, is still in the experimental stage. The research underway in prestigious universities such as Harvard or Washington focuses on interpreting brain waves by means of ultrasound interfaces placed directly on the head, such as, for example in helmets, although for the moment it has only been possible to transmit very general feelings.

Virtual and remote laboratories. These two interrelated trends are an attempt to recreate a laboratory environment so that users can interact with them for educational purposes. This capability is essential for the distance learning of certain areas of knowledge which are more experimental in nature and therefore require interaction, and where laboratories are of major importance. The first case involves using simulation technologies to recreate not so much the elements of a laboratory but their behavior. This allows students to carry out experiments at any time and as often as necessary. However, the results are also simulations, so depending on the subject, they may be entirely reliable or may contemplate a certain margin of error.

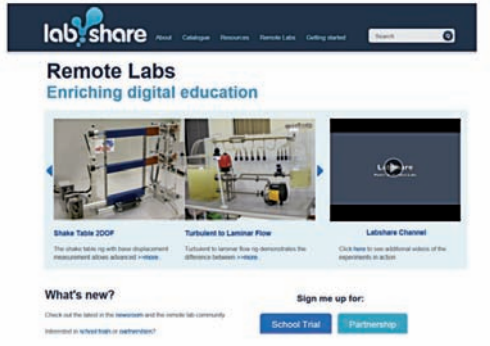
The second case involves access to a real laboratory through a virtual interface. In this case, users can handle calibration machinery or tools remotely, and can view the results through a video image that is

24. http://www.hml.queensu.ca/blog/telehuman

transmitted via videoconference. This cuts down on the expenditure of laboratories, optimizes the use of existing ones and, above all, spreads high-level education to areas beyond the development centers. Some examples of this type of laboratory have been developed in higher education centers such as the University of Colorado. There are also global initiatives such as Labshare,[25] which is sponsored by the Australian government and several of its universities, or iLabs,[26] of the MIT (see Figure 1.17).

Figure 1.17 Remote Laboratories

Labshare



iLabs

1.4 Pedagogical Causes for Change: Research into New Pedagogical Practices

Apart from the technological evolution as a disruptive aspect of change, an ongoing debate is also raging about the way teaching practices should evolve to tackle the challenges of this century. This debate is hence linked to the above sections, since it is rooted in the issues of current education and in technology as an enabling element. These pedagogical practices are as follows:

Learning through exploration. Up until now, teaching (at least in the higher stages) has followed a model that has clearly used the approach of having teachers as the source of knowledge. Teachers are therefore the protagonists of the process, they make the important decisions: what to teach and how to teach it. They are the chain spreading the knowledge and, ultimately, the judge. This model is the most widespread, albeit not the only one, in subjects where practical exploration plays a key role, and tends to be highly theoretical, so the contents are easily forgotten once exams have been passed. On the other hand, many experts favor a more constructivist approach, especially in subjects that are easier to apply. This means that exploration becomes the center of the process and students learn through experience.

25. http://www.labshare.edu.au/
26. http://icampus.mit.edu/projects/ilabs/

New technologies can play an important role in this change. Digital simulators that reproduce the behavior of all sorts of systems allow students to check the result of their proposals. New low-cost production technologies, such as 3D printing and laser manufacture, allow physical elements to be manufactured and tested. The Internet and social networks will make it easier to exchange viewpoints, search for information, interact with resources and with work groups throughout the world and, in short, help students build their own models and experiment through trial and error.

Learning through games, gamification. Games have often been used in environments such as work and education. These types of games have been termed *serious games*, and have resulted in a phenomenon generally known as gamification. Some of these games (typically known as simulators) recreate situations that are extremely similar to real situations and have enjoyed great popularity in many fields (pilots, the army, etc.) for years. On other occasions, they allow many users to interact and check group behavior.

Models of games where the purpose is to involve users to attain certain goals are becoming increasingly common. The competitive nature of games that involve meeting other users or achieving personal goals increases their use and favors the creation of routines. In this way, resources such as obtaining points for completing a given activity, prizes for perseverance or sharing tasks among users become a prime motivational weapon. There are many success stories about the use of this concept, such as the Foursquare application, with thousands of followers, that encourages students to check in at the sites they visit to receive rewards in exchange. Physical exercise monitoring applications list targets for users, such as a daily number of steps or calorie consumption, and are increasingly widespread among users who can even share their results in social networks, thereby increasing the game factor.

Within the field of education, the use of these models as motivation is a reality. The University of New Mexico has developed the Mentira application, a game that combines GPS location and augmented reality to develop Spanish-language competencies. In this game students have to overcome several obstacles and solve a murder mystery. Within a more academic environment, the SICKO platform developed by the Stanford School of Medicine allows students to manage three virtual patients simultaneously, compelling them to make critical decisions in the operating room.

Self-regulated learning. The traditional education model grants users quite a bit of freedom when developing their studies. In some cases, a certain amount of scheduling freedom is allowed, but there are some restrictions. Some of these limitations, especially the ones regarding the schedules to access learning, disappear with the advent of online courses. However, this movement can be considered a small step towards students having more capability to choose their learning. This practice requires, firstly, a great deal of maturity on the part of the student, so it would be mostly limited to higher education. With this model, all students will be able to design their own learning path. In this case, the figure of the mentor, that is, an expert in education who guides students through their learning process, becomes very important. This figure already carries a great deal of weight in U.S. universities, and its role may be even more critical in an environment with greater freedom. There are currently several platforms centered on the mentoring of MOOCs, such as Moocsmentor,[27] which manages the

27. https://www.moocsmentor.com/

participation of its users in learning platforms from prestigious universities such as Harvard, Berkeley or Stanford. This practice also involves an effort when reassessing the evaluation systems that currently have a strict format in accordance with the teaching model.

Customized learning. This practice, which is somewhat related to the previous one, in a way, marks the end of the industrial learning model. It involves understanding the peculiarities of each student so as to provide tailor-made education. The grounds for this customization lie in the existence of a highly-specialized labor market where jobs are not easily interchangeable and in the differences in capabilities among students. In principle, this might seem to contradict the main subject of this report, since there are thousands of students registered in many Internet MOOCs. It opens a debate on the approach that needs to be applied to these courses and on which activities the term 'massive' should apply to: for instance, it is logical to assume that the contents of a master class may be distributed through streaming. However, the concept of massive requires the implementation of certain techniques when it comes to seminars, tutoring and replies to specific questions, and also when providing students with customized teaching.

Microlearning. Teaching activities have been designed following a model aimed at learning broad study subjects. The prototypical content of teaching programs, especially in higher education, includes dense syllabuses with profound and interconnected contents. Since the subject matter is so interconnected, a given subject can only be accessed by studying all the lessons that come before it, resulting in compact knowledge. This model is useful whenever specialized knowledge is required and when the traditional learning model is followed. Nevertheless, other environments that require a more general knowledge of different subjects or where the learning process does not have the same continuity as traditional models tend to divide syllabuses into small independent units. This situation, when taken to the extreme, yields the microlearning approach, which divides knowledge into microunits that users can access at any time of the day. This model will gain importance thanks to new habits, such as a more flexible management of attention or the use of devices such as smart phones, which can be used whenever the student has a moment to spare.

Peer-to-peer collaboration. One of the main criticisms leveled against the current education system is its excessive focus on the individual as opposed to a labor market where team work and collaboration are key qualities to ensure the success of people and organizations. The capabilities offered by information technology to promote collaboration and interaction among people are undeniable. Furthermore, users never hesitate to use, some may even say abuse, this capability, as proven by the success of social networks. The fact is the Internet allows us to communicate and work in groups with anyone regardless of their location. This capability can be used in teaching to favor discussions among peers and team work. In fact, it has already been included, but it still plays a marginal role with respect to traditional approaches. Nevertheless, there are some significant initiatives, such as one from the University of Indiana where researchers, technologists and teachers are looking into a learning platform known as Peer-Led Team Learning (PLTL). This platform is conceived to teach science, and within it small groups of students solve problems together in workshops headed by peers that take on the role of leaders.

This trend is actually associated to others seen above, such as self-regulated exploration or learning, which leads us to think that these practices are not isolated, but rather different pieces within a wider movement that will define 21st century education.

1.5 General Trends in the Educational World

The aforementioned pedagogical and technological evolution processes generate a reference framework with enough potential to change some of the pillars on which education stands. This process is uncertain because the mere possibility of change does not necessarily mean that structures will be transformed. As will be explained later, the inertia of the current structures is powerful enough to have a bearing on its evolution.

The changes occurring parallel to the current positions will be more disruptive, and the degree to which they will or will not displace the current models will depend on the level of their success. Education could be transformed by digital technology in the same way that the music, cinema or press industries have. Several trends with transformation potential are appearing in the education environment. MOOCs are an important element in several of them.

From knowledge consumption to knowledge creation. Traditional education models have revolved around the use of a 'master class' or similar elements as the center of the model. In this case, students were mainly 'consumers' of the knowledge that was provided by teachers. The teacher was responsible for deciding the material to learn and for designing adequate procedures to convey knowledge to the students. In any case, interaction with students was limited.

The change occurred when students started to devote more time to collaboration with other agents (teachers, classmates, online resources, etc.), so that it was this interaction that generated the knowledge users needed. This, in fact, is the original intent of the MOOCs: serving as a platform to share and create knowledge by means of collaborative participation.

A good example of this is the 'project-based' models that aim to focus the learning activity on developing a project. Under these models, the consumption of knowledge is a necessary step towards attaining the ultimate result, but the most important element is the collaborative effort of the students. The education implemented by institutions that form part of the 'high-tech high' is a clear example of this, and their results are extremely promising.

In fact, one of the reasons used to substantiate the better quality of leading universities is the student selection process. In other words, the best universities are in that position partly because of the interaction that students have with other excellent students.

Optimization of the time in contact with the teacher. Almost all recent studies on the quality of the educational systems acknowledge the value of teachers as one of the key elements in the end result. The natural consequence is that teachers become a rare resource that needs to be optimized to make their work as effective as possible. This can be done in several ways:

Firstly, the time the teacher spends with a student should be devoted to the most advantageous activity. Thus, the flipped classroom models allow teachers to spend more time on activities such as resolving questions or tutoring students than in the traditional master classes. This is an advantage that MOOCs provide. This results in 'hybrid models' of teaching where it is possible to select the most appropriate process for each learning task.

On the other hand, excellent teachers will be able to keep in touch with a larger number of students if they are freed of part of their activities and can then focus on the most relevant activities for a larger group.

Customized adaptive learning. One of the main problems of collective learning systems is that no two students are alike, so they all need different learning processes. Solutions would mostly focus on supporting students that fall behind and, in the best of cases, would only affect a small percentage of the students. The difficulty lies in the lack of means to provide customized learning processes to every student.

However, digital technologies are an excellent means towards this end. Monitoring the activities with computer programs helps ensure all students maintain an adequate pace of progress. It is almost as if every student had a support teacher to make the learning process more effective.

A good example of this are the Rocketship schools in San Jose, California, which blend traditional learning with an hour of online math, comprehension and literacy classes per day. Their students are from lower-income families, but they still manage to show better results than students from higher income homes.

Evidence-based teaching. As with any other science, education will undoubtedly benefit from the use of data from digital learning sources and replicate the success attained in the health-care sector, where the follow-up of actuation protocols based on real data leads to lower death rates than when doctors follow their own intuition.

The phrase 'data-led teaching' is used because it will be data, and not beliefs, that will guide the design of learning methods. The obvious first step is being able to rely on those input data, and this is only possible when students work predominantly with digital tools.

Deconstruction of the learning process. Generally speaking, this involves breaking down the educational process into basic tasks so that they can each be completed by the most appropriate actor. The reasoning behind this process is that the cost of coordinating several agents is offset by their greater efficiency in one or more of the tasks.

MOOCs would, therefore, be used to replace 'master classes' so that they could be taught by the best teachers in the world. Local teachers could then spend most of their time answering questions or tutoring students.

A further proposal would be linked to the need to evaluate teachers on the basis of their results. When the person evaluating what students have learned is the same person judging them, a conflict of interest is inevitable. In these cases, independent result evaluations are an effective solution.

Diversification of qualifications. New learning systems entail changes in the qualification systems for the knowledge acquired. The qualification system is currently very complex. On the one hand, it is fragmented because it is possible to receive qualifications for smaller learning activities, but on the other hand it is balanced because it can accommodate several levels of 'quality'.

The current trend is for companies to acknowledge a greater number of qualifications as proof of the capabilities of candidates, especially in quickly-changing technological environments where technology evolves so swiftly that it requires continuous cycles of learning.

When taken to the extreme, the qualification system would include the badgets (sic) that can be obtained in many settings for outstanding participation in certain activities. A relevant example of this would be the credit that is received by participating in open code projects. Employees find this a highly reliable indicator of how candidates can operate in an environment which is close to real work environments.

Chapter 2

MOOCs (Massive Open Online Courses)

The term MOOC is an acronym in English for: Massive Open Online Courses. This is a new type of non-regulated education provided via the Internet. Its main features (discussed in section 2.2) are free access to courses and their dissemination through technology platforms that thousands of users simultaneous access.

2.1 Origins of the MOOC concept

The MOOC concept falls within the scope of the open models described in paragraph 1.3.4, specifically under the OpenCourseWare (OCW) paradigm. The launch in 2001 of MIT OpenCourseWare (MITOCW)[1] by the Massachusetts Institute of Technology (MIT) marks the beginning of a general trend of opening of educational content via the Internet. This totally innovative idea was presented by the President of MIT, Charles M. Vest, with the following words: «OpenCourseWare combines two things: the traditional openness, commitment and democratizing influence of American education and the possibility that the Web provides to make a vast amount of information immediately available.» With this initiative, MIT intended to make almost all of the institution's course contents available for free and open through Internet in a period of ten years.

In 2002 MIT published the first proof of concept, a web page that had 50 courses. In April of 2011 MIT celebrated the initiative's tenth anniversary, with more than 2,000 courses, the incorporation of 33 academic disciplines and more than 100 million students.

The course «Connectivism and Connected Knowledge (CCK08),» held in 2008 by Stephen Downes and George Siemens at the University of Manitoba in Canada, marks in some way the beginning of the MOOC concept. This course was attended by twenty-five students, who paid their respective tuition, and 2,300 students free of charge via the Internet. All of the course content was available through RSS tools, and users attending the course online could participate in the classes through blog posts and treaded discussions in Second Life and Moodle, among other online collaborative tools. This course is also considered one of the possible pedagogical approaches within the MOOC, the so-called cMOOC for their «connectivist» conception of the students' learning (mentioned in more detail below).

It is, therefore, as of the year 2008 when the term MOOC starts to be used to refer to the courses that were similar to the CCK08 (creation tools open, availability for many participants, free access and active participation of the students) and which intended to materialize the OpenCourseWare paradigm.

1. http://ocw.mit.edu/index.html.

2.2 MOOC Features

MOOCs are considered a new model of teaching, based on the following premises:

- They have a course structure, as they already have defined goals and milestones within a set of learning areas or specific topics.
- They are available online, as they are developed in virtual environments and allow connection in remote locations via the Internet.
- Their scope is massive, as the technological platforms through which they are taught allow the access of a large number of students.
- Their content is open, giving any person access to follow-up. In regard to the ownership and license type of the content for its reuse there is no consistent approach and it depends on each platform, as we shall see in section 2.4.

The main features of this type of education that sets it apart from the traditional online education are the following: free access to the courses, the endorsement of prestigious educational institutions or experts in the field, and the support of technology platforms that allow massive dissemination, reaching more than 100,000 students per course. In addition, MOOCs allow interaction between participants thanks to a wide range of collaboration tools and a rich user experience with videos, multimedia content, etc.

Since the beginning of the MOOC phenomenon, and as a result of the proliferation of platforms that offer MOOC, two different approaches have emerged in relation to the paradigms of learning and the structure of the courses. On one hand, there are the so called connectivist (cMOOC), in which students, through their participation and generation of content, are at the same time part of the learning process as the rest of the students. On the other hand, there are the «non-connectivist» (xMOOC), in which the course development is more like a traditional course and the interaction with the rest remains in the background. In these, the student receives a significant amount of structured and sequential information which is subsequently evaluated. xMOOCs are also more focused on the incorporation of new educational methods and technologies in their platforms in addition to increasingly providing more and better content in the courses.

xMOOCs are mostly sponsored by traditional players in the field of education, such as universities, as they most closely resemble the courses or subjects taught in their education supply (degrees, masters, etc.). Currently, almost all of the courses offered in the most popular platforms are xMOOCs.

Besides the existence of common elements within the definition of MOOC, it is important to highlight some characteristics of the two approaches in a way that would be able to respond to the following questions in a qualitative manner: What is their objective? Which is the theory or learning model?

Table 2.1 Comparison xMOOC vs. cMOOC

	xMOOC	cMOOC
Objective	To transmit educational content on a massive scale and in a structured manner. To reach out to new geographical and social segments. To experiment with new formats or themes outside the traditional university environment. To allow free access to quality content.	To promote the connection and collaboration among the participants of the course. To set parameters for future collaboration for the development of the course itself (the course has no defined structure). Targeting «niche» sectors of students.
Which theory of pedagogical inspiration do they use?	Instructivism; focused on the transmission of knowledge from teacher to student.	Connectivism; the learning process is obtained from the collaborative and interactive process of the students, their peers and the instructor.

Source: Self-developed and translated from MOOCs and Open Education: Implications for Higher Education. Li Yuan and Stephen Powell, JISC CETIS. http://publications.cetis.ac.uk/wp-content/uploads/2013/03/MOOCs-and-Open-Education.pdf and http://campustechnology.com/articles/2013/08/15/cmoocs-putting-collaboration-first.aspx

In spite of the existence of these two theoretical approaches, in practice, the promoters of the course (trainers and facilitators) use elements inherent to both the cM00Cs and xMOOCs interchangeably, primarily in the aspects related to the student participation. The practical approach also depends largely on the theme and objectives of the course being offered.

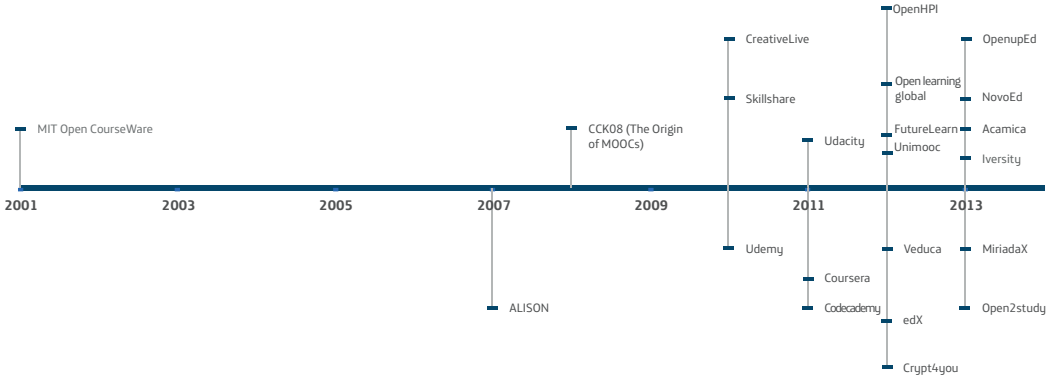
2.3 MOOC Demographics (Supply)

The supply of MOOCs has grown exponentially in recent years. To get an idea of their impact, it is worth describing how they have evolved the platforms that are sheltering them since 2008, when the term MOOC started to be used. We will analyze basic indicators such as the increase in the number of courses, the evolution in the number of users or the knowledge areas involved.

2.3.1 Evolution of the Platforms and Courses

The recent MOOC phenomenon has led to the appearance of numerous platforms through which such courses are taught. As of 2012, an explosion occurred in the number of platforms available in the market, as shown in Figure 2.1.

Figure 2.1 Timeline of MOOC Platforms



Source: Based on the information of each portal and press releases.

The main global platform by number of students, Coursera,[2] was founded in 2011 by two professors from the University of Stanford. The year in which the greatest number of platforms was launched was 2012, especially EdX,[3] a consortium formed by two of the most prestigious educational institutions in the United States; the University of Harvard and MIT.

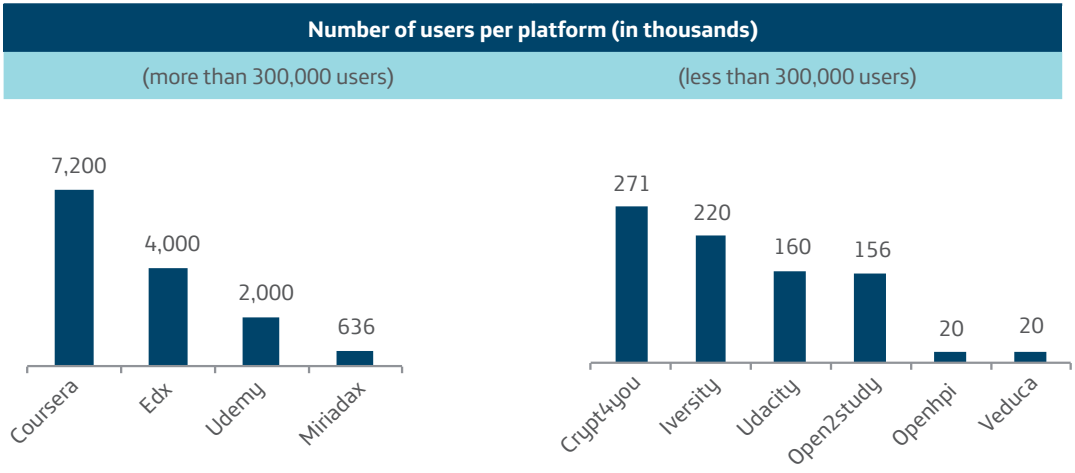
The main Spanish-speaking platform, MiriadaX,[4] was launched in early 2013. It started by offering 58 courses and had 188,802 students enrolled.[5] This platform, an initiative of Universia (the largest collaboration network of Latin American universities) and Telefónica Learning Services, offers the possibility of imparting free of charge MOOCs to 1,232 universities in Latin America.

Not all MOOC platforms come from the academic environment. There are examples of platforms developed by private companies, such as Alison or Udemy, which intended to teach highly practical courses with a focus on the improvement of the student's technical or social skills.

The characterization of the platforms that comprise MOOCs can be performed according to a series of indicators, such as the number of registered users, the number of courses available or the number of universities and educational institutions that have agreements with these platforms.

2. https://www.coursera.org/.
3. https://www.edx.org/
4. https://www.miriadax.net/nuestra-filosofia
5. https://www.miriadax.netiblog/-/blogs/fin-de-la-primera-edicion-de-cursos-cifras-remarcables.

Figure 2.2 Main MOOC Platforms by Number of Users[(a)]



(a) The graph shows those platforms whose number of users was available on the query date (April 2014).

Source: Based on the information available on the website of each platform (data consulted in April 2014).

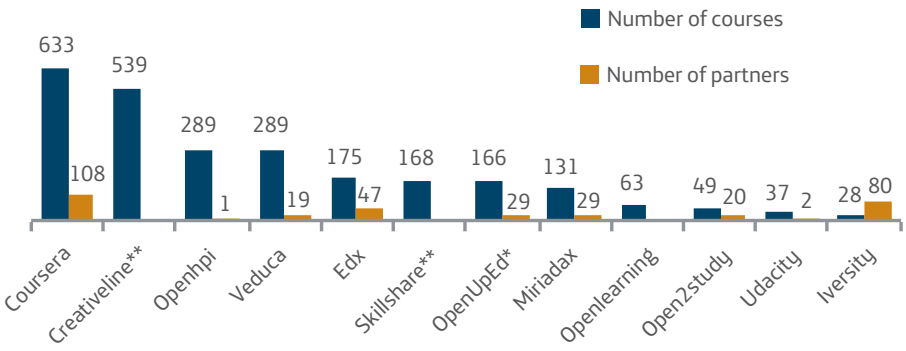
As you can see, the platforms with the greatest number of users are Coursera, EDX, Udemy and MiriadaX. MiriadaX, despite being one of the more recently launched platforms, ranks fourth in terms of number of users. However, Coursera is the one with the highest growth rate, reaching over seven million users in just three years.

Below the 300,000 users mark there is a large group of recently created platforms (Iversity, Open-2study), that focus on specific themes thereby reducing the number of potential users (Cript4you, Udacity, Openhpi) or have a more regional character (Veduca). If we analyze the MOOC platforms based on the number of courses they offer and the number of universities or academic institutions that have agreements with these platforms to offer their courses through them, we can also see that Coursera is the world leader.

Despite the fact that the MOOC phenomenon is attracting a lot of media attention and that some platforms have begun to publish statistics on use and profile of their users, it is not easy to obtain data other than the number of courses and students each platform has. In an attempt to provide reliable information that would enable making a comparison by countries, The European Commission launched the European MOOCs Scoreboard[6] in late 2013. This portal offers updated information on the evolution of the MOOCs in European countries, analyzes the MOOCs' country of origin, and the language in which they are taught.

6. http://www.openeducationeuropa.eu/es/european_scoreboard_moocs

Figure 2.3 Main MOOC Platforms According to the Number of Courses they Offer[a]



* OpenUpEd does not directly maintain agreements with universities or educational institutions, but it is promoted by the EADTU consortium (Europe's institutional network for open and flexible higher education) http://www.eadtu.eu/about-eadtu.html

** Platforms intended for professionals or experts in a particular subject, without agreements with universities or educational institutions.

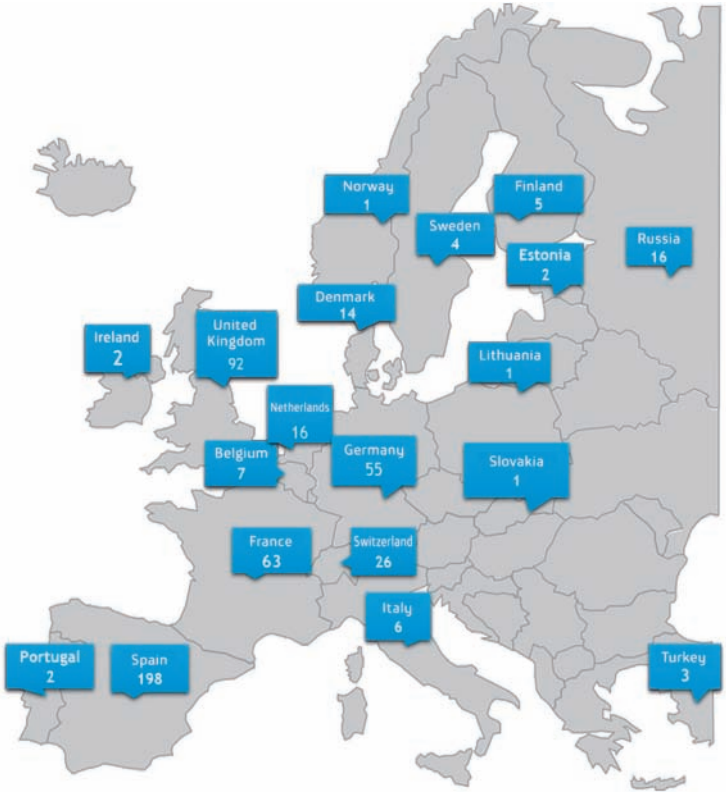
a Conceptually, some platforms many times classify as «courses» short lessons or micro-courses leading to a large number of «courses» as is the case of Udemy, with more than 12,000 courses of this type. The graph shows the platforms whose number of courses and agreements with universities were available on the query date (April 2014).

Source: Based on the information available on the website of each platform (data consulted in April 2014).

Regarding the country of origin, Spain leads the rest of Europe as a producer of MOOCs, well above the other four major European economies (United Kingdom, Germany, France and Italy). It is worth noting that, of the 198 MOOC courses generated in Spain, 51%[7] are available through MiriadaX.

7. Information based on the data from the European MOOCs Scoreboard.

Figure 2.4 Number of MOOC in Europe by Country of Origin



Source: European MOOCs Scoreboard (data consulted in April 2014).

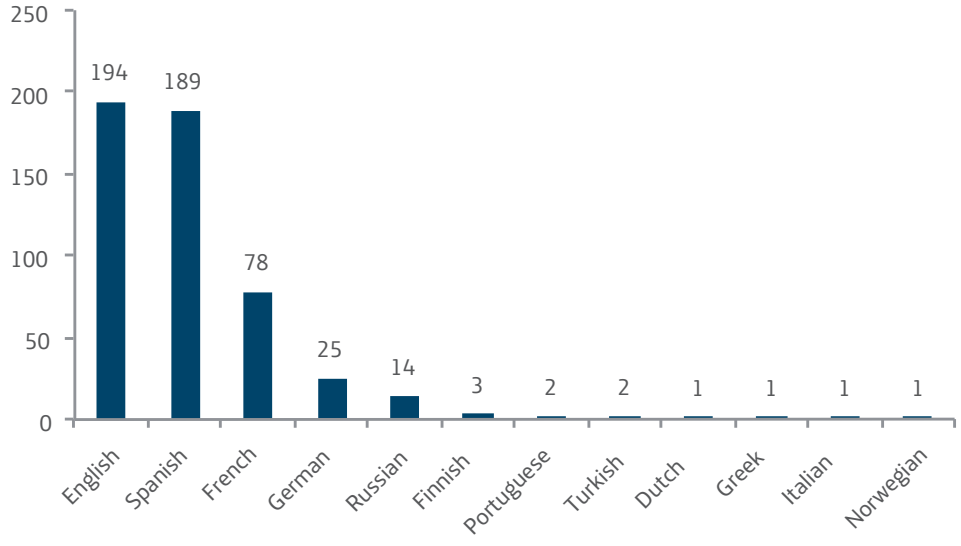
Now, as to the language in which the MOOCs generated in Europe are taught, Spanish ranks as the second most used language.

The existence of a potential market of more than 500 million Spanish speakers[8] is without doubt a great incentive for universities and national educational institutions to create MOOCs in Spanish.

Analyzing the information supplied by the largest platform of MOOCs by number of users, Coursera, we see that English is the dominant language. It is used for 87.7% of the courses offered through this platform. Spanish is the fourth language by number of courses, after English, Chinese and French.

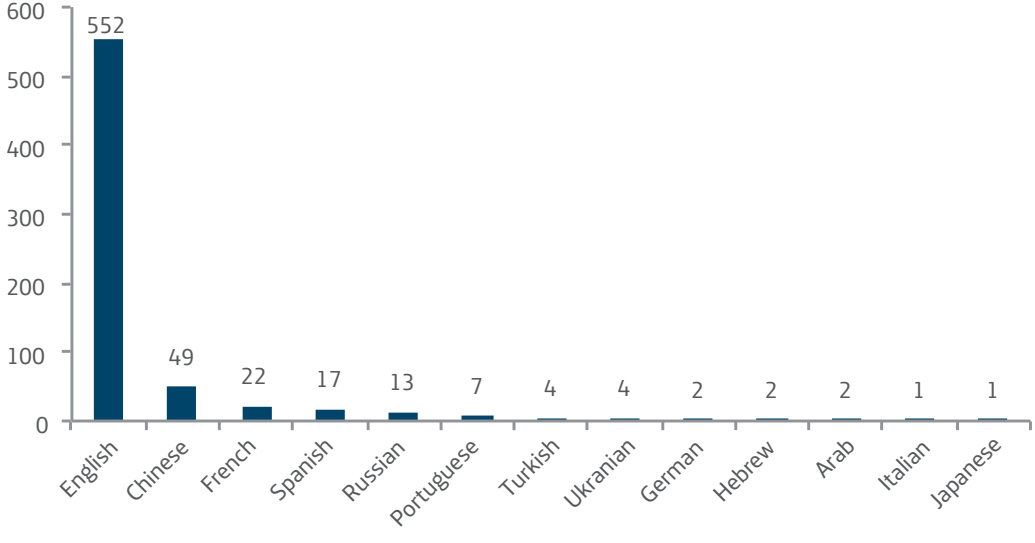
8. Instituto Cervantes (2013): Spanish: a living language.

Figure 2.5 Number of MOOCs Generated in Europe by Language



Source: European MOOCs Scoreboard (data consulted in April 2014).

Figure 2.6 Number of MOOCs by Language in Coursera



Source: Coursera.

The importance of language to reach the largest number of users possible in a world where globalization is the dominant trend, has led Coursera to create an international community that translates the courses into different languages. This way, it increases the geographical area where it can offer its courses (see Figure 2.7).

Figure 2.7 Coursera, International Community of Translators

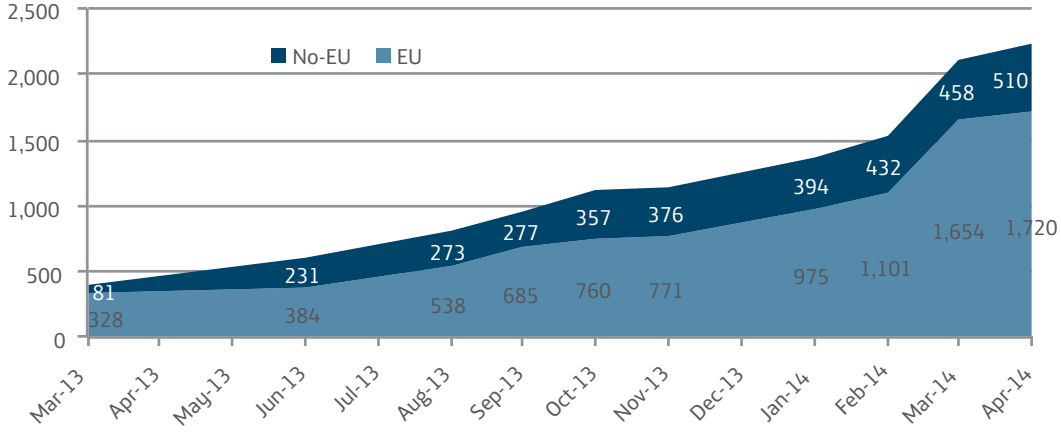
Coursera's mission is to give access to everyone in the world to a better education. This mission is accompanied by a challenge: to ensure that education is within the reach of students, no matter where they live or the language they speak.

In order to face this challenge, we have launched a program called Global Translator Community (GTC). The GTC is a community of volunteers and partner organizations who work hard so the brilliant educational contents overcome the geographical and linguistics barriers.

Find out more GTC (and how to get involved) here>>

Another noteworthy indicator is the evolution of the total number of MOOCs developed in Europe compared to the rest of the world.

Figure 2.8 Number of European and Non-European MOOCs



Source: European MOOCs Scoreboard (data consulted in April 2014).

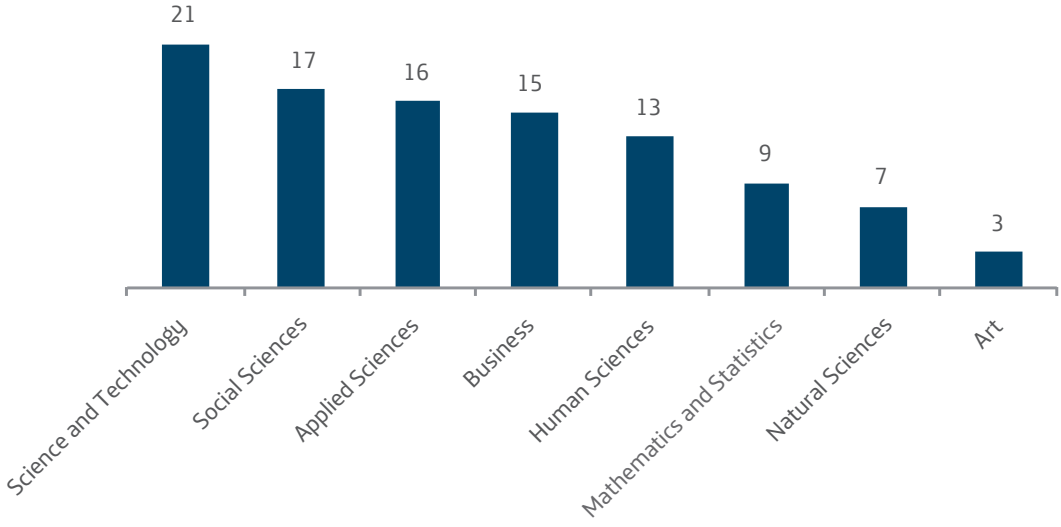
As shown, the total number of MOOCs worldwide has grown in just one year from 409 in March 2013 to 2,230 in April 2014; that is, 445%. During this period, the growth in Europe has been higher than that experienced in the rest of the world (529% vs. 424%).

Disregarding our sources' accuracy in the number of courses reported, which may become obsolete in a short period of time given the variable nature and growth of the phenomenon, there is no doubt that MOOCs have pushed their way in as an alternative learning mechanism. An undeniable fact is that the supply of courses through MOOC platforms has just taken off, and it is still early to make a definitive assessment of the impact of this new teaching model on the pre-existing models.

2.3.2 Areas of Knowledge

The MOOCs, as well as higher education, cover a large amount of topics. Figure 2.9 shows the distribution of the MOOCs generated in Europe according to their areas of knowledge.

Figure 2.9 Thematic Distribution of MOOC (in percentage)



Source: European MOOCs Scoreboard (data consulted in April 2014).

An analysis of the distribution of the fields of knowledge addressed by the MOOCs shows that these courses are preferably focused on those areas in constant evolution, such as science and technology, social sciences or applied sciences. These areas require continuous updating, and the MOOCs are configured as very suitable tools to access such knowledge. Conversely, those disciplines whose updates

are less significant (art, natural science) tend to have a less significant presence among the MOOCs, as there may be other most appropriate tools to convey this knowledge (traditional courses, textbooks, etc.) and are less prone to the interaction between the students.

2.4 MOOC Business Models

The analysis of MOOC platforms launched in recent years reveals two major groups depending on the economic purpose, which is determined in many cases by the entity that drives them. In the first group, there are the platforms driven by profit organizations, which from their inception have been geared to obtain financial gain from the courses they offer through the development of various business models. Generally, these platforms are promoted by private companies. In the second group there are platforms driven by non-profit organizations whose purpose is to generate sufficient revenue for these platforms to be viable and self-sufficient, without pursuing economic benefits.

In both cases, either through the pursuit of economic benefits or because of the need for self-sufficient, self-sustaining platforms, promoters are experimenting with various business models without a clear idea of which will be the dominant model.

Currently, the most common business model is the one involving payment for course recognition as university credits. Students who have successfully completed courses can obtain a validation of the same or college credits by paying the relevant fees, for which the platform gets a commission. Very similar to this model is the one of obtaining certifications by completing the course, which can be recognized by a pupil's potential employers, by the countries at the time of opting for jobs in the public sector, etc.

In the certifications option, platforms are offering their users the possibility of certifying the completion of the courses in employment search portals or in social networks of a professional nature, which provides greater relevance to the candidate's curriculum vitae.

Other business models are directly linked to the access of the course content. While free access to the course entitles the student to some basic content, the user who wishes to deepen their knowledge of the subject matter can access more advanced extra materials by paying for them. These are freemium business type models by which the user only pays if they want to access additional content.

As any Internet service, MOOC platforms can also accommodate advertising. The knowledge of its users also allows a very valued segmentation by online advertising agencies, as it facilitates the insertion of advertising focused on the public user of the MOOCs.

Finally, other models that platforms have begun to explore are more closely tied to the know-how of the MOOC phenomenon. For example, platforms offer outsourcing services so that companies create their own enterprise platforms for training their employees without having to deploy the entire required technological infrastructure. They have also begun to provide consulting services for the generation of educational content with interactive formats.

Table 2.2 Some Platforms and Their Characteristics

Platforms driven by non-profit organizations

Elements of the Business Model				
Platform	Access to Courses	Certification	Other Sources of Income	Partners
EDX www.edx.org	Free	Several types of certificates: compliance (free), Xseries (set of certificates of payment).	Charging the associated universities for use of the platform. Focused services to companies for content creation and use of platform services.	Consortium founded by Harvard and MIT. Various partner universities (48).
OpenUpEd www.openuped.org	Free	Certificate of accomplishment. Possibility of ECT credits.	–	European Union EADTU, group of universities (29).

Platforms driven by companies

Elements of the Business Model				
Platform	Access to Courses	Certification	Other Sources of Income	Partners
MiriadaX www.miriadax.net	Free	Certificates of participation and course completion + Gamification Systems: Karma points and downloadable badges.	Exploitation of the platform. Services for content creation and integration in the platform.	Universia Network (1,232 universities) and Telefónica Learning Services.
ALISON (Advance Learning Interactive Systems Online) www.alison.com	Free	For payment. The price depends on the course.	Agreements with manufacturers. Lease of the platform to professional firms. Content creation services.	Software companies and publishers of educational materials. Universities.

Elements of the Business Model (cont.)				
Platform	Access to Courses	Certification	Other Sources of Income	Partners
Coursera www.coursera.org	Free	Payment for certification	Membership fee to the universities.	Universities (108).
CreativeLive www.creativelive.com	Payment. Free in live broadcast.	Yes, included in the price. Variable price.	-n.d.	Professionals of the sector or topic.
Skillshare www.skillshare.com	Monthly fee or per course	Yes, included in the price. Variable price	-n.d.	Professionals of the sector or topic.
Udacity www.udacity.com	Free / payment for complete course	Yes, by completion of the course.	Affiliation marketing.	Universities (2) and technology companies (e.g. , Google).
Veduca www.veduca.com.br	Free	Payment for certifications and qualifications. First MBA via MOOC.		Universities (19)
Open learning global	Mix	Private courses in blended format.	Open creation of courses on the platform.	Business associations, universities and individuals.
FutureLearn (beta)	Free	Payment for free certificate of accomplishment.	Educational content MOOC via apps.	
Unimooc www.unimooc.com	Free	Free certificate.		Various entities (18): universities, businesses, foundations.
Open2study www.open2study.com	Free	Some paid certificates.	Continuation of instructor-led courses.	Universities and institutes of education (20).
NovoEd www.novoed.com	Free. Collaborative focus.	Payment for certification.		Universities (13).
Iversity Students www.iversity.org	Free	Free certificates. ECTS credits.	Marketing of affiliation. Complementary courses in situ.	European Union. German Government. Universities (80 in initial phase).

Elements of the Business Model (cont.)				
Platform	Access to Courses	Certification	Other Sources of Income	Partners
Udemy www.udemy.com	Free / Partial	Payment In advance.	Charging for use of platform. Affiliation Program. Flat rate package deals for organizations.	Universities, individual teachers and topic's experts.

Source: Based on the web sites of each platform and of the press releases of the companies (data consulted in April 2014).

Table 2.2 presents the business models launched by the different existing platforms in the market, highlighting the access mode of the courses, the different types of certification they provide and the existence of other sources of income through alternative business models.

As shown, most of the platforms offer access to the courses for free. However, where it is evident that the MOOC phenomenon is still in the process of consolidation from an economic standpoint is in the different sources of income that the platforms are exploring. It may be concluded that the new business models are, in most cases, in the experimental phase. There is, therefore, a long way to go in terms of maturity of these models, so that the agents currently starting to work in the MOOC platform ecosystems in universities and other educational institutions or companies, may reach the threshold of profitability.

2.5 User Demographics (Demand)

After analyzing in detail what is happening on the MOOC supply side (evolution of platforms, implemented courses, and business models), it is now time to focus on MOOC users. The usage of the data openly provided by the platforms themselves allows us to perform the analysis of the MOOC users' profile.

2.5.1 Sociodemographic Profile of the Students

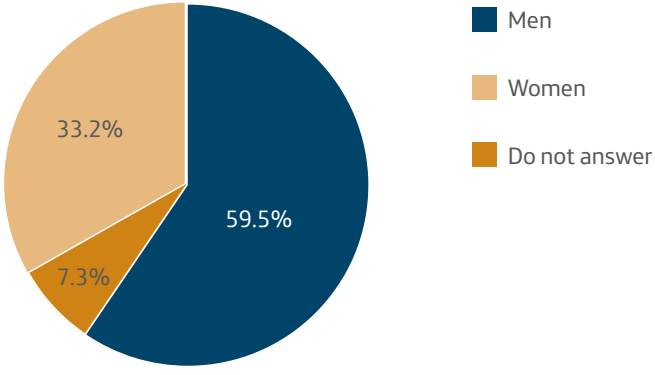
To characterize the demographic profile of MOOC students, the following variables will be used: gender, age, geographic location and level of education. This characterization will be made with the data released by the HarvardX platform, which brings together all the MOOCs provided by this university, through its HarvardX Insights portal.[9] While these data correspond to a single platform, they are properly structured and allow performing interesting statistical analyses. Other institutions, such as the

9. http://harvardx.harvard.edu/harvardx-insights

University of Edinburgh and the University of Pennsylvania, have also begun to analyze the profile of their MOOC students. In the case of the University of Edinburgh,[10] the analysis has been carried out through a series of student surveys before and after the course. These data will also be used to provide details on the profile of MOOC users.

Starting with the gender of the students, the percentage of men registered in HarvardX is considerably higher than that of women (59.5% versus 33.2%).

Figure 2.10 Distribution by Gender of the Students in the HarvardX Platform



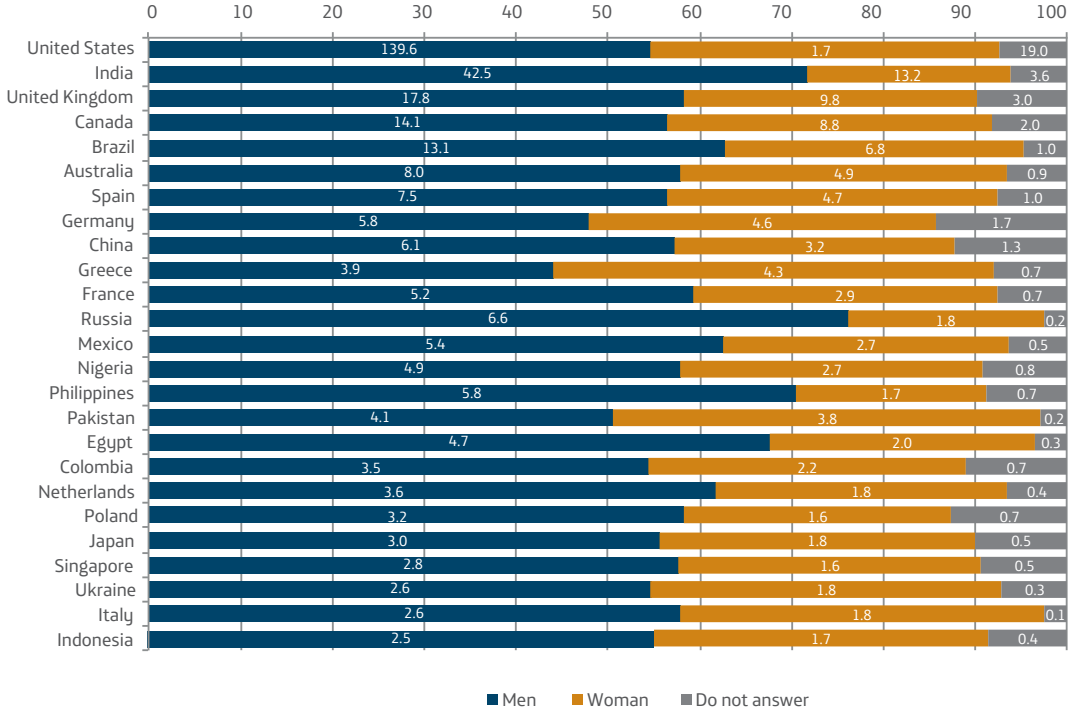
Source: Based on HarvardX insights.

In the case of a study conducted by the University of Edinburgh, 54% of the students were women. This study concludes that gender is not a relevant variable when characterizing the use of MOOCs, given that it depends largely on the topic.

If we break down the number of students enrolled in the HarvardX courses by gender and geographical distribution, in 24 of the first 25 countries the number of men is greater than the number of women. Spain ranks seventh in terms of the number of students enrolled in HarvardX, with a distribution of 56% of men, 36% of women and 8% that do not indicate their gender.

10. MOOCs @Edinburgh 2013-Report #1.

Figure 2.11 Gender and Geographical distribution in the HarvardX platform (thousands of students and percentage)



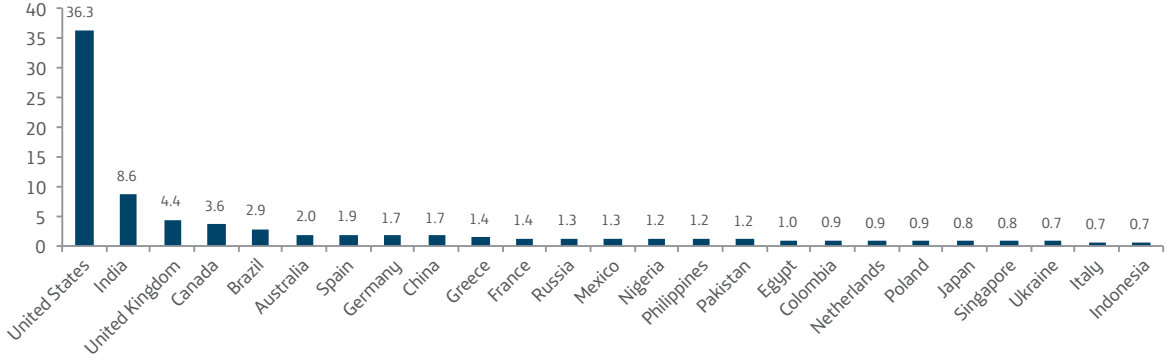
Source: Based on HarvardX insights.

Continuing with the geographical distribution, the following chart shows the origin of the students for the «top 25» countries without gender distinction. More than a third of the enrollments (36.3%) are from the United States; far behind are India and the United Kingdom, with 8.6% and 4.4% of enrollments, respectively. Spain is in seventh place with 2% of the enrollments.

The study of the University of Edinburgh yields similar results regarding the origin of their students. In this case, Spain is located in sixth position by number of students who have completed any of the MOOCs at the University of Edinburgh through Coursera.

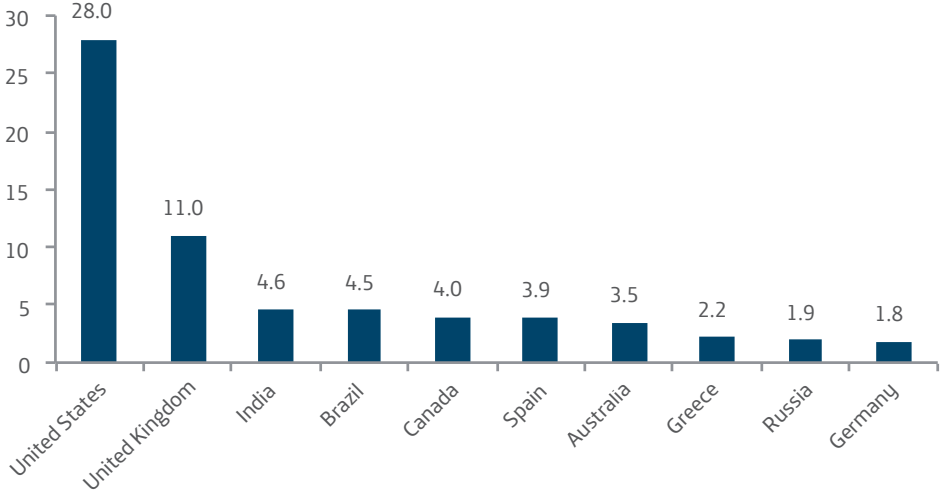
In both cases, English-speaking countries garner almost 50% of the MOOC students. Spain is, after the United Kingdom, the European country with the greatest number of students in both studies.

Figure 2.12 Geographical Distribution of the Origin of the Participants in the HarvardX Platform (thousands of students and percentage)



Source: Based on HarvardX insights.

Figure 2.13 Geographical Distribution of the Origin of Participants Enrolled in the Courses at the University of Edinburgh (in percentage)

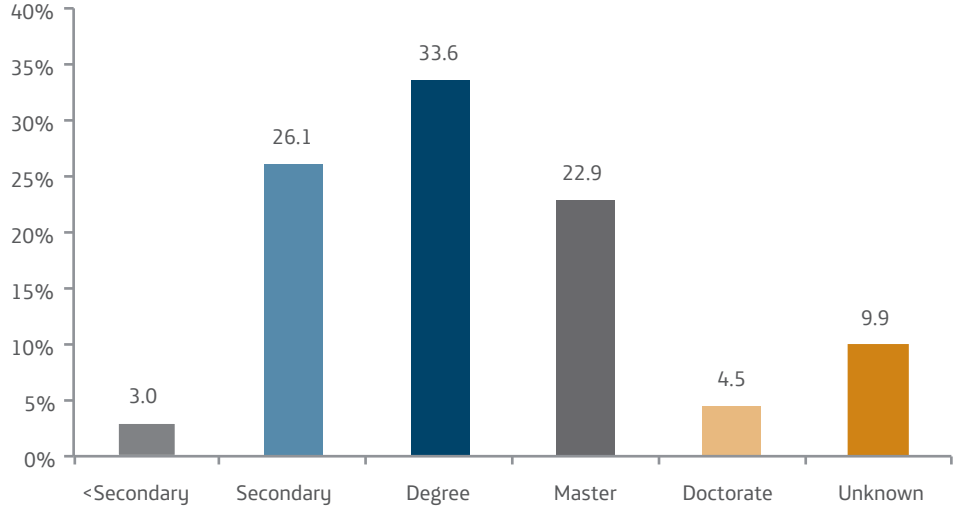


Source: University of Edinburgh.

Regarding the educational profile of students participating in HarvardX's MOOCs, 61% have a university degree (undergraduate) or higher (master, Phd). If we also include the degrees and diplomas of secondary education, the percentage rises to 87% of the participants. The rest of the students declare they have some kind of studies below secondary education (3%) and 9.9% of people who do not

declare the type of qualifications they have. So in the case of the HarvardX platform, students have a high level of education, which could be used as a guideline when defining student segmentation strategies and looking into the knowledge preferences and needs.

Figure 2.14 Educational Profile of the Students Who Enroll in the HarvardX Platform (in percentage)

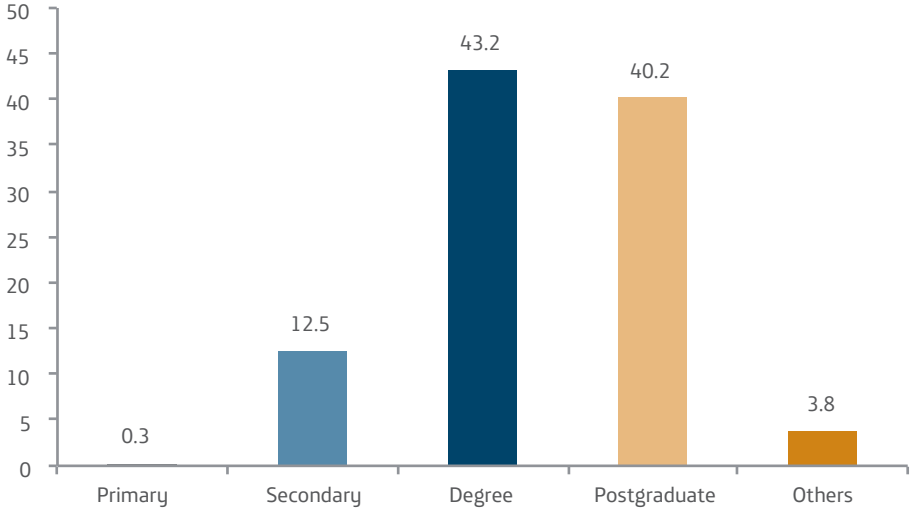


Source: Based on HarvardX insights.

In the case of students at the University of Edinburgh MOOCs, the percentage of students with undergraduate and graduate studies is even higher, and there is a growing trend towards higher studies detected in Figure 2.14.

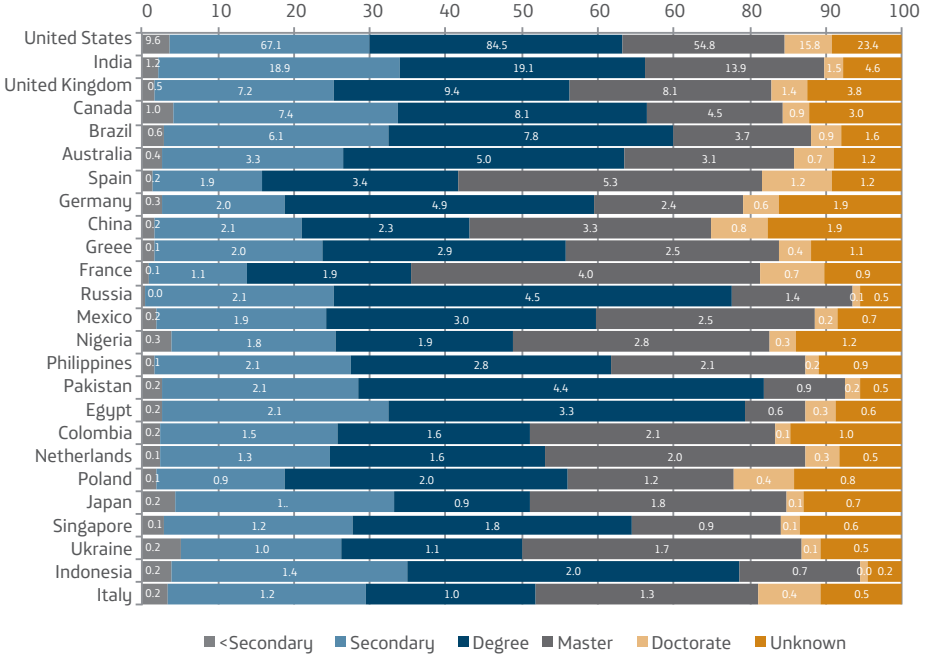
If one analyzes the distribution of students depending on their educational profile in each of the 25 countries with the highest number of students in the HarvardX courses, we observe how the pattern of students with higher education levels (undergraduate and graduate) is repeated in all of them. This trend is most prominent in the case of Spain, since 75.1% of the students have a higher education degree (40.1% of students with masters' degrees, 25.7% with undergraduate degrees and 14.1% with doctorates).

Figure 2.15 Educational Profile of the Students Who Enroll in MOOCs Developed by the University of Edinburgh through Coursera (in percentage)



Source: University of Edinburgh.

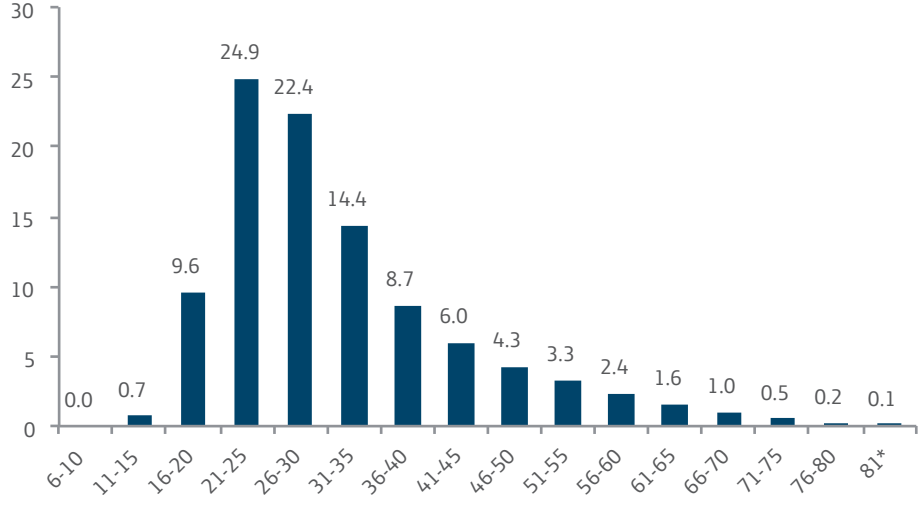
Figure 2.16 Geographical Distribution and According to the Level of Study of Participants in the HarvardX Platform (in thousands of students and percentage)



Source: Based on HarvardX insights.

Age as an indicator will be used to complete the characterization of the demographic profile of the MOOCs. Figure 2.17 shows that 86% of the students are between the ages of 16 and 45. Taking a closer look at this age segment, there is a greater concentration in the group of 21-25 years of age, which comprises 25% of the students, followed by the 26-30 age group with 22% of students. The remaining 39 percent is distributed mostly among the groups 31-35 (14%), 16-20 (10%), 36-40 (9%) and 41-45 (6%). The average age of participants is 28.

Figure 2.17 Distribution of Students by Age Range in the HarvardX Platform (in percentage)

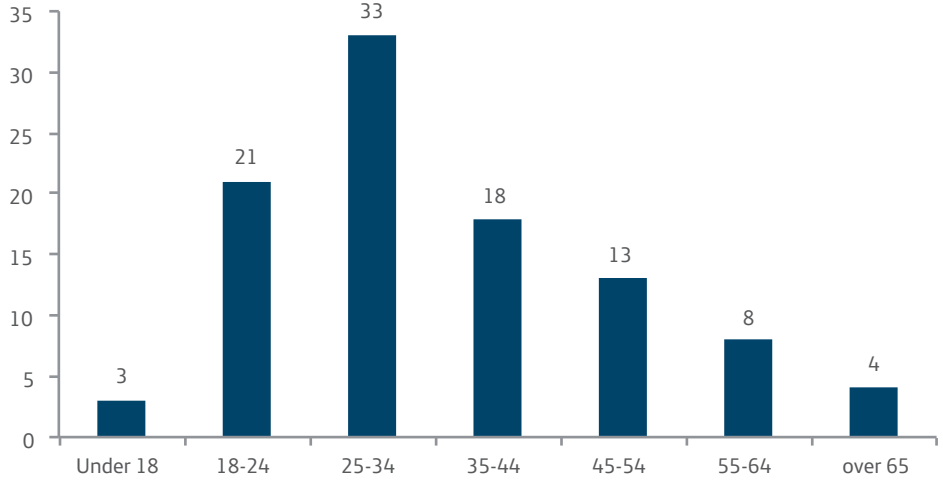


Source: Based on HarvardX insights.

The University of Edinburgh's study shows different age ranges, although the trend is similar, because the bulk of students is concentrated in the age range of 18 to 45 (72% of the total number of students).

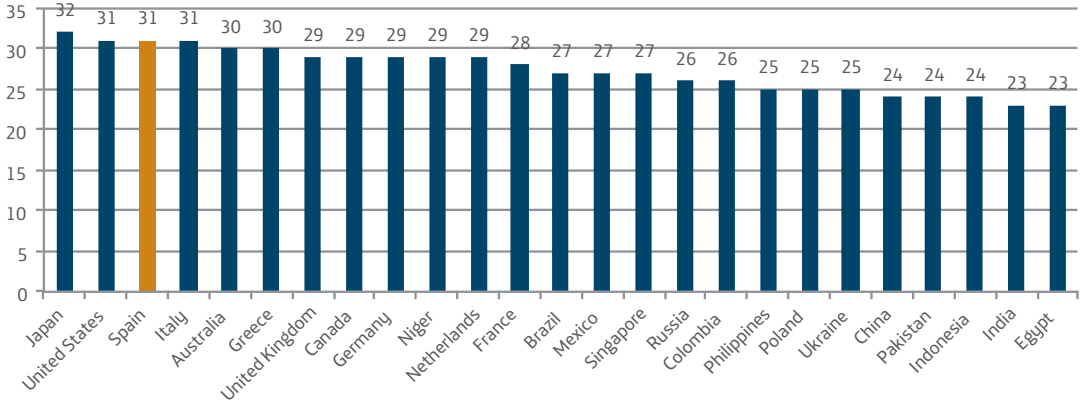
Figure 2.19 shows the average age of the participants in HarvardX's MOOCs by country. Spain is among the countries with an older average age, data consistent with the high number of graduates entering the MOOCs in our country.

Figure 2.18 Distribution of MOOC Students by Age Range at the University of Edinburgh (in percentage)



Source: University of Edinburgh.

Figure 2.19 Distribution by Country of the Average Age of the Students in the HarvardX platform



Source: Based on HarvardX insights.

Based on the above demographic profile, the two studies consulted present similar findings:

- A greater presence of males among MOOC students. However, gender depends largely on the topic of the course.
- United States garners nearly a third of the pupils involved in MOOCs through the considered platforms. Four English-speaking countries (United States, United Kingdom, India and Canada) are home to more than half of MOOC users in the world. Spain is the second European country, after the United Kingdom, with the largest number of students.
- A large percentage of MOOC students, which varies between 60% and 80% in the considered platforms, have higher education levels.
- The average age of MOOC users is below the age of 30. In developed countries this average exceeds 30 years, while in the emerging economies it falls under 25 years.

2.5.2 Motivation and How to Use It

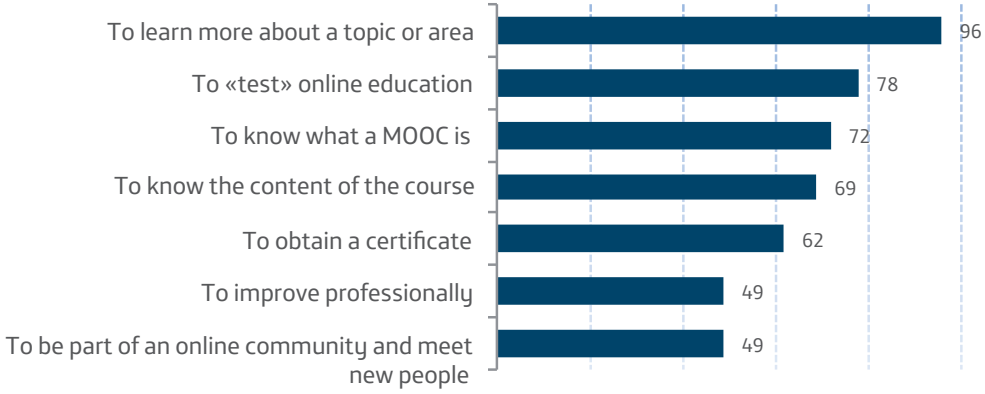
After studying the demographic profile of MOOC users, it is interesting to analyze the motivations that prompt them to take part in this new model of education and the way in which students are involved in the course. This will enable us to respond to the three fundamental questions regarding the demand for MOOCs: Who uses them? (Demographic profile, analyzed in the previous paragraph); Why do they use them? (Motivation); How do they use them? (How to use it).

There are two prominent motivations for students to enroll in MOOCs. The first is a purely academic motivation by which the student seeks to increase their knowledge on the subject. The other has to do with the novelty of the MOOC phenomenon, which increases the curiosity of the students to know and test this new type of education. Other motivations that at first glance could be more important, such as certificates or the possibility to participate in an online community on a topic that interests the student, do not have as much relevance.

It is expected that when the phenomenon is consolidated and the real effects of the MOOCs start to be seen in key areas such as the improvement of the CV, employability of the user, the increase in professional relationships, etc., curiosity will diminish and motivations of a more professional character will step up.

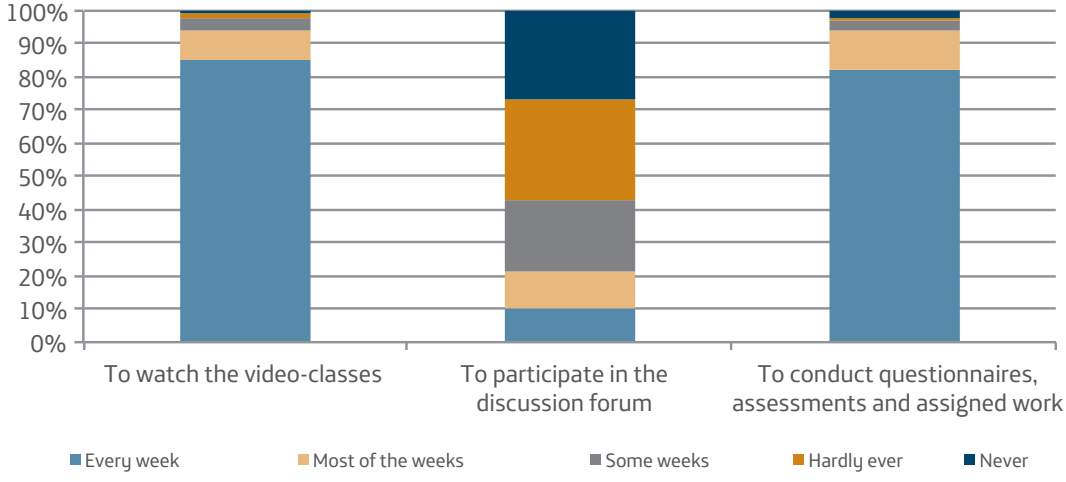
As to how MOOCs are used, it can be seen that participation in and follow-up of the same depends largely on the topic, and it is difficult to obtain general behavior patterns. However, the study conducted by the University of Edinburgh on the behavior of their pupils produces some interesting conclusions, as shown in Figure 2.20.

Figure 2.20 Motivations for Joining a MOOC Course (in percentage)



Source: University of Edinburgh.

Figure 2.21 Using the Different MOOC Features



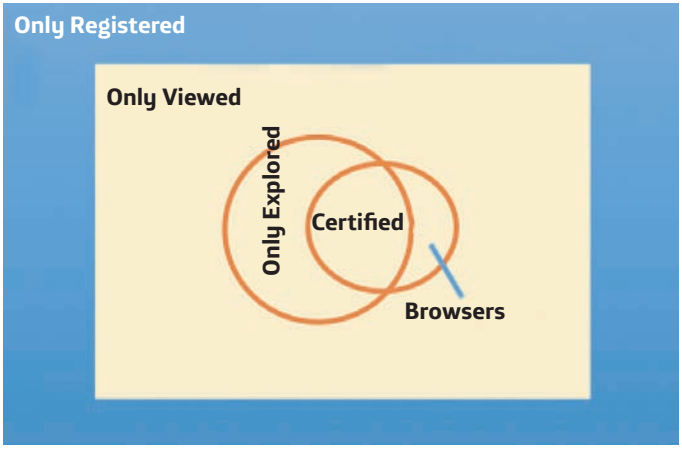
Source: University of Edinburgh.

As shown in Figure 2.21, personal interactions between the learner and the platform precede (watching the videos of each class or conduct the tests and questionnaires) interactions with the rest of the students in the discussion forums, which are significantly less used. This form of use of the courses' functionalities is aligned with the motivation to follow them, in which online interaction was in the last place in terms of preference. It seems clear that, in spite of the new educational opportunities that the MOOC offer and the possibility of generating knowledge in a collaborative environment, students choose traditional methods of acquisition of the course (assistance to master classes and examinations), although these are provided through the powerful technology platforms.

Having analyzed how MOOCs are used, it is necessary to take an in-depth look at the level of participation of the users, because it provides many hints about their behavior. With regard to the degree of participation, HarvardX and MITx[11] have identified four main user groups:

- Only Registered: students who enroll in a course and never access it again.
- Only Viewed: students registered to the courses who access less than half of the content or chapters. They do not obtain certification.
- Only Explored: students who have access to more than half of the course content. They do not obtain certification.
- Certified: registered students who manage to obtain a certificate.
  - A cross between these last two groups are the «browsers» who, in spite of accessing more than the minimum required to obtain the certificate, do not requests it.

Figure 2.22 Categories of Students According to their Behavior within the Course



Source: Based on HarvardX and MITx.

11. A. D. Ho, J. Reich, S. Nesterko, D. T. Seaton, T. Mullaney, J. Waldo and I. Chuang (2014), HarvardX and MITx: The first year of open online courses (HarvardX and MITx Working Paper No. 1).

In accordance with the same study, 34.8% of the users only signed up for one of the courses and did not continue; 55.8% accessed less than half of the course contents; and only 5.1% of the registered users obtained the certification. Those who accessed more than half of the course, but did not obtain the certification represent the remaining 4.3%.

The degree of completion of the MOOCs is taking shape as the best indicator to measure the effectiveness of the courses, which is why it is being widely discussed by numerous universities. For example, the University of Pennsylvania conducted a study at the end of 2013 on 16 courses offered by the university through Coursera.[12] The study concluded that the average rate of completion stood at 4%, ranging from 2% to 14% depending on the course, and increasing in the courses with less credit load and tasks for the students. The study also concluded that the duration of the courses does not significantly affect the completion rate.

In January 2014, MITx and HarvardX[13]published the previously mentioned study, where they have measured the behavior of the students during the period from autumn 2012 and summer 2013 in a set of courses from both institutions, available through the edX platform. The results of both studies put the average rate of completion of the courses and obtaining a certificate at 5%, and 9% if the students who completed the course but did not get the certificate are considered.

In the case of MiriadaX, as of February 2014, the average completion rate stood at 13.6% of the users in the plataform,[14] higher than the one obtained by the University of Pennsylvania and HarvardX and MITx.

As these three examples show, the completion rates are very low. These negative results have led universities to inquire into the possible causes. In this sense, the lines of research are focusing on the motivation that leads students to access courses of this type, on the mechanisms of interaction between students and teacher-student, on the certification system, and on MOOC cultural factors.

The use of the completion rate as the sole parameter to measure the success of the MOOCs must still be handled with caution, and it must be expected to continue to publish data on the use of the platforms. Additionally, the experts in the MOOC field are proposing that other aspects to measure the performance of students be taken into account. These metrics would depend, to a greater extent, on the student usage of both the course materials and interactions and the quality of the same.

12. Http://www.gse.upenn.edu/pressroom/press-releases/2013/12/penn-gse-study-shows-moocs-have-relatively-few-active-users-only-few-persisti.
13. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2381263
14. Information provided by MiriadaX.

Chapter 3

How MOOCs Resolve Educational 'Tasks': Experiences

MOOCs face different challenges when it comes to offering students a quality educational experience. Critical aspects such as the evaluation of students' performance, the interaction among them, the mechanisms of recognition and certification or the customization of the contents are being addressed from different perspectives. The following paragraphs address the different responses that are being offered to face these challenges.

3.1 Student Assessments

The evaluation of courses is one of the technological and pedagogical challenges of MOOCs. The method of assessment varies considerably depending on the subject. The course professor is responsible for designing the evaluations, always according to the technological possibilities that the MOOC platforms offer. In general terms, platforms enable three assessment tools: the short multiple choice test; the *peer assessment* evaluations, by which the students themselves are involved in the evaluation process by correcting the work of their peers, and the automated evaluations of content.

A large part of MOOCs use short automated tests as the main assessment tool. These tests can be multiple choice and carried out at the end of each lesson or embedded within the videos, thus allowing moving forward as the test is being answered.

Other courses evaluate the performance of students with written texts. However, the mass nature of the courses does not allow the professor to make individualized corrections. For this reason some platforms, such as Coursera, are experimenting with a methodology of peer review, whereby each student is assigned the evaluation of another student's work, and it is a necessary prerequisite to complete the course to work on such assessment. The main problem that arises in the application of this methodology is the high student drop-out rate before the end of the course, which severely limits peer allocation. There is also some concern with this type of evaluation due to possible «fraud» or plagiarism that the students can commit, especially if these courses offer the possibility of obtaining official certifications or degrees.

The third most widely used tool for the evaluation of the MOOCs is the automated evaluation of content. This tool is mainly directed toward the evaluation of courses related to software programming in which students must develop a code as the final task of the course. Evaluations of automated content allow validating the correctness of the generated code, reporting the detected errors, and verifying compliance with the specifications proposed to the student.

In addition to these three main evaluation mechanisms there are other methods that assess the interaction of the student throughout the course. These methods, which quantify participation of the student in the different channels of communication (discussion forums, social networking, etc.), are more focused to MOOCs called «Connectivist.» In these, the sharing of knowledge among students comes before the mere transmission by the teacher.

3.2 Student Interactions

The debates surrounding the MOOCs, not only focus on aspects such as its financial viability or low completion rates. There is also some controversy about the quality of the interactions generated among the participants in the MOOCs, interactions of a virtual nature that introduce a component in the impersonal relationship, compared to interactions that occur within the traditional classroom, much more personal and profound. Both positions are valid, but more research into the interactions that facilitate the MOOC should be carried out in order to evaluate them.

Interactions with teachers and other students make up the essence of the collaborative aspects of the MOOCs, although, as we have seen in paragraph 2.5.2, these are still not being used regularly. The platforms that house the MOOCs facilitate interaction based on the exchange of messages both teacher to student and student to peers. This interaction leads to:

- The forums for discussion or questions.
- Tests and evaluated *assessments* by the peers themselves.
- Available consultation hours to consult with teachers.

Depending on the course promoter (university or other educational institutions) the teacher can also act as a moderator for the panel discussions or count on partners to help in this mission.

Thus, the possibilities of interaction that the current platforms provide are quite limited. The platforms are looking for solutions to remedy this situation. An example is the «Learning Hubs»[15] initiative by Coursera which seeks to create communities that provide a blended learning experience. This initiative promotes the use of physical spaces with moderators around the world in such a way that the students may have direct interaction with specialists and with other students.

Another initiative that encourages the attendance of students to local meetings is the creation of meeting points called MeetUps, organized independently of the course. These emerged in the United States, and it is possible to find a MeetUp group on practically any subject in any of the big cities. The MOOC platforms themselves, although totally unrelated to the organization of these meetings, recommend attending them.

These face-to-face forums are appropriate to provide the MOOCs with one of the features of the traditional school which, according to many of their detractors, is missing: personal interaction.

Other tools of interaction outside the platforms themselves are social networks. The teachers responsible for the course or the forum moderators create specific pages in the course in the main social networks to facilitate the exchange of information among students. However, these are still no more than another virtual media, with the limitations this entails.

15. https://www.coursera.org/about/#programs/learninghubs

Figure 3.1 Off line groups of MOOC

Source: MeetUps.com

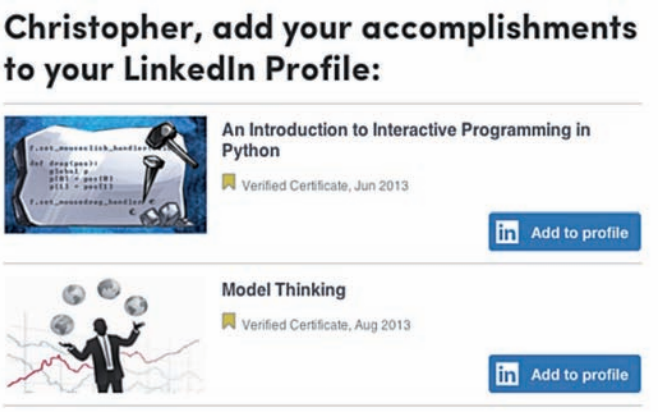
3.3 Degrees

The qualification obtained after completing a MOOC is set as one of the most relevant motivations that compel students to register and complete the courses, as discussed in paragraph 2.5.2. In addition, the issuance of certificates or course recognition with university credits are among the various business models being explored to achieve the economic viability of the MOOC platforms.

In an attempt to innovate compared to the traditional models of certification, platforms are resorting to other reward models in order to achieve greater commitment of the student to the course. Between these new models, two tools are already used in other Internet services: the scoring system through Karma points, positive points awarded by the community of users, and the badge system, which are obtained depending on the student's participation in the course. These elements taken from the paradigm of «gamification» are increasingly being used in combination with the traditional diplomas and certificates. MiriadaX is one of the platforms that has implemented both reward mechanisms, thus allowing, in the case of the badges, exporting to other services such as social networks. These mechanisms introduce a component of fun and fulfillment that leads to increased student commitment to completing the course.

Beyond the mere collection of badges, many of the participants in the MOOCs are looking for some sort of specific recognition after completing the courses. These people often resort to MOOCs in search of very specific skills in relation to their work or area of expertise. For this type of student, a certificate is being used that can be added to the social networking profiles for job search as LinkedIn.

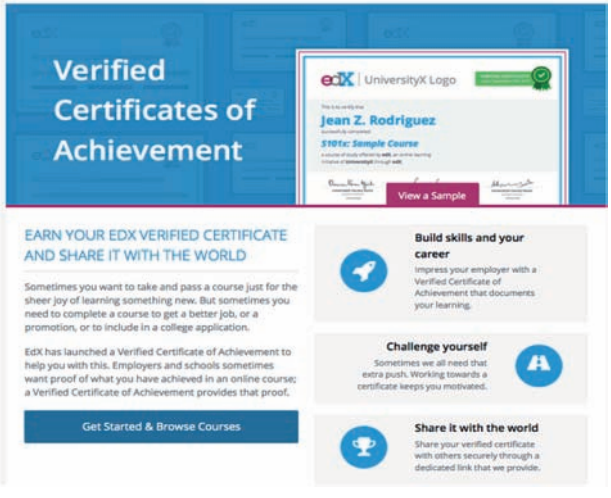
Figure 3.2 Example of Completion Certificate of MOOC on LinkedIn



Source: Coursera.

Other platforms are innovating the certification process by offering, for example, sets of certificates. This is the case of EDX, which in 2013 launched a new concept of certification called EdX Xseries, which consists of a set of certificates grouped around a theme and that must be obtained sequentially in order to move forward. The prices of these licenses vary according to the subject.

Figure 3.3 Verified Certificate of EdX

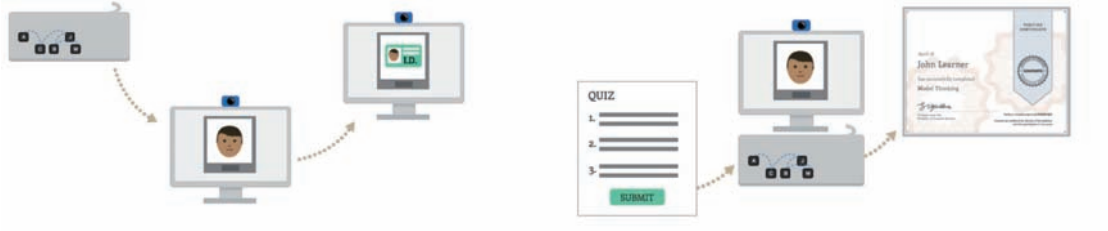


Source: EdX.org

In the field of qualifications and certifications an essential aspect is to ensure the identity of the user. Platforms are developing different methods to do so. For example, Coursera has launched the system known as Signature Track to which the student signs up in the first weeks of the course. Initially the rate of the Signature Track is paid, which can range between about 25 and $100. Then a copy of an official identification (ID card, passport, driving license) must be submitted, and a photo taken with the webcam. Finally, a series of characters must be written on the keyboard so that the cadence and speed of the writing is stored (an imprint of keyboard «biometrics»). This same sequence of characters will be needed after submitting each test.

EdX also launched a mechanism for the verification of the identity like Coursera's Signature Track, which consists of a series of photos that are ordered along the course and that are compared with those which have been previously taken and with the student's official identification.

Figure 3.4 Coursera's Signature Track



Source: Coursera. https://www.coursera.org/signature/course/cariesmanagement/970846

3.4 Customization

MOOCs, born within the OpenCourseWare philosophy, deliver new levels of very relevant customization. This customization is oriented to the two main actors which converge in the platforms: educational entities that develop the courses and students.

From the supply side, the educational entities that design and develop the courses, platforms offer various possibilities for customization: the course creators can choose the format of the classes, the degree of interactivity they desire with the students, the evaluation criteria and the tools to carry out such assessments. In this sense, the market supplies different platforms, such as Wemooc[16] or Course-sites,[17] that facilitate the customized development of the MOOCs.

From the demand point of view, MOOC users also have access to numerous customization tools. Aspects such as notifications, reminders of deliveries, etc., can be customized by the student, improving their user experience.

16. http://wemooc.com/home
17. https://es.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/index.html

Speaking of customization, we are not referring only to the possibilities of adapting the content and functionality of the platforms to the users' preferences. We are also talking about MOOCs as tools for achieving a true personalized education. While the curriculums in traditional education have a defined and quasi-static structure, MOOCs allow the user to create their own curriculums, tailoring the courses to their needs or preferences.

Technology plays a vital role in this matter. The application of learning analytics techniques, addressed in section 1.3.2, in the MOOC platforms allows getting detailed information about student preferences according to their activity on the platform, providing recommendations for new courses that may be attractive to the student, thereby increasing the likelihood of keeping them in the platform. Without a doubt, the teaching customization that MOOCs provide is one of their great opportunities to become an alternative to traditional education.

Chapter 4

Interactions with the Current Educational System

The existing interactions between the MOOCs and the current educational system are plain to see. Existing synergies, such as having university or master's degree teachers, who are more familiar with traditional teaching environments, create many MOOCs by adapting their own courses, or having students that for the most part attended higher education courses with a totally different approach to that of MOOCs, requires an analysis of the implications of these synergies on both MOOCs and higher education.

4.1 Integration within the Current Educational Systems: Replacement vs. Complementarity

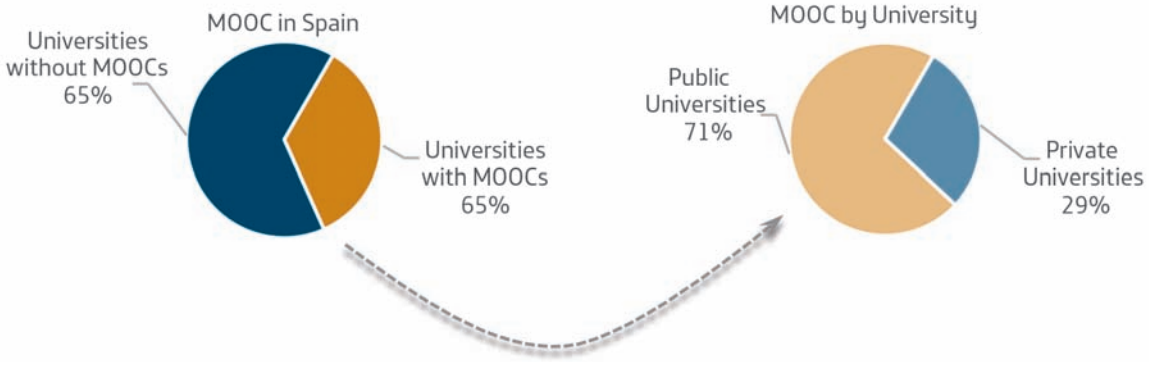
The evaluation of the role of MOOCs on the current educational system needs to start with an analysis of the settings where this educational model is starting to find an adequate niche. MOOCs are essentially having a positive impact on the so-called 'continuing education', that is, to extend the training of active personnel or of university students who wish to continue their formal education with complementary material. Access can be proactive, by the students themselves, or can be provided by companies to their employees. MOOCs are, thus, the ideal complement to the different types of higher education. However, it is hard to conceive that these courses may replace formal higher education in the short term. According to a 2013 survey[18] that evaluated the acceptance of MOOCs by hundreds of universities throughout the world, only 5% of these institutions estimated that MOOCs could really replace traditional education within five years, whereas 67% of them stated that virtual training can never replace face-to-face higher education. These figures clearly show the complementary nature of MOOCs in the current educational systems, so no replacement process is envisaged.

In the case of Spain, the integration of MOOCs in the national university system is still limited, since only 28 out of the 80 universities offer MOOCs.[19] Out of these 28 universities, 20 are public (40% of the total number of public universities) and 8 are private (27% of the total number of private universities).

The issue of the degrees is at the core of the debate on the integration of MOOCs within the current educational system. As shown in paragraph 3.3, the models of certificates provided by MOOCs are still at an early stage of development. The lack of official recognition from the educational institutions that offer them is a significant impediment for the consolidation of these models. Since the degrees and certificates provided by MOOC platforms are still in a budding stage, they cannot be viewed as a short-term replacement for traditional educational institutions (universities, business schools, etc.). However, complementarity mechanisms can be found, whereby MOOCs can be acknowledged by the educational institutions and taken into consideration for university qualifications. Models such as the validation of completed MOOCs for university credits are a step in this direction.

18. http://www.extremenetworks.com/trends-in-massive-open-online-courses-infographic/
19. Social Innovation in Education, Cuaderno Red de Cátedras Telefónica. Los Mooc en España. http://www.catedratelefonica.upf.edu/wp-content/uploads/2014/02/MOOCs-en-Espa%C3%B1a1.pdf

Figure 4.1 MOOCs in Spain. Distribution by Universities



Source: Author's work taken from the Cátedra Telefónica Universitat Pompeu Fabra study (data for December 2013).

This complementarity between MOOCs and the traditional method of teaching is currently being tested in U.S. universities, where certain subjects of the university syllabus are now being taught through MOOC platforms.

In Europe, this complementarity is even more relevant, given the multidisciplinary nature of higher education after the Bologna Process. While the syllabuses of university degrees encompass subjects from different academic disciplines and there is a plethora of dual degrees, face-to-face education is still spread out through different university buildings, so students suffer the hindrance of having to be constantly on the move from one class to another. The MOOC format in this multidisciplinary environment would undoubtedly save students time and streamline interrelations between universities to allow for shared courses. Recognition of the courses with university credits is the first step towards complementarity between the MOOC phenomenon and traditional university teaching. From the point of view of the platforms, the challenges that lie ahead are extremely important and are essentially geared towards providing assurances about the identity of students and evaluation mechanisms to prevent fraud.

4.2 Challenges for Teachers

As mentioned in the introduction to this chapter, most MOOC teachers have a university background, and they normally bring with them preconceived ideas about pedagogical methods that don't quite fit in the MOOC environment. Therefore, they are faced with significant challenges to adapt to the new educational environment of MOOCs, the main one undoubtedly being the skill to create MOOC content.

A series of digital skills are required to prepare a MOOC course of acceptable quality. These skills will evaluate the knowledge and pedagogical approach of each teacher for their subject. The lack of digital know-how is an important obstacle for teachers to adapt to these new educational tools, and it re-

quires a significant adaptation effort. Teaching institutions have a key role in this digital qualification process by facilitating the change.

With this in mind, the European Commission launched the Opening up Education plan[20] in late 2013. The goals of this plan include the creation of new opportunities for teachers and teaching personnel to innovate with new Internet-based educational methodologies, especially with MOOCs. In order to reach this goal, web sites devoted to educational technology list a series of digital skills, all of related to MOOC development that teachers need to master:

- Multimedia creation and/or editing, screencasting..
- Use of social bookmarking to share resources with and among students.
- Use of blogs and wikis.
- Use of CG images and visual content.
- Management of social networks, voting or polling tools.
- Online security and copyright issues.
- Detection of plagiarism in work submitted by students (handling of tools).
- Handling of management tools.
- Use of digital evaluation tools to create questionnaires.
- Use of basic IT applications (word processors, spreadsheets) and new shared and cloud based storage systems.
- Use of note-taking programs to share relevant information with students.

Regardless of the spread of MOOCs, teachers need to keep up to date in digital skills not only because of the technological changes that MOOCs bring with them, but also because their students will be demanding those skills.

The challenges that teachers face in their adaptation to the MOOC world are not limited to technological aspects. There are many cultural challenges, since teachers will need to work with students from all around the world, and therefore with different social views, as well as sociological challenges, because of the dehumanizing effect of the educational process resulting from the lack of personal interaction between teachers and students and the massive nature of the courses.

20. http://europa.eu/rapid/press-release_IP-13-859_en.htm

Chapter 5

Future Scenarios for MOOCs

As described throughout this monograph, information technology, and particularly MOOCs, holds great potential to transform the field of education. This trend is currently on the rise, as proven by the high rate of growth of this form of education and the many universities and business schools that are embracing MOOCs to complement or replace other traditional format courses.

However, it is safe to state that this form of education is still in its infancy, and that these first years have seen it try to reproduce the traditional models and adapt their contents to the digital domain, using the Internet as its distribution platform. As witnessed with other trends, MOOCs will redefine their format, their role and their relationship with legacy systems over the coming years; in other words, their position in the world of education and their way of operating. This section will delve into these possible evolutions and spur a debate over the future form of MOOCs. The debate will also affect the future of formal education, mainly higher education.

This debate is currently taking off. Its outcome is fairly uncertain, so it is impossible to categorically venture to say that one model will become more widespread. The current degree of uncertainty is such that no one is capable of safely predicting the path that will be followed.

The reason for this is that education is a complex activity, involving many institutions that devote extensive resources to it, so changes need to take into account a large legacy system and also certain inertias when adapting to changes, especially large-scale ones. Besides, there are other elements that add uncertainty, since it is impossible to know how technology will evolve in key aspects such as identification systems, virtual reality, the application of learning analytics, etc. It is also impossible to know how students will accept these new forms, or how the labor market will rate degrees obtained through MOOC platforms instead of traditional systems.

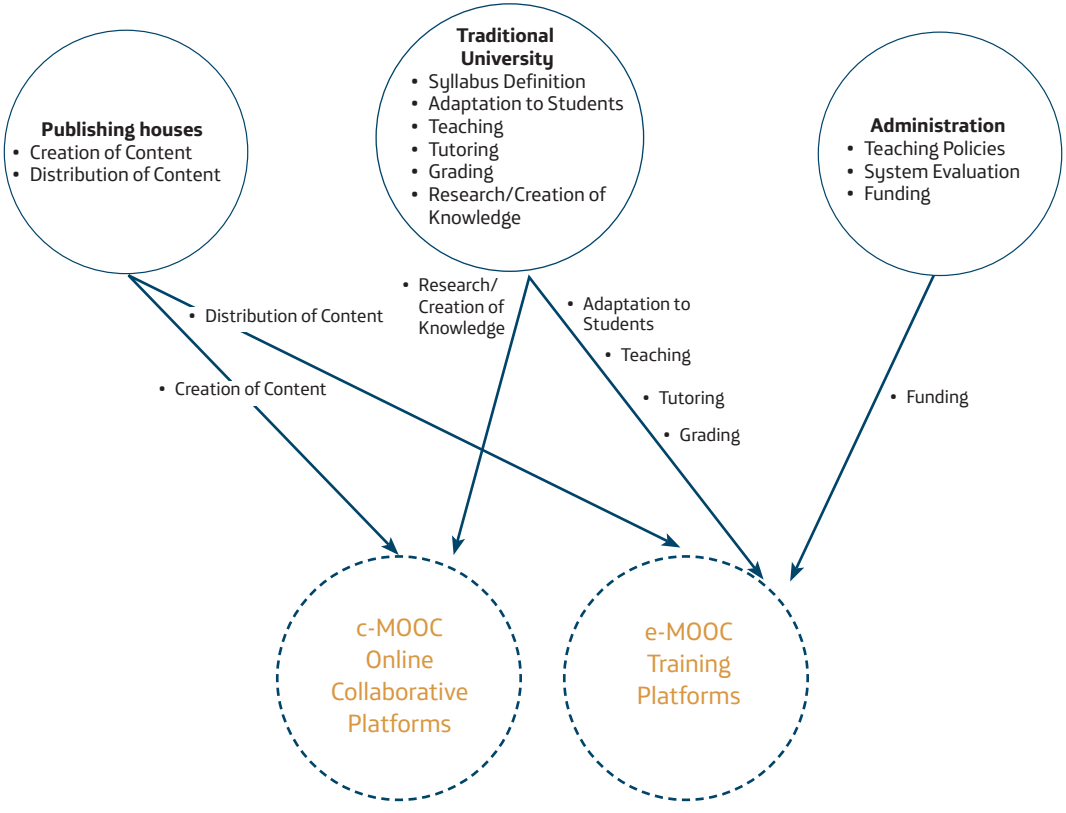
Therefore, there are currently many elements that add uncertainty to the process of selecting a specific formula to describe the expected future of MOOCs. In view of this situation, it is necessary to contemplate different alternatives or scenarios. Firstly, it is important to stress that this exercise does not purport to predict what the MOOCs of the future will be like. Its purpose is to outline the possible evolution of MOOCs in order to understand the role they can play in education. Their future will probably not match any of the scenarios completely, but will instead be a hybrid form with different aspects from all of them. Furthermore, several models will logically coexist.

The initial step for the development of the scenarios involves identifying the main bodies that shape the educational system, as well as their activities. In some cases, certain activities are the exclusive responsibility of a given body, but in others one activity may be shared among several entities (for instance, books may be published by independent publishing houses or by the university). The educational system is therefore built as a structure of entities and of functions performed by each entity. This structure will be modified with the appearance of new entities such as the ones outlined in this report: c-MOOC online collaborative platforms and e-MOOC education platforms.

The appearance of new entities is expected to redefine the roles within the structure. In some cases, the new entities will assume some of the roles of traditional ones, and they will both perform the same activity (maybe with slight differences) or said activity will disappear from the traditional entity if it can really be done more efficiently in the new one. In other cases, activities

that were not possible previously may even appear, such as the creation of student customized syllabuses, in the case of education. Figure 5.1 shows an example of the traditional entities and their functions, as well as a potential shift of some of these functions from the traditional entities towards the new ones.

Figure 5.1 Redistribution of the Functions of Each Entity towards New Entities Appearing with MOOCs



Source: Author's work.

However, the purpose of our approach to the scenarios is not to determine which activities will continue to follow the traditional method and which will be completed digitally. Instead, it aims to establish which training models can appear or improve through the use of MOOCs, and what the consequences of this revolution might be. Although MOOCs can play a relevant role within ongoing business training plans, the proposed scenarios mainly consider the role of MOOCs within the field of higher education because of the sector's scope and the disruptive effect they might have on it.

As stated above, the purpose of this section is not to predict what education will be like in the future, but instead to simply show scenarios that can help us picture the possibilities for the evolution of education so as to design the educational policies. Three scenarios will be considered:

- MOOCs as MOORs.
- MOOCs as Centers of the Higher Education System.
- MOOCs as Centers for the Creation and Spreading of Knowledge within a Community.

Elaborating on the representation model shown in Figure 5.1, Figure 5.2 shows the entities that will appear and the functions that each is most expected to have under each of the three scenarios. A visual model will then be prepared to show the educational environment for each scenario at a glance. The sections below describe these scenarios in further detail and explain the way in which educational functions could be carried out in each of them.

The study of the scenarios also needs to establish a timeframe, since the digital implementation of certain educational activities may encounter hurdles that will surely be overcome over time. The timeframe has, thus, been set for the year 2020, that is, six years from now. A shorter timeframe would not allow any ambitious assumptions, while a lengthier timeframe would unacceptably increase uncertainty and the assumptions would be less predictable.

5.1 Scenario 1. MOOCs as MOORs

Under this scenario, MOOCs focus on providing educational resources, such as books, presentations and other digital-format material. At the same time, other activities that require a greater level of interaction, such as grading, tutoring, mentoring, etc., are not replaced, either because the technology is not ripe or because the habits of the legacy system still carry too much weight. Under this scenario, MOOCs are considered a complement to the studies of universities, or even separate systems that provide second-rate degrees for anyone in the world. The key implications of this scenario are the following:

- Universities keep their status quo. The reason for this is that the real value of universities lies in the activities that take place at the university itself, and not in the contents, so the prestige of face-to-face teaching is maintained.
- The publishing and educational content industry is redefined. It follows in the footsteps of other content industries that can now reach any location in the world through digitalization. It also provides new capabilities, such as self-creation and self-publishing of content.
- International alliances between large educational institutions. One of the consequences of globalization is that many sectors need to transform to adapt to this new situation. Education cannot escape this reality either, and this may lead to market shifts, such as alliances or acquisitions that have already been witnessed in other sectors.

- An inter-university MOOC/MOOR market appears. Under this scenario, the most prestigious universities sell their content to other universities that use it but continue to develop other activities such as tutoring, mentoring or grading independently.

5.2 Scenario 2. MOOCs as the Center of the Higher Education System

This scenario envisages MOOCs becoming the cornerstone of the whole higher education system, which would mean that all the difficulties in digitalizing teaching activities would have been overcome. This assumption may not be entirely fulfilled by the year 2020, but this scenario allows us to picture the implications of a MOOC-based model. It would involve breaking away from the traditional industrial model. However, under this scenario it would be possible to achieve customized teaching at no extra cost, since the system would make a realtime selection of the most appropriate content and way of teaching for every session and every student, using a large number of data and learning analytics technologies. Therefore, two concepts that are seemingly contradictory, such as 'industrial' and 'customized', may become compatible to give rise to a new model. This model also means there will be a university where all the elements required to establish the teaching process will be geographically distributed and the cloud will be the actual bonding element. This will give the concept of 'university in the cloud' its meaning.

The most important implications for this scenario would be the following:

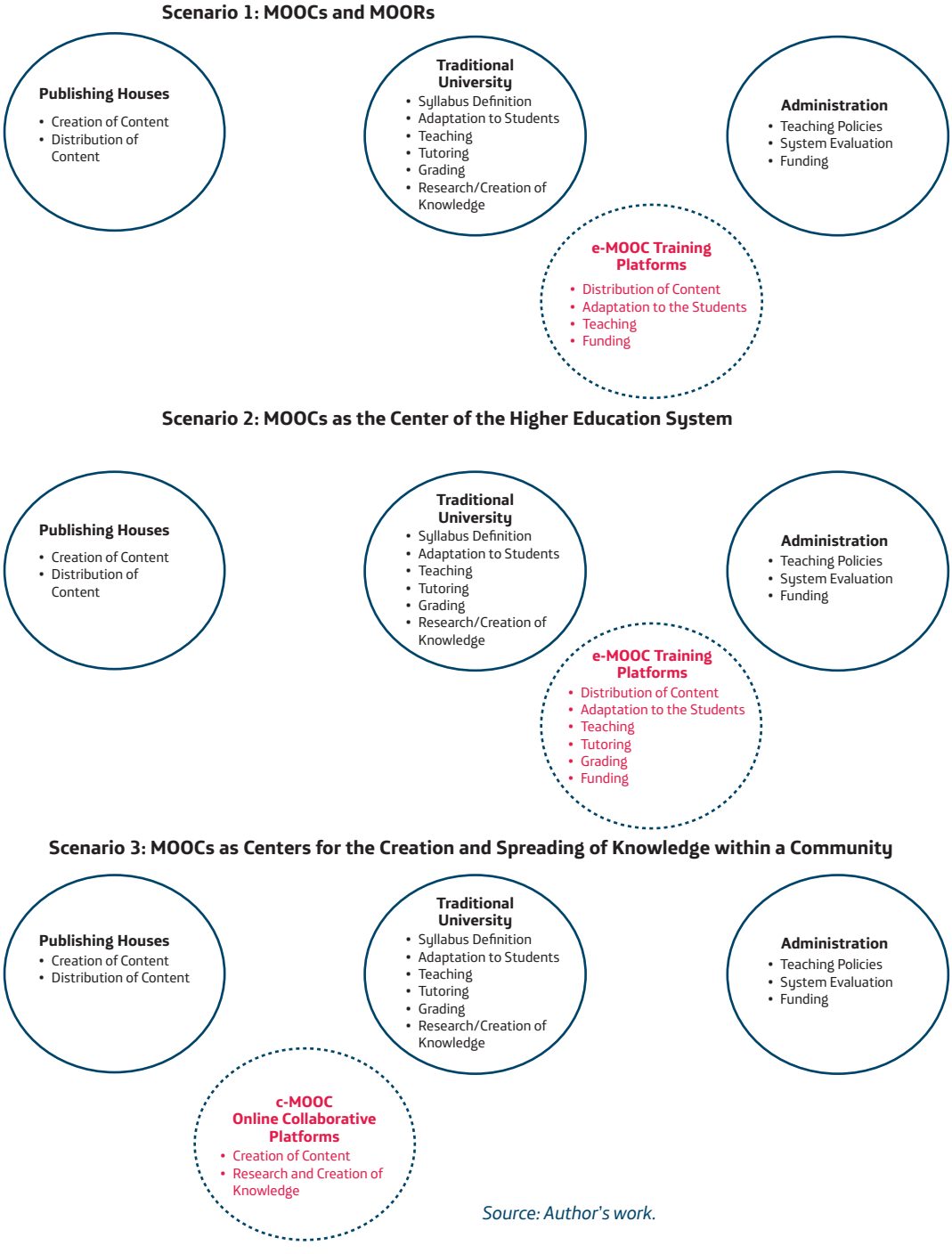
- University concentration process. The universities will extend their scope of action, so the local element will lose importance against the quality of teaching. This phenomenon has been witnessed in other sectors, since the digitalization of activities causes a series of economies of scale where the most powerful and prestigious organizations dominate the global market. This can also occur in the educational field, with prestigious institutions growing at the expense of less renowned universities. Up to now the latter have had their own public, if only for geographical reasons, but this model could make them lose ground or even disappear.

- 'Winner takes all' effect. As a result of the above point, the most prestigious universities impose their dominance over the less renowned institutions. This will result in the growth of the leading centers in certain subjects while a large number of centers disappear.

- Education costs reduction. One of the consequences of this scenario is the disappearance, or at least the minimization, of the physical facilities of educational centers. In fact, universities have been conceived as large centers with enough facilities to house thousands of students, so classrooms, seminars, departments, etc., take up most of the space. However, these facilities will be rendered unnecessary if IT systems can perform many of the functions that are now entrusted to teaching personnel. Furthermore, the automation of many activities also reduces personnel needs and overall teaching costs.

- Appearance of the 'superteacher' figure. Teachers who do not need to repeat the same classes over and over again have more time to devote to their students. They can also rely on many support technologies that will allow them to know every student better, from their study habits to

Figure 5.2 Redistribution of the Roles of Every Entity towards New Entities that Appear with MOOCs



Source: Author's work.

what they find harder to study. They will, therefore, be able to provide a customized service to a large number of students, even students in other countries.

- Increased number of degrees with the same MOOC content. MOOC courses thus appear as open courses that accommodate different study habits. This is not only restricted to the current options of face-to-face or distance learning, but there can also be intermediate options depending on whether mentoring, in-depth study of a certain field, or specific needs, among other things, are required or should be addressed.

- Overcoming geographical restrictions of universities. Students will not need to travel to attend the best universities. Consequently, they will most likely remain in their countries of origin to complete their studies. There could even be a paradoxical scenario where certain countries lack schools in some areas of knowledge but still boast some of the best students, on a par with those of the leading powers, through the use of MOOCs.

5.3 Scenario 3. MOOCs as Centers for the Creation and Spreading of Knowledge within a Community

This scenario presents a redefinition of the MOOC model whereby the teaching aspect takes a back seat in favor of the role as the center for the creation of knowledge. Its main purpose will be, therefore, to allow virtual communities to congregate and become the hub for professionals and creators of knowledge. In reality it would be mimicking the 'wiki' model, but with increased capabilities since it would include new functionalities that could be applied to generate both science-related high-level knowledge as well as more specific knowledge, even knowledge that only makes sense within a given time setting, such as local matters, trends or projects. Universities or other entities would gather this body of knowledge to produce specific courses.

The most important implications for this scenario would be the following:

- State-of-the-art crowdsourcing. The model for creation of content by a community becomes more general and evolves from peer reviews to reviews by thousands of users as crowdsourcing becomes the most natural way of creating and validating those contents. This results in a dynamic state-of-the-art that reflects the status of the knowledge of a community at a given moment.

- Constantly updated content. This approach ensures that the contents are constantly updated, since they are receiving comments continuously. The main beneficiary of this is universities that were outside the world top ten and, nowadays, account for most of the students.

- Students integrate within the debate and shared knowledge networks. From an educational point of view, this allows them to debate about their problems not only with other students, but also with real professionals. They will then be as up to date as the professionals themselves and will have first-hand knowledge of the current state of industry.

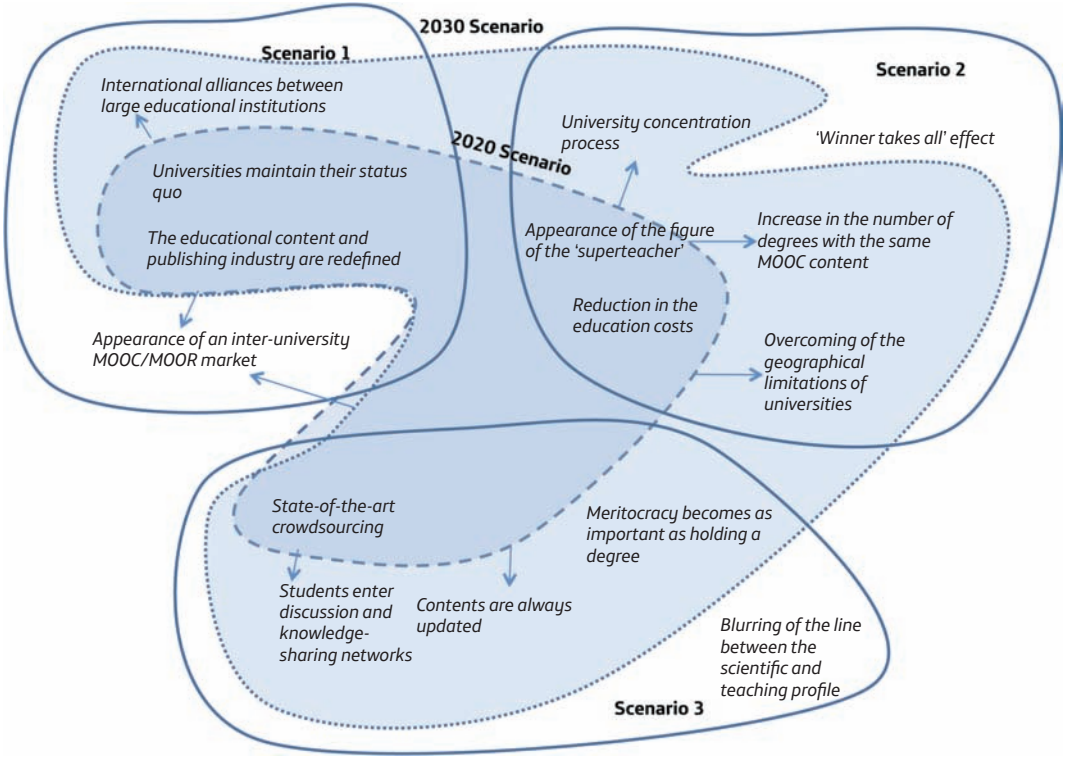
- Meritocracy becomes as important as holding a degree. This means that students are valued not only for the degree they may obtain, but also because of their position within the meritocracy scale that reflects each student's contribution (this situation is similar to the one found in open code projects).

- The line between the scientific and the teaching profile becomes blurred. One of the results of this collaborative and cooperative model is that it becomes hard to distinguish between research activities per se and teaching. It will also become hard to tell between the scientific and teaching profiles of teachers.

5.4 Evolution of the Scenarios

As stated above, the purpose of this exercise on scenarios is not to predict what the world of education will look like beyond 2020, but instead to analyze the potential lines of evolution, the possible moving forces and their consequences. Three scenarios have, thus, been developed to portray three possible futures. However, in the end the evolution of teaching in general and MOOCs in particular will take as-

Figure 5.3 Scenario Evolution Model



pects from all three scenarios, as shown in Figure 5.3. It will not be a still frame, but instead a model that will evolve over time. As an example, this image includes a solid line that shows a possible evolution of the MOOCs by the year 2020, and a dotted line that shows the year 2030, to graphically represent the evolution process. At this point it is important to stress that this is not an estimate, but instead a model of evolution where both the dates and the status of the MOOCs should be considered a mere example.

It is clear that the pace of this ongoing evolution will be dictated by technology and the inertia of the current legacy systems. Although these are two major challenges, especially the second one, which is harder to overcome because it is related to deeprooted habits, it is safe to say that MOOCs will have an impact on educational systems. Furthermore, technological concepts such as the cloud and other more general ones such as social networks and globalization will become key elements of the educational system of the future.

Chapter 6

Transcript of the MOOC Expert Meeting

The drafting of this report has benefited from the participation of a group of experts in different areas who have contributed their vision with regards to the MOOC (Massive Open Online Courses) phenomenon. This section contains the literal transcript of the meeting that took place on May 6, 2014 at the headquarters of the Fundación Telefónica in Madrid. The participating experts have contributed their vision about the impact of MOOC on university education, the access to very high-quality educational content for everyone, and the role this new form of dissemination of knowledge is going to play in improving the employability of students. All this without neglecting the technological aspects, related to the platforms that support them, or the economic ones, like the business models that are being implemented to ensure their sustainability.

The discussion was guided by the contents of the initial version of the report, provided in advance to the experts. From these contents and the prior experience of each expert, a series of questions was developed to guide the individual interventions. After a first round of participation, a joint debate was conducted.

Figure 6.1 Meeting of Experts on MOOC

6.1 MOOCs as Tools for Optimizing Educational Resources

José Luis Cabello
Social Networking Service
Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado
Ministry of Education, Culture and Sport

Starting questions for his intervention:

- What role can MOOCs have as a means to optimize public resources that are dedicated to the educational system?
- How can you solve the problem of the lack of training for teachers to design and create MOOC courses?

Figure 6.2 José Luis Cabello

With regard to the questions, I would like to point out that they are quite relevant. The optimization of public resources is something important and undoubtedly these new training modalities can allow initiatives that will lead to that goal. In fact, in many European countries large investments in education have been made in relation to ICTS, without achieving the expected results yet.

Spain is the number one country in hours of teacher training in ICT but we are slightly below the average ICT integration level. We cannot deduce, therefore, that the current training has been very effective in spite of the great economic effort that has been made, or that a sufficiently effective use has been made of the public resources devoted to this purpose. We at the INTEF, which is the National Institute of Educational Technologies and Teacher Training, are developing a new framework for professional teacher development. We believe that to achieve such ICT integration, one of the key points is to develop the digital competence of teachers. We are dedicated to the training of teachers in non-university levels, but it is actually a postgraduate training, as teachers are university graduates and therefore are highly competitive students.

How can the massive online open courses help? We saw that one of the projects we had to develop was new training methodologies. Training, in the cited professional teacher development framework, has three core points. The first is the professional competencies of teachers (we need to create a framework that indicates which are the required skills for the twenty-first century teacher). The second point is related to the new training arrangements that we have to introduce, and the third with the changes that we should include in the regulation of teacher training. In the area of new training modalities, the first line of action we proposed was a pilot plan for massive teacher training courses to test how useful and effective it could be. And we did. The first course was conducted at the end of 2013 and the topic we chose was «personal learning environments for the professional development of teachers». The platform we chose was OpenMooc, which is used by the UNED, but we made an adjustment as we wanted the teachers to also be content creators. We created a new tab that we called «community» and we complemented it with a portal created by Wordpress where all the blogs of the course participants could be added. What is certain is that the response was interesting: we recorded more than 10,000 teachers, of whom about half were in Latin America and the other half were from all over Spain. Of the more than 10,000 registered, about 7,000 started activity in the course. Of these 7,000, more than 1,000 teachers completed the course, a percentage that we can consider a success, considering the demanding character of the activities plan.

With the platforms used, we confirmed that the videos should be more than the experts' explanations to outline the key points. What we did was add to each unit an explanatory video of the goals, then a second video explaining the key concepts and finally a third video that focused on how to carry out the tasks. As you can see, the approach is quite different from the traditional MOOC, that provides the explanation of contents by an expert, and where the activities are usually reduced to surveys or questions to the expert in the forum. We were looking for interaction; the creation of a teacher's learning community.

The methodological orientation of this course is, therefore, massive open courses oriented to the social learning by gathering contents that blend individual content generation, generation of learning communities and Internet dissemination of everything that is done in the course. What is certain is that, for a course in which the teachers had no official certification, we have some quite surprising activities results. Teachers created up to 1,700 blogs that have had more than 90,000 visits. The course not only serves to ensure that teachers develop a series of competencies, which is expected, but also to disseminate via the Internet all the training proposals and everything the teachers have done. Throughout the course, 120 virtual communities have been generated. In particular, the virtual

community on Flipped Classroom is still active. In the forum, 1,500 threads of discussion were created and the participants formed a group on Facebook where they interacted. They were given digital emblems and teachers have put them on their blogs. This contributed to the dissemination of course. Twitter has been one of the keys in the communication: the course hashtag had 21,000 messages in the first thirty days and it also generated other hashtags and more than 1,000 daily messages on Twitter. Many MOOCs limit their activity to the platform itself. We have seen that for teacher training, we are not interested in this type of massive courses. We are interested in a massive course that spreads itself through the Internet to disseminate what they are doing and combine face-to-face meetings: a proposal called MOOCcafé, which was a trending topic on Twitter. Teachers met in locations everywhere, including Latin America.

In regard to the assessment, this can be a problem in massive courses. There is an automatic evaluation, that the platform generates, but what we did the most was peer assessment which also automated the delivery of digital badges. Equally important was the teachers' self-evaluation about what they had learned. It is a massive open course model with connectivist guidance (cMOOC); it is not a content delivery course model (xMOOC). Perhaps the courses at the universities, such as the Coursera model, are based on content delivery models. However it is important to pay attention to the latest Coursera initiative, in which they are already proposing associated learning communities to the courses (Learning hubs).

As to certification, this is something that we are asking ourselves. We are now carrying out the second course, which decreased in the number of registered users. For this reason we ask ourselves: if there were an official certificate, would there be more teachers that would take the course? I believe the answer is yes without a doubt. But there are regulation issues. The current regulations on teacher training do not address the possibility of massive courses, which is why we have to consider changing them. This is something that we will have to do in collaboration with the autonomous communities. We will have to analyze the results and see to what extent these massive courses can be useful.

Another area in which we are thinking to optimize resources and also generate help and support to the teaching and learning activities is to create massive courses for families and students. The network support for student learning can be another area that the massive courses facilitate. The issue is not only to deliver more content to the teachers, but also questioning what we should do with the content. Contents are already on the network, but just as important or more so, is what do we propose to learn? What is generated as evidence of the learning? Is it a questionnaire that allows us to see that a student has actually learned a series of concepts? In addition, if we are speaking of the development of skills, these skills are tested by making them effective.

6.2 The Impact of MOOCs on University Education

Timothy Read
Director of UNED Abierta
National University of Distance Education

Starting questions for his intervention:

- How do think «classic» undergraduate qualification will evolve by the appearance of the MOOCs?
- Which would you foresee as the remuneration schemes for teachers in a context in which the MOOCs attain greater importance?

Figure 6.3 Timothy Read

To begin with, I will comment that the last assignment I had was to initiate UNED Abierta, which was prior to the massive online open courses. We started in July 2012, and we launched around 20 courses in the OpenMOOC platform, from our own center of Centro Superior de Enseñanza Virtual (Superior Center for Virtual Education), since at that time we did not have our own platform. This wasn't so much of a change for us as we normally have thousands of students, so the numbers as such do not scare us. It is possible that the MOOC produce certain changes in distance education but I also have a certain feeling of déjà vu, because I remember how some ten years ago we had discussions and studies on open courses and how they were going to change education. But at the end of the day we need a coordinated direction at many levels, it is not just about the teachers deciding that they are going to

start using the open or massive courses. We need institutional support and also support from the government authorities, because at the end of the day, the teacher complies with the curriculum that is approved.

In my opinion, I think that it is true to say there is a demand for degrees and bachelor degrees in Europe, the United States, and, above all, in India and China, where there is an impressive growing market. By 2025, 40% of the nearly five million people who are going to study outside of their countries are going to come from these regions. The question is how we can cater to all. Therefore I believe that the massive courses can help if we combine them with mobile technology.

But if we also think of the training needs of our students in Europe, the conclusion is that we lack an industrial shift. For the vast majority of jobs, a degree or a license is not necessary. What is needed instead is mid-level education, in which case, the online training and the massive courses could be part of this process.

As Jose Luis has remarked, there are many issues being debated about how we ensure the quality of education, evaluation of the person, how to ensure who is actually doing the work, as we've already tested many methods. It is also necessary to check the quality of the courses.

On the other hand, I think that as universities we defend the fact that we have our own trading platforms of learning and within them, our activities, materials, etc. However, we must take into account that we are talking about open courses when the only thing that is open is the access to the courses, but not the re-use of the content, which is essential for me. When we start to adapt and change is when we really connect with the content and learn.

With regard to the second question, I was lucky enough to participate in international groups and European projects precisely on business models. There are many models, and still there is no single model that works. Sustainability is complicated. We pay our teachers at the first call of the courses and the courses were profitable. However, I doubt that the courses continue to be profitable in the medium term. What is important is the advertising that these courses generate for the institutions and participate in these initiatives. For example, I know that a European university spent quite a bit of money in half-page advertisements in prestigious newspapers about their courses. Then they opened some activities and what they found after a few months is that more or less 10% of the people who had participated in these courses, then decided to pay for the education, which provided significant income. At that time they were considering whether to continue with this project or to close due to the costs to keep it running, and when the efforts in terms of savings in advertising started to be noticed, the figures changed from red to black and the project is still ongoing.

At the moment of considering the salary of teachers, we must bear in mind that there are two parts: one direct and another indirect. It can be outlined in direct terms, in relation to a percentage of each certification, but it can also be viewed indirectly through added value services such as, for example, mentoring, considering face-to-face classes, etc.

Another important aspect that, I think, is also the responsibility of any government is to give relevance to these activities because the way to reward teachers is important. It seems that we take it for

granted the theme of the gratuitousness and that the teachers have to teach these courses in a completely selfless way.

In short, I don't think the MOOCs are a completely different thing and that they have suddenly appeared out of nowhere, but that they are the result of the continuous development of a teaching modality we have been working on for many years with huge potential.

6.3 Traditional Education vs. MOOC: Differences and Similarities

Juan Quemada Vives
Professor of Telematics Engineering
Escuela Técnica Superior de Ingenieros de Telecomunicación
Universidad Politécnica de Madrid

Starting questions for his intervention:

- From the professor's point of view, what are the main differences between traditional education and education through MOOCs?
- In the specific case of technology teaching that has traditionally required a physical presence of the student (laboratories, practices, etc.), how are these activities going to be able to shift to the MOOC environment?

Figure 6.4 Juan Quemada Vives

I'm going to offer the vision that my experience with this topic gives me. I have been working for many years in ICT application, where we have carried out many experiences of recording classes, the use of multimedia, etc., but I must admit that the MOOCs have been the most rewarding experience, although the one that has required more effort by far.

Last year I got in contact with Red.es, Telefónica and Universia as they had an interest in creating a MOOC on HTML5 and Firefox OS, which are topics that I cover in my classes. We signed an agreement to make a specialization program in cloud design services using HTML5, JavaScript and other trendy technologies. I knew it was going to be difficult but with the help of the educational innovation and research group, consisting of about twenty people, we made it through, although more slowly and with much more effort than initially expected.

Based on this experience and with regard to the differences from the professor's point of view between the traditional and MOOC education, I believe that campus-based education in universities has three basic components: the first are the materials supplied by the professor, the second is the collaborative learning in a group, that in the face-to-face universities is very important, and finally, there are classes and other educational activities supervised by tutors or teachers. In the MOOC you keep the first two: the materials and collaborative learning, which are performed through the Internet.

One of the discoveries that has surprised me most is the magnificent atmosphere in MOOCs. I started the first MOOC at the end of November 2013, which worked very well: 15,000 people were registered, more than 12,000 began, and of those 12,000, 2,500 finished, or nearly 20%, which is very good. These persons did 100% of the activities, over 100 tasks in a five-week period. There was a fantastic atmosphere where they helped each other. At the beginning, the process appears to be out of control, but then I understood the dynamics and that the key to learning was, in addition to the materials, the collaboration between the participants. For example, in the evaluations, which were in pairs, there was a lot of collaboration and as the course progressed, the participants discovered the usefulness of peer reviews, both to learn how others had done their exercises as well as to teach those who had not done them properly, instead of just quitting without further explanation.

On the other hand, the MOOCs had a heterogeneous participation, which ranged from experienced programmers interested in learning these techniques to participants that did not even know how to program. There was a huge variety. During the course I was encouraging the ones with more experience to help the others, which they did and it greatly benefited the beginners.

The participants were highly motivated because the contents of the MOOCs have a college credit value as these were classes of third, fourth and fifth semester of Telecommunications Engineering of the UPM. HTML5, JavaScript, design in the cloud, etc., are common topics in many job advertisements.

As to what has been said of the access from remote locations I was very surprised, since two-thirds of those involved were Spaniards and a third had very exotic origins, going all the way to Lithuania or the Antilles, but only a third of the participants were from outside of Spain.

Comparing with the learning in my classroom teaching activity in the university, the differentiator is that the material and methodology need a lot of improvement. The material that we use in class

is not valid because the explanation in class and on the board support everything. The teacher is there and they fill in for any shortcomings of the material. The quality or efficiency of the educational materials is not so important because it is complemented with explanations in class or with supervision. At the beginning I recorded my classes with the intention of reusing them in the MOOC, but I immediately saw that it wasn't going to work; much better material was needed. I have been surprised by how difficult it is to prepare good self-learning material. In fact, for the second edition of the course, which began in early March, we redid approximately 50% of the material, especially the methodology, moving toward what is known as microlearning, making smaller resources, better assessments in the form of tests or exercises. The material improved greatly as self-learning material and the course is working wonderfully. Now I use in my classroom both the improved material and the associated methodology. I think that the instructor-led course has improved a lot and this is also benefits the university greatly.

What has been the greatest benefit for me and for the university? I believe that for the university there have been two benefits: one; image, communication and marketing. The other, which is the most valuable to me, as I have already mentioned, the materials have improved tremendously and with them the quality of classroom teaching. In fact the goal of adapting to the requirements to make smaller educational resources is the key. Educational materials are not something dead, but they must be seen as something within an educational methodology that may or may not be tutored.

From the point of view of educational methodologies I have reused ideas of two schools, *microlearning* (go to small and self-contained resources) and the old-story-telling which consists of properly structuring the sequence of concepts. It is called old-story-telling because greater care was taken in oral speech; for example, poems were sung by the minstrels.

What needs to be done is to construct our subject into small resources where we explain a clear concept, an idea, a technique or we provide a certain skill. Each small-resource must be assessed, using either a test or an exercise, which in the MOOC is evaluated by peers, and in class by the professor. Teaching in Spain has traditionally been very demanding, with daunting obstacles, that only the smartest can overcome.

The key lesson that I have obtained is that, even for very skilled people, some easily understandable materials, even for laymen, complemented with tests and simple exercises that properly reinforce what has been studied, are of enormous value. Preparing these MOOCs I've learned a lot about how to apply educational methodologies that I theoretically knew, but had not fully applied in practice.

With regard to how to teach technology and especially labs and activities that have traditionally required the physical presence in the laboratory, I believe that the cloud is the answer.

I was already aware of the fact that in my classes, students' learning was based not so much on the classes, but on their active work. For the MOOC, I have improved the process by increasing the number of exercises and tests to try to cover all the micro-resources generated. In the end, the MOOC methodology is very similar to the one I practiced in my classrooms before performing these MOOCs. The dif-

ference is that there are many more assignments to be handed in and self-assessments. In the university, the assignments were presented by Moodle. In the MOOCs, we have requested that the exercises be published in the cloud (Google Docs), delivering a url to the published exercise. We are now also using this new form of delivery in the university courses with great benefits.

I think that, in the future, the cloud will support any type of exercise based on virtual laboratories, although the technology still needs to improve. In my case, programming of web application exercises, the services in the cloud are perfectly prepared to support this process.

One interesting thing is that the most important collaborative part of the MOOCs are the evaluations. In the peer reviews there were people assessing others in an extremely rigorous way, but in the end through the forums I convinced them to use the assessments to teach the less knowledgeable, instead of making traditional style evaluations, which generated a lot of discomfort. I think that the MOOCs need to be seen as something where you are going to learn.

In conclusion, I would like to say that I think the great current challenge is the production of content. It is not easy to produce content; it requires a lot of effort and work. I believe that we need to develop communities that facilitate this task by using social networks of collaborative content production. We should make the production of content much more efficient and achieve something similar to the collaborative projects of free software, where people can cooperate in large communities that result in consolidated quality content. Wikipedia is a good example of what can be achieved.

6.4 New MOOC Trends and Business Models

Carolina Jeux
CEO Telefónica Learning Services

Starting questions for her intervention:

- What general trends are being seen for the MOOC evolution?
- In particular, what trends are being detected with regard to the technologies that are used to create and implement the courses?

Over a year and a half ago the MOOCs were the great novelty; everyone was talking about them, and now it seems that this trend is settling. What we really see is that there is no turning back: both the academic world and the online training agents have a clear understanding that the new MOOC paradigm is transforming the ecosystem in a way that we are still unable to measure. It is clear that in this first boiling phase all kinds of content have emerged, of very various qualities and having different degrees of success among the students. We are currently seeing a professionalization of the contents, based on the experience gained in these last few months. On the other hand, it was noticed that the MOOC concept is expanding from the model of the large and open platforms as Coursera, edx or MiriadaX to proprietary projects developed by organizations that want to offer their own MOOCs to specific target audi-

Figure 6.5 Carolina Jeux

ences, whether clients, the public at large or employees. For example, institutions such as the Inter-American Development Bank have decided to build their MOOC platform to train Ibero-American SMES in Business Administration. Large companies are reinventing Corporate eLearning, incorporating MOOCs in their employees' training. Telefónica launched a few months ago, a MOOC program on culture that incorporated all the concepts of karma, gamification, collaborative and social learning, etc., giving the students a new type of online learning experience.

Probably, one of the main reasons why this trend has emerged is the fact that several renowned university professors have been committed to openly offer their knowledge, as well as the increasing ability of Internet that allows access to videos (a relatively inexpensive way of developing content that was out of reach just a few years ago). When making an effort to study, the credibility of the teaching staff has a significant impact.

It gives much more confidence to sign up to a HTML5 course developed by a recognized professor of the Polytechnic of Madrid, instead of using any free online content. There have been resources available for a long time, but they had not achieved these large numbers of users. In the end, people want the prestige of the university and also the possibility of certification to develop their employability and career opportunities. We expect that shortly, from a governmental standpoint, this will generate a degree of recognition for the MOOCs.

In regard to the professionalization of the contents, I also think that there has been significant progress made in this last year. Regarding the learning mentioned by Juan Quemada, we, who

have been developing multimedia content for fifteen years, already knew the difficulty of producing quality multimedia content. In order to maintain the interest and ensure student learning in an online course, especially when there is no certification to support it, it is necessary to develop a very powerful pedagogical screenplay (storytelling) and high quality multimedia production, with its consequent cost. This entailed a lot of work for designers, graphic artists, educational advisers, content experts, and programmers. At the outset of the MOOCs, it was thought that it was enough to have the professor reproducing their experience in the classroom to develop some quality online content but this is not the case. The pedagogical model must be different, and for this, teachers have to work hard. On the other hand, dealing with a camera is not always easy and, in general, as Latinos we are not as comfortable with being exposed as the Anglo-Saxons. As supply increases, students are demanding more quality content. I have heard some American experts saying that the cost to install a course can be up to $150,000. Without reaching such big amounts, it is true that, if you want to have good production, highly interactive multimedia, experts to help the teacher make the instructional design, it's necessary to spend time and money developing a MOOC.

There are also special cases; for example, a professor at the University of Cantabria who has not made a significant investment in production and instead has used a simple camera and PowerPoint. However, with her extraordinary communication skills, she has reached completion rates of over 40%. On the other hand, we will have to see where the sustainability of the model is. Many universities are telling us that, for them, this investment has a great return, regardless of the certification money itself due to the visibility and prestige that they are giving them, as well as the new students coming from Latin America after hearing about the Spanish universities through their MOOCs. This is clearly a very interesting opportunity. In addition, the teachers are being called to make presentations throughout Latin America as gurus of the topics covered in the MOOCs and that is giving them visibility and revenue. Also, some universities require teachers to create MOOC content that can also be used for teaching in university classes. This improves the educational experience at the university, using models such as the flipped classroom. In summary, my impression is that universities are generally satisfied with the revenues that they receive from the MOOCs.

In the case of companies like ours, it is necessary to analyze how we are going to position the project in the midterm, with a focus on business or social reputation. By now, the investment has been important and sustainability is projected in the midterm. By focusing mostly on the technological part, we have collected all the teachers' requests from last year's experiences and we have a development plan to incorporate the improvements.

For example, we're going to incorporate *software code* correction systems, a system that ensures the identity with a camcorder for the online certification ... We are also developing megabadges, aggregation of several MOOCs, providing valid degrees. We're also looking into remote and virtual laboratories, among others.

The great technological investment is clearly *learning analytics*. All the information of tens of thousands of users needs to be sorted and processed to obtain useful scorecards for the teacher and to personalize the training of the student. There could even be relevant information for governments that allows them to analyze the level of knowledge and gaps of different groups and develop em-

ployability opportunities for thousands of people, etc. I think knowledge management is clearly where this year's focus should be in order to help the various components of the value chain. The truth is, at Telefónica, we love to participate in such a relevant project for the digital education of the Ibero-American world.

Pedro Aranzadi
General Director of Universia Spain

Starting questions for his intervention:

- Which contents are better suited to the MOOC format? Is there an evolution happening towards the production of individual content or are there still mainly «re-used» contents from the traditional environments?

- How can you finance an educational model based on MOOC?

Figure 6.6 Pedro Aranzadi

At Universia, we delegate all the contents to the universities. We identified the universities that wanted to participate in MiriadaX, these selected the teachers, and the teachers selected the content or materials they wanted to teach. We simply provided some minimum standards, not even rules, but recommendations. What we can do now is to report some things that have happened. First, a basic premise that all platforms, including ours, are currently looking for, is critical mass. Given the level of drop-outs, you need volume, otherwise it is a learning failure and totally unworkable from the financial point of view. So if we now have close to the 700,000 registrations, our goal

is to reach seven million in a reasonable amount of time. Then, in order to reach this critical number, universities choose some courses they understand will potentially attract these tens of thousands of students.

I believe that the courses that will be well suited are the ones concerning the Internet itself, like the courses of programming development, etc. There are two reasons for this. First, because the professor knows the tool better and secondly because the environment itself means that there is a massive influx of people who want to learn this type of content, technology, programming, etc. Then, many other core courses, such as an introduction to finance, introduction to mathematics... Leveling courses for those people who also want to start engineering, for example. Finally, we also see the relevance of courses that the user sees as potentially valued by companies when hiring: courses in project management, coaching, etc.

With regard to the second question regarding content, I think the value is in the medium. It is true that the materials have to be the best possible, and that teachers have to be clear and try to transfer knowledge in the most efficient way possible, but without going overboard, because there are just too many materials and technical possibilities.

With regard to funding, it is clear that, for now, funding is direct without getting a return on the investment. The universities have to provide all content, at least that's the model we have created with Telefónica Learning Services. It works as follows: Telefónica provides the technology, the universities provide the contents and Universia provides the networks of universities. This is not profitable. In fact the new CEO of Coursera, a former president of Yale, said that Coursera will be profitable in five years.

Here you have to take the risk. I think we have a historic opportunity here. This is going to change education, without question. Although I do not know what will happen, I think this is a paradigm shift. There were those who compared it with the printing press. Now is the time to invest. And in Spain we have an historic opportunity, because the market is on the other side of the Atlantic, in terms of language. We need to get rid of prejudices and insecurities. I believe that we can compete. In the end, this will be a competition with Anglo-Saxons and Chinese.

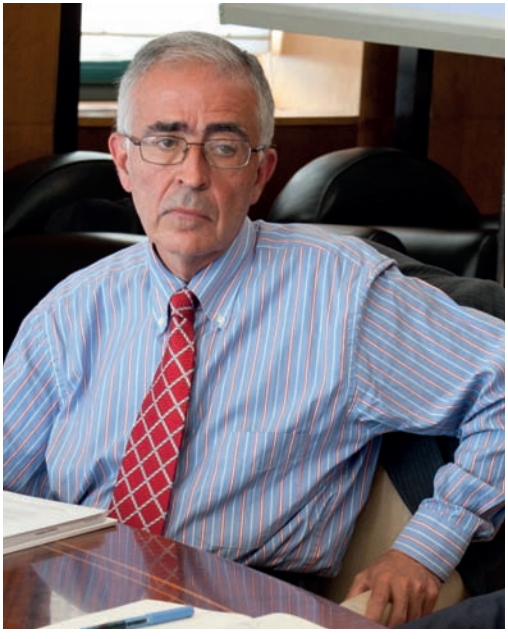
With regard to the origin of funding, it is clear that students will have to pay. It seems to be that the larger revenues will come from certificates, without disregarding advertising and the sale of publications. However, the bulk will be certificates. There are other issues like the identification of talent, for which the MOOCs seem to be a good tool in my opinion. And of course, drawing students to the classroom.

Finally, we get to the prescription point. The content is there, and there will be a lot more. However, I could upload content and prattle about MOOCs without having the slightest idea, and I'd probably have followers. Someone will have to discern. What we have to do before the proliferation of content is the evaluation and accreditation. We are at the dawn of the disintermediation of knowledge, so universities will have to cling to the evaluation and accreditation. For example, exams like the TOEFL, which are the most aseptic thing in the world, grade you with a percentage. Then, when you send your CV, the employer will determine if it is good enough for them or not. There will come a time when it will

not matter where you've learned as long as you know. Clearly, I need someone who can prove that that person knows, but to me it seems irrelevant where that person has learned it.

Antonio Castillo: We have done a fairly comprehensive review of the MOOC experiences of each one of you. All we need now is the insight of Gayle Allard, of the Institute of Empresa, who at the moment has a course on macroeconomics in the Coursera platform. She is going to share her experience. Then, to finish, we will review Telefónica's point of view as a telecommunications operator.

Figure 6.7 Antonio Castillo



6.5 The Relationship between MOOCs and the Business World

Gayle Allard
Professor at Instituto de Empresa

Starting questions for her intervention:

- What is expected to be the evolution of business schools (and in general of private education) with the emergence of the MOOCs? Do you expect that there may be a consolidation of the sector to decline the offer?

- What role can MOOCs have in training for the corporate sector?

Figure 6.8 Gayle Allard

In the first place, I would like to show some statistics. I am currently teaching in Coursera a course on economic policies: *Understanding Economic Policy Making*. We are in the last week and there are 30,000 students. These numbers can be deceiving. Actually the participation in the forums is of 500 people. This is nothing. The idea was trying to bring the course to a slightly lower level than the one of a MBA, so someone without prior knowledge of economics could participate.

For me the challenge is to be able to connect with the student, and without investing many hours. I attempt to invite them to think, reproduce graphics, many of the exercises are interactive, and however, the greatest challenge is to connect. I don't know if human contact can accomplish this. I can tell you that the previous course we held in the IE had 60,000 students, but 22,000 saw the first video, and of those, 5,931 did the last exam. Not bad, this is around 10%. A little more than 5,000 received the certificate of the course by completing the minimum which the professor defined. In this course we received 8,000 responses in surveys. 37% were American, but it is very interesting to see that the second largest group was Indians and then Spaniards with 8%. When we asked: why did you sign up for this course, 25% said because of IE's reputation, and 90% because they were interested in the topic.

Students are very committed to the idea of free education and against payment. I made a mobile app on economic policies which sells for 1.99 euros and there were some protests. I also see this as negative, as education with its great benefits, has a price. Although it is a very good thing that we are able to reach students from all parts of the world and I see how wonderful it is to have students from sub-Saharan Africa.

I believe for IE it is still not very clear why they will offer these courses. I think that perhaps it is more a platform for marketing than anything else. In fact, in the previous course, when the students were asked if they knew anything about the IE before taking the course, 20% said yes and 67% stated that as a result of the course they would study in the IE. I guess this is the main reason, as the cost of preparing the course has been very high.

6.6 Telecommunications Operators' View on MOOCs

Abdelkader Es-slami Houssine
Product Manager e-learning
Telefónica

Starting questions for his intervention:

- What is the current view of education as a business?
- What parts do the MOOCs cover and what part will they cover in the future?

Firstly, thank you for the invitation. I have liked very much being part of such a prestigious group. I work in the area of digital business within Telefónica. The idea of Telefónica is to take advantage of the carrier's *core* capabilities to offer additional value on specific topics. In the case of education, we are seeing a technological revolution in all aspects: in the form of teaching, in the educational roles, etc. It is no longer the capacity of memorizing, but to seek, to think, to analyze and to combine multiple sources of information to a certain degree.

On the other hand, in the Hispanic world whenever we speak of education, the word «business» is forbidden. It is as if it affected the universality, the freedom and the availability of education for the entire world. I think Americans, in this regard, are more open to the idea of operators: there is an effort within the value chain; there are people who generate content; there are people who develop platforms; and there are people who do research. All this type of added value has to be transformed into a business value. Improving connectivity is essential for accessing online content and providing services.

I've been taking notes on some issues that have come up during our meeting. You were mentioning the Cloud topic. I think Telefónica, as a reference in this field, can facilitate this capacity, bringing knowledge to the cloud and removing the complexity from the universities' systems.

Education is being transformed. We, the business area, want to accompany society in this transformation. I was telling you that all agents are involved in the learning process. Teachers are no longer who they were; they are no longer the person that dominates everything. We need certain new tools and training in the appropriate use of ICTS.

Figure 6.9 Abdelkader Es-slami Houssine

MOOCs, in pedagogical terms, are based on the connectivism concept, at least in most of the current platforms, although there are certain nuances. But in terms of technology, most of them are based on the video concept, as the training tool par excellence.

With regard to the business model, it is still too early to draw any conclusions. A transformation of the current model is necessary.

Teresa Sánchez Godoy
Senior consultant in Telefónica

Starting questions for her intervention:

- What are universities demanding from a technological point of view?

What are the universities demanding? In Telefónica, we have been working vertically in the university environment for eight years. What they have been demanding is that we help them in the transformation in which they were engrossed at that time -the transformation of the Higher Education European Space, which revolutionized the university. We were asked for a technological model that would help them implement such a transformation, which would facilitate communication between the various agencies; help them to adapt these new degrees and expand the Spanish university to all international forums. This way a student who studied in Spain would have a degree that is recognized here and throughout the rest of the E.U. in accordance with the spirit of Bologna.

Figure 6.10 Teresa Sánchez Godoy

However, universities are currently asking us to offer common services to cut costs of their basic horizontal services. In that sense, Telephonic has a lot to offer, as there is a great deal of trust based on years of close collaboration with universities thanks to a few solutions that bring value to compliance with regulations, as it was, for example, the e-government. Let's not forget that the university is a privileged public entity as it is at the forefront of technology and our champion. The university knows how to adapt in this sense, how to adapt communications and technology services to their specific needs. We are working with universities to define a common set of online services to unify and optimize its use and performance. Telefónica is mostly helping them to define models that make their operating costs cheaper.

Basic connectivity is the *core* in order to bring state-of-the-art technology to universities, but also to end users. Following this idea, we are focusing on mobile learning, and on the great benefits for universities from the exploitation of all the information generated by the daily activity of a critical mass of students. Imagine millions of students acting for hours in a platform. We get an idea of the information about usage and profiles that can be made available, for example. From the point of view of the university business, all that information could be used through mechanisms that allow student follow-ups to provide the best proposal and the paradigm of the personalization of education.

Obviously, new technologies will have to be used and more advanced mechanisms to better serve universities and a growing number of digital students. For example, solutions that facilitate the development and management of the curriculums, speeding up the adaptation to the new demands of so-

ciety and of companies, in order to prepare students for their future professions. We are aware that this is the university's principal duty, and that the technology and Telefónica are going to be right there in this transformation.

6.7 Discussion

Following the presentations by the experts, a discussion session was proposed, focusing on two points:

- Spain has always suffered from over-reliance on official certificates. Without it nothing is proved. Therefore, there is a need for a certificate that is entrepreneurially recognizable. How do the experts see that problem in Spain with regard to the MOOCs?

- MOOC platforms encourage the rivalry between universities, since the same course can be offered by several universities, competing for the students. Is this case possible in Spain?

Pedro Aranzadi: The «certificatitis» topic is a fact. It is the most recurrent question. On the other hand, it is a part, at least at the beginning, of the sustainability of this kind of initiatives and their future viability. Although the value lies in the millions of people who learn, they are two different things. This brings me to a comment: the importance of achievement rates. I do not think that they are important. The managers of MOOC platforms are frustrated because these rates do not make their business viable. In relative terms, I also wanted to ask the «Telcos», how many kids start and finish their college studies?

It seems to me that one must look at the absolute terms without undoubtedly belittling the relatives. The relatives need to be looked at from the business perspective, I think. Then, let's not get dramatic. It is clear that in something free, without any commitment, the drop-out rate is high. In the end, there are a lot of people who are learning. Of the courses that I have enrolled in, I have finished none but I have learned a lot.

Well, the thing about the seven million users of MiriadaX is an anecdote rather than an expectation. I believe that it is simply possible, especially if two companies such as Telefónica and Santander and 1,200 Universities put their minds to it.

Carolina Jeux: I would like to add that there has been a request by two ministries, the Ministry of Education and the Ministry of Foreign Affairs, who view MOOCs as an immense opportunity to promote the Spain brand and Spanish, which is a spectacular asset. At Telefónica it is seen from the business point of view, but much more because of the value that it can provide and spread in all Latin America.

Pedro Aranzadi: On the second question, on the rivalry of universities, it should be welcomed. I believe that it has never existed in this country. I believe that this is changing and we need to start worrying about it. In fact, our chief executive officer in Universia, who has been the principal of Politecnica de Cataluña, said as soon as he arrived: «In fifty years there will be no more than fifty universities in

the world.» It was impressive. There is going to be an important Darwinism, and we need to be there. This is a global competition.

Alejandro Díaz-Garreta: I wanted to highlight a reflection that you have not mentioned. When a candidate comes from a prestigious educational center, that person is selected for the job because the employer associates that place with a good professional. This association not only comes from the fact that they have good teachers and an excellent learning process, but also because they are based on a fundamental element which is strict student selection criteria. Therefore, it is a raw material which ensures success. If that's the way it is, if the employer associates a brand of university because they have excellent professionals, who care about the warranty that comes from a good material and the process itself. Is this diluted in the MOOCs? I wanted to bring up this question.

Figure 6.11 Alejandro Díaz-Garreta

Carolina Jeux: From the Human Resources area they can see a new source of talent search. For example, in Tuenti they created a MOOC and assured work to the best ten. MOOCs are a spectacular way to identify talent. A fourteen-year-old boy from Bhutan scored a 100 on EdX, and that kid now has a scholarship at MIT.

It is clear that 95% will not be extraordinary people, but it is a way to capture great talent that until now was unthinkable. What we are trying now with the areas of human resources is for them to begin to assess the MOOCs when selecting staff. Thus, the students will appreciate it more when Human Resources managers consider them. It is clear that a telecommunications engineer has shown sacri-

fice and knowledge throughout their career, but someone who demonstrates curiosity through ongoing learning and continually reinventing themselves will be rated highly.

Juan Quemada: With regard to the «certificatitis» in Spain, I think we have two Spains, the official and the real one. The official is the one of the certificates which are quite well entrenched in the culture, and the real one seeks to evaluate the actual knowledge people have regardless of the degree. I believe it is not good that the catalog of professions is so rigid. There needs to be more flexibility. There needs to be a shift in education and change it because the technologies move very rapidly and the degrees inch along slowly, with some exceptions. We need to find a mechanism that allows the catalog of professions to adapt better to the demands of knowledge and skills needed by society. I agree that the heavy demands of the engineering schools in Spain select people capable of learning rapidly, standing up to pressure and updating easily, which is highly regarded by companies. But this is not enough, as it does not encourage innovation, something totally needed right now. I believe that the educational system has to be much more flexible, with competition and market criteria that select well, but that also foster innovation. In addition, I believe that Spain has particular cultural features that do not promote technical and scientific innovations- it is necessary for us to change.

Timothy Read: I believe that Juan is very right in what he says. It is very difficult for universities to change course. I believe that if one compares the generation of my parents with my own, in their day the goal was to get a degree and live and retire. Today this no longer applies to anything; you have to think about life-long learning, training on demand. When I speak with my students –at the UNED–, I am talking to a person who works who knows how many hours a week and has a family and a few children and asks me for tips on how they can integrate their studies with the life they lead. This is complicated. We need this flexibility.

Abdelkader Es-slami Houssine: Very briefly, on the question of recognition of certificates. I think that in some ways, MOOCs have to reach agreements with the authorities so they can give the certificate to who has earned it. The United States have done so. Coursera has signed an agreement for a specific course with the Government so the certificate has the same learning validity of a normal traditional standard course. This should be applied to some quality MOOCs. On the other hand, when you finish a course in Coursera, it directly links you with LinkedIn so that you update your skills and knowledge in this professional network, which is good for the official recognition of this training.

Timothy Read: I would like to briefly reinforce that the MOOCs have a very important role in learning, although then they can furnish stamps and titles to those who have accomplished them, and, in Spain agreements can be reached. But I think that they have an essential role in the continuous learning and knowledge updating.

José Luis Cabello: MOOCs are not in a formal field, but this does not mean that they're not going to have more value in the future. Without a doubt, the digital badges that are given in some MOOCs have a great value. We are seeing certain academic degrees in certain universities that can start devaluating and that a company, when hiring, can find a series of digital badges that show not only these skills, but a continuous learning development. In terms of the sustainability model, it was said that these could be places to find talent, but also places to generate talent. We have to follow the learning hubs. These are communities that generate talent.

With regard to Spanish, we are the second language on the Internet; however, in Wikipedia we are the seventh. What conclusion we can draw from this? Are we creating content with the informative actions? Are we making our students generate knowledge? Here is a capacity for tremendous growth. We can compete with the Anglo-Saxon world, without a doubt; but, to do this, our massive online open courses must go far beyond the simple transference of information. This depends on the instructional design. We need to think about which the best activities are and how we do these activities. I believe that we have to provide valuable training related to professional competence. And it is important that we evaluate the development of competencies. The technological support is also important. We should experiment.

Antonio Castillo: I believe that we have gone through the whole range of possibilities and it is evident that we are facing a social transformation. With all the MOOC difficulties, they are something that began in 2011, but are gaining ground. I believe that this is our big gamble. I hope that within a couple of years we can repeat this meeting with a lot more optimism.

Figure 6.12 Reflection and Analysis Group on Various Aspects of the MOOCs