Lecture Notes in Educational Technology

Mohamed Jemni
Kinshuk
Mohamed Koutheair Khribi *Editors*

Open Education: from OERs to MOOCs

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Preface

The tremendous growth of ICT in recent years and the increasing availability of advanced high bandwidth network infrastructures have opened up new accessibility opportunities for education, and supported quality teaching and learning at all levels. As opportunities and technologies evolve, the expectations of opening up learning to suit individual needs, ensuring equitable quality education, and lifelong learning for all have become more and more pressing than ever before. Being mindful of these major advancements in technologies and big shifts in education, nations are looking at adopting new educational paradigms to advance educational opportunities for their citizens. To this end, several national policies, strategies, and action plans for the effective use of ICT in education are being formulated worldwide, with the focus on openness, twenty-first century teaching and learning competencies, and smart learning. At the core of these policies, mostly aligned with post-2015 education agenda, is the emphasis on open and free access anytime and anywhere to quality educational resources, whatever its shape, such as Open Educational Resources (OER) or Massive Open Online Courses (MOOCs).

This book focuses on reviewing existing policies, initiatives and international experiences, with the aim to promote the use of ICT in education primarily through the development and adoption of OER from the international practices, including implementation and licensing issues. With the particular focus on the new trends of MOOCs, the book explores the potential of this emerging paradigm, and its rise and impact on openness in education.

This book starts with Stephen Downes' documentation of major shifts that education has witnessed, thanks to technologies. He describes the new educational trends in social learning, personal learning, and MOOCs, drawing from the development of open and distributed learning, with free share and access for all, to the licensed quality educational resources.

Junfeng Yang and Kinshuk discuss the policies for Open Education (OE) that are mostly formulated as part of general educational policies, overall policies for OE, specific OER policies, and policies for open standards. They review various existing policies from different countries and regions, and provide recommendations for developing national OE policies.

Stylianos Sergis, Demetrios G. Sampson, and Lina Pelliccione introduce the educational design of MOOCs with the emphasis on cultural and motivational issues, and explore existing educational design frameworks. They reveal the ADDIE-based educational design considerations framework (EDCF) for MOOCs, incorporating both "massiveness" and "openness" requirements.

Mohamed Jemni and Koutheair Khribi describe the efforts and the ongoing projects of the Arab League Educational, Cultural and Scientific Organization (ALECSO) towards promoting the effective use of ICT in education, especially through fostering the development and adoption of open learning, mobile technologies, and cloud computing, creating the so-called "ALECSO Smart Learning Framework." They describe first the status of ICT use in education in the Arab region through conducted studies and surveys, and then review the completed and ongoing activities with respect to the aforementioned ALECSO Framework's dimensions.

Stephen J.H. Yang, Jeff Cheng-Hsu Huang, and Anna Yu-Qing Huang review the experiences of MOOCs in Taiwan, from perspectives of both the Ministry of Education and the volunteers who come from various universities, K12 schools, and private sectors. They explain the motivation of adopting MOOCs and the purpose and core mission of MOOCs in Taiwan.

Sie Wai Chew, I-Ling Cheng, and Nian-Shing Chen explore available strategies and methods for the development and design of MOOCs, and interactive video lectures, ranging from the construction process of video lectures embracing recording, editing, segmenting, and enhancing of video lectures' phases, from both technical and instructional points of view.

J. Michael Spector introduces MOOC concept, its origin, types, goals, and impact. Then he provides a critical look at MOOCs, pointing out what do they effectively lack, especially from an instructional point of view, and what would be the MOOCs' future.

Ronghuai Huang, Yongbin Hu, and Xiaolin Liu provide an openness maturity framework for OER projects. This framework is intended to analyze and assess the promotion and sharing of OER. They first review the development process and typical projects of OER, and then analyze the driving mode of OERs development and promotion approaches, taking into account the OER's characteristics.

Sara Osuna Acedo, Divina Frau-Meigs, Lucía Camarero, Cano, Adeline Bossu, Raquel Pedrosa, and Darco Jansen introduce a pioneering European project entitled "ECO project" providing a new MOOC model named sMOOC (social MOOCs), based on constructivist and connectivist pedagogical theories. They describe the sMOOC experience held at different linguistic and cultural zones.

Ebba Ossiannilsson, Zehra Altınay, and Fahriye Altınay provide a possible roadmap for institutions towards establishing policies on open online education quality. They describe how institutions can enhance and ensure quality through OER and MOOC practices.

Martin Ebner, Anja Lorenz, Elke Lackner, Michael Kopp, Swapna Kumar, Sandra Schön, and Andreas Wittke discuss the importance of combining the use of both OER and MOOCs, in order to foster new and innovative didactical approaches, as well as future education, especially in German-speaking Europe.

Sonia Santoveña Casal and Alejandro Silva report a study of the application of the virtual learning model in a MOOC, "Communication and mobile learning," within the project "Elearning, Communication and Open-data: Massive Mobile, Ubiquitous and Open Learning (ECO)" of European Commission. The learning model effectiveness is analyzed by contrasting students' opinions before and after the course, taking into consideration some key aspects related to the acquired knowledge and performance, interest and innovation level, and overall satisfaction with the course.

Yves Epelboin points out the importance to set a suitable business model to ensure a successful preparation and launch of MOOCs. He explores some emerging business models for both MOOCs' providers and creators. He reveals the necessity for a corporation financing model between MOOCs' creators and providers, as the future of MOOCs and online learning is closely linked to the consolidation of these business models.

Darco Jansen, Jon Rosewell, and Karen Kear review current and emerging practices for the quality assurance and quality enhancement of MOOCs. They explain the necessity to consider the quality issue for MOOCs, and discuss the importance of the use of international quality frameworks for MOOCs, embedded in institutional quality processes.

Nelson Piedra, Janneth Chicaiza, Jorge Lopez-Vargas, Javiera Atenas, and Edmundo Tovar introduce the evolution of Open Educational Movement and the potential of the use of linked data approach to improve the discoverability, reusability and integration of open and free-access materials. They focus on the benefits of reusability and sharing of open licensed educational resources.

Francis Brouns, António Teixeira, Lina Morgado, Santiago, Fano, Aquilina Fueyo, and Darco Jansen propose a collaborative approach for MOOC design. This approach is based on a model already tested in practice and has been further elaborated and evaluated in the ECO project. The pedagogical framework is based on the notion that MOOCs should be designed to accommodate the specific context of open online education with its heterogeneity of learner needs.

Finally, Nenad Stefanovic and Danijela Milosevic introduce an innovative open educational model and supporting software system that is capable of answering the major challenges of modern education. The proposed OER model and software platform enables the creation of agile and adaptable educational ecosystem that can transform the learning experience and connect individuals, educational institutions, and companies.

We hope that this collection will not only provide an overview of the current state of the art and also serve as a milestone for researchers as they progress further, but will also provide a roadmap for the vision for the future. The quality of this collection would not have been possible without the support of various individuals. Editors would first like to thank Richard Tortorella, who provided excellent support

for smooth progression of the whole editing process. Various reviewers dedicated their time to ensure the quality as well. Editors would like to thank Ashok Patel, Demetrios Sampson, Fathi Essalmi, Fathi Essalmi, Guang Chen, Hadi Shaheen, Imran Zualkernan, Jan M. Pawlowski, Jeremy Hunsinger, Jon Dron, Junfeng Yang, Koutheair Khribi, Lilia Cheniti, Michael Verhaart, Mike Spector, Mohamed Ally, Mounia Abik, Nian-Shing Chen, Ramesh Sharma, Ramzi Farhat, Ray Yueh-Min Huang, Riadh Besbes, Tore Hoel, and Wong Su Luan for their kind help.

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Chapter 1
New Models of Open and Distributed Learning

Stephen Downes

1.1 Introduction

Historically most learning that has ever taken place has taken place in a classroom with a teacher giving instruction and students reading books and writing on paper. In the twentieth century, however, more and more learning has been taking place outside the classroom, using technology to reach students at a distance. For example, Australia's "School of the Air" used wireless radio transmissions to send lessons to children growing up on isolated sheep stations (Hanson 2010). And of course institutions like Britain's Open University became expert providing learning by correspondence.

The first online classes were offered starting in the 1980s and over the last 30 years the Internet has been used to offer lessons at all levels all over the world. These new technologies have changed the way educators look at learning. The need to adapt to students working from home and at a distance caused educational institutions to examine their practices more closely.

For example, one of the first technological developments was the "course pack". This was typically a package of printed material containing all the guidance that would normally be provided in class by a teacher: lessons, readings, quizzes. Course packs are still used to this day; the Open University offers them online as part of its OpenLearn initiative. These packs need to be created ahead of time, so their authors had plan every detail of a distance education class ahead of time. As they did so, their understanding of the process changed (Fig. 1.1).

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Fig. 1.1 1880s Victorian boys' classroom. Public domain image via BBC. http://www.bbc.co.uk/schools/primaryhistory/victorian_britain/victorian_schools/

1.2 From Passive to Active

The first and most important lesson learned by distance educators concerns the role of the student in his or her own learning. Where students were once thought as passive recipients of learning, today it is understood that they must be willing collaborators in the educational process. And where once it was thought that an education consisted mostly of the facts and data to be remembered, today it is understood that becoming educated is a developmental process, like becoming physically fit.

Understanding the student's role is important because it directly informs the design and methodology employed by online learning technology. At one time, learning may have been thought of as the simple transfer of information from one person to another. In such a model, online learning could then consist just as the presentation of information—put up some videos, give students some texts, and they will learn. But because learning is more than just the transfer of content, online learning must consist of something more than the presentation of content. These define some of the major design criteria for any learning system online today:

- Prior learning—learning resources may need to be adapted to a learner's background and culture, their work, their language, and their understanding of the world, and so history and coherence are important elements of online learning;
- Learning styles—learning materials may need to match the individual's preference to learn visually, or through concrete experience, or by solving problems, and so on, so choice and variety are important;

- Motivation—the learning environment may need to stimulate a student's interest and engagement, so there needs to be a way to stimulate social presence and interaction with people they can relate to;
- Knowledge formation—the student's environment may need to help a student visualize or construct internal models or representations of the content being learned, so there needs to be a way to compose or construct or create objects to share with others;
- Community—the student may need social engagement to comprehend the implicit and unwritten aspects of a discipline, such as a feeling for what is relevant, ways of observing and approaching problems, and standards for success.

When online learning technologies were first being developed in the 1990s their designers sought to incorporate not only the presentation of content and learning materials, but also to support these other aspects of the learning experience. Consequently, learning management systems consisted not only of text readers and video players but also additional tools supporting the active engagement of students.

These systems—with names like Atutor and Blackboard and WebCT (short for "Web Course Tools") sought to encourage student participation by replicating the classroom experience. They included at a minimum discussion boards or online conferencing tools, a conversation or chat area, online exercises and quizzes, personal profiles and activity lists, and scheduled activities involving readings, exercises, interactions, and assessments.

Through the first decade of the twenty-first century, traditional learning management systems came under increasing criticism precisely because by emulating the classroom experience online they did not sufficiently support student engagement and participation. The new models of open and distributed learning described in the remainder of this chapter can be seen largely as attempts to reinforce the student's active and participatory role in learning, to move beyond what is possible in an online classroom, and to embrace the potential of the wider Internet.

Today, though, the learning management system (LMS) remains the dominant model for online learning. Virtually every institution along with most large corporations and governments use LMSs to manage training and education. The LMS market is worth $925 million in the U.S. and more than a billion dollars worldwide (Mallon 2011). Learning online today means taking a course from an LMS, which means being led through a series of lessons and activities by oneself or with a cohort of classmates.

Learning tomorrow, though, will mean something very different as learners and education providers push the limits of the traditional LMS in an effort to make learning increasingly personalized and active.

1.3 From Formal to Informal

A second major trend in recent years concerns the management of learning. For the most part, learning is managed formally under the auspices of departments of education, college or university administrations, or corporate training departments. Formal learning involves the statement of specific learning objectives or curricula, a rigorous mode of teaching such as classroom instruction, and evaluation or assessment leading to credential or certification (Ainsworth and Eaton 2010).

Whether offered through an in-class or distance education setting, one of the central issues of formal learning revolves around its cost (Cross 2007; Cofer 2000). Savings expected through the use of distance or online media do not materialize due to the expense of course design, formal instruction, and assessment or evaluation. Through the 1990s as well criticisms began to be voiced regarding the formal and inflexible nature of learning management systems.

A distinction between formal learning and a more bottom-up or democratic form of learning has existed for more than 20 years. In 2007 an OECD report defined two additional forms of learning in addition to informal learning (Werquin 2007):

- Nonformal learning refers to a type of learning that may still be offered by an educational institution but which does not have a formal credential or certification as an outcome. Nonformal learning may thus be more loosely structured and delivered than formal learning.
- Informal learning by contrast is not managed by an institution at all, but is rather managed by the individual learner. Consequently, it may be thought of (from an institutional perspective) as lacking any form of organization or objective.

Informal learning in particular has received increasing attention because of its relation to lifelong learning. It may be thought of as “learning on the job” or “experiential learning”. In particular, learning occurs as individuals make sense of the experiences that arise during their daily lives on the job. It is rooted in a person’s existing knowledge, skills and interests, and often adapted to meet a participant’s specific needs.

As a result, the development of informal learning systems managed by learners themselves tend to focus less on the presentation of information and the remembering of facts and more on descriptions of experience, discussions about practice, response to requests for advice, and conversations of a more general nature. These systems arise outside the traditional learning infrastructure and often outside learning institutions entirely.

The emergence of the Internet, and specifically the free and open-source software movements, have shown that peer-to-peer communications technology can put people in symbiotic, “you answer my question, I’ll answer yours’ relationships.”

For example, self-organizing social systems arise in discussion websites such as Slashdot and Yahoo Groups (Wiley and Edwards 2002). These are essentially learning communities organized around some topic of interest, whether it be knitting or learning disabilities or beekeeping. Instead of there being one teacher leading instruction, people ask questions and are engaged by the community. Sometimes an answer is provided, but just as often more questions are asked as people try to narrow the context or reframe the question entirely from a more informed perspective.

Informal learning is often viewed less as a means of acquiring some body of knowledge and more as a means of enabling or fostering some future action. In other words, informal learning serves a different purpose from traditional learning. In formal systems, there is a greater emphasis on educational progression through a body of knowledge, perhaps leading to a diploma or other form of recognition, while in the case of informal learning the effort generated leads to some form of community involvement, action or even activism (McGivney 1999).

The principles of informal learning apply to any form of environment where informed and effective action is the desired outcome.

Jay Cross, for example, writes about Company Command, an informal learning community developed by two American company commanders who knew each other from West Point (Cross 2007). The Company Command website states, “We are a grass-roots, voluntary forum that is by and for the profession with a specific, laser beam focus on company-level command.” Cross cites some of the very specific advice found in comments on the site, varying from taking off armor in tents to wearing seatbelts in the vehicles. “Every community needs a clubhouse where members can discuss things and draw conclusions,” he says.

Informal learning has become increasingly associated with the concept of online community or, more formally, communities of practice. A good example is the Australian Research Council funded project “Uncovering Learning in the Workplace”. This project emphasizes the role of community in online learning, seeking to increase social interaction among staff at different educational institutions in Australia. It points to the extent of everyday learning in workgroups created in the educational system and their importance in “getting the job done.” (Leontios et al. 2003).

1.4 Open and Distributed Learning

A major element in the development of informal learning through the early 2000s has been the emergence and development of open learning.

The term “open learning” originally referred to “Policies that permit open entry to learning, liberal transfer of credits, and recognition of prior learning.” (Farrell 2003). Institutions such as Britain’s Open University and Canada’s Athabasca University were created in order to offer access to learning without admission barriers by offering distance and online learning, though in a formal mode, with clear learning objectives leading to a certificate or degree.

That said, open learning has over time come to be associated with flexible or distributed learning and in particular to be associated with the following characteristics:

- Separation of teacher and learner in time or place.
- Ue of mixed-media courseware.
- Two-way communication between teacher and learner.
- Industrialized processes including development and delivery teams (CoL 2013).

A significant proportion of the investment in open learning is toward the learning materials to be used in course packages and other delivery media. The course packages would be constructed out of reusable modules of digital learning content called "learning objects". Beginning in the late 1990s the development of these "learning objects" and associated infrastructure has become central to online learning. Consequently, open learning has come over time to also be associated with the concept of open access, which is to say, a lowering of barriers to the access to these educational materials themselves.

A number of academic and technological initiatives emerged in support of open access. The concept of open access covered not only learning objects but also any resource involved in education, including for example books and journal articles. Open access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions (Suber 2004). An early advocate of open access was the Scholarly Publishing and Academic Resources Coalition (SPARC), formed in 1997 by the association of research libraries. The Budapest Open Access Initiative (BOAI) was the first major statement by scholars in support of open access.

The first major technological development in support of open access was probably the Open Archives Initiative. This project described a set of specifications for the provision of open content through repositories, and included methods for submission, indexing, search and retrieval of content. The initiative was designed primarily for research materials, but its wider applicability to educational materials is apparent.

The Open Archives Initiative was the basis for the DSpace Project, founded at MIT as "a turnkey institutional repository application." Numerous journals have declared themselves to be 'open access' journals, either by making their content freely available online (this is known as the "Gold" model) or by allowing authors to self-archive their content (the "Green" model) (Harnad et al. 2004).

The expansion of open access over the last decade has been nothing short of dramatic. The Bielefeld Academic Search Engine (BASE) indexes 36 million documents from 2000 repositories. The Directory of Open Access Journals lists 8000 titles. The Internet Archive contains 670,000 movies, 100,000 concerts, 1.3 million audio recordings, and 3.5 million texts (Morrison 2012).

1.5 Open Licensing

In addition to lobbying and the provision of technological infrastructure, the primary mechanism employed in support of open access, and therefore open learning generally, is open licensing. This term may be used to refer to any of a number of licenses that support open access.

Open licensing is based on the similar innovation in software development, the open-source license. These licenses were based originally on the four freedoms outlined by Richard Stallman in 1996:

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3).

A core element therefore of open licensing is not merely access to the content in question, but also the ability to share the content thus accessed.

In the realm of educational content, the license most frequently used to support open access is Creative Commons. This form of licensing preserves copyright in the material thus licensed, but allows free access and distribution with, as the website notes, "some rights reserved." Creative Commons licensing allows the author or copyright holder to stipulate some or all of the following conditions (Fig. 1.2):

- That the author of the work be attributed.
- That the work be used noncommercially.
- That the work be shared under the same license it was granted.
- That the work be shared as a whole, without a derivative being made.

Numerous funding institutions have begun to require that materials produced under their programs be released as open access, typically under a Creative Commons license. These open access mandates, as they are known, have been implemented by such agencies as the Wellcome Trust, the U.S. National Institutes of Health, the World Bank, and others.

The development of learning management systems, discussed above, led to the development of repositories of learning resources similar to the Open Archives Initiative. These learning resources, called "learning objects," were designed in

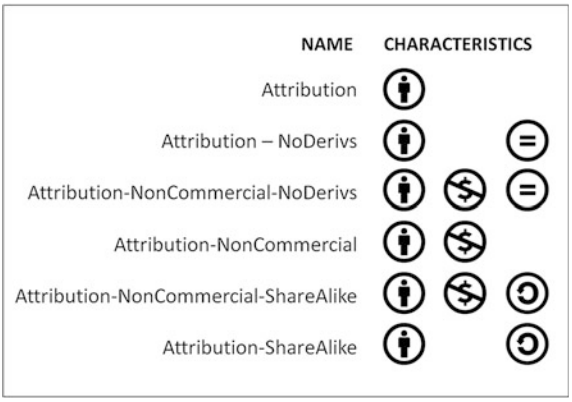

Fig. 1.2 Creative commons licenses and characteristics. Image by the author

such a way as to be discoverable, sharable, and reusable in learning management systems. Examples of learning object repositories include the Multimedia Educational Resource for Learning and Online Teaching (MERLOT), Europe's ARIADNE project, Canada's Campus Alberta Repository of Educational Objects (CAREO), and Australia's EdNA (Education Network Australia) (McGreal et al. 2004).

Many of the resources offered through these repositories were licensed under Creative Commons or more specific licensing schemes, such as the Open Content License, created by David Wiley in 1998, or the GNU Free Documentation License (GFDL), created to support open-source software. Then in 2002 MIT launched the Open Courseware (OCW) project, offering open access to teaching and learning resources under the Creative Commons "Attribution Noncommercial Share Alike license" (CC By-NC-SA). By 2003 materials from 500 courses had been posted online. To date OCW has seen 140 million visits by 100 million visitors from around the world (MIT 2012).

In 2002 the global effort to begin formally recognizing open educational resources began. The term Open Educational Resources (OER) was adopted at a global forum convened to study OERs, and the UNESCO OER project has been active since, focusing on research into development, distribution, and sustainability, and launching OPAL, an initiative to investigate the quality of OERs.

Even with these initiatives, the number of open educational resources is dwarfed compared to the number of open resources available generally. The Internet Archive, mentioned above, collected millions of audio, video, and text resources. Additionally, sites like Flickr and YouTube store millions more photos and videos: Flickr, for example, has more than 220 million photos licensed under Creative Commons in addition to hundreds of millions more with all rights reserved. YouTube sees 3 billion hours of video viewed each month. Additional services with millions of openly licensed resources include Jamendo and CCMixter (music), Open Clip Art Library, Photopedia, and Pixabay (images), as well as Wikimedia, Europeana, and SopinXpress (media).

The impact of open licensing over the last decade is that hundreds of millions of high-quality educational materials have been made available without charge to the educational community. In some cases, these resources may be reused or incorporated into course materials. This was the type of use envisioned by the developers of learning object repositories and open educational resources. The resources would become a part of a course package; open licensing was used to allow the resources being adapted into course packages and to allow for resale, if necessary.

But the growing ubiquity of web access begged the question: why incorporate materials into course packages at all? Why not just send the student to the resource? This would make many more resources available instantly. Some objections present themselves immediately: questions about the persistence of materials were raised, their quality and provenance, as well as privacy and security concerns. But the possibly suggests new models of online learning, and these began to appear with the articulation of E-learning 2.0.

1.6 E-Learning 2.0

In 2005 the concept of "Web 2.0" was first articulated. It represented a shift in the way developers looked at the World Wide Web. Before, the web was thought of as a collection of documents. These documents were collected and hosted on web servers, and readers would navigate from one document to the next to the next. After, the web was thought of as a body of interconnected data. Rather than viewing pages, web users were thought of as using applications. These applications might have a location, the way a web page does, but it could draw data from anywhere else on the web (O'Reilly 2005) (Fig. 1.3).

A good example of web 2.0 was the way Flickr worked with other services, such as Piknik. As mentioned above, users uploaded and stored their photos on Flickr. So Flickr was like a big database of photos. But if the user wanted to edit their photo, they could go to a different service called Piknik. Once they logged in and gave Flickr permission, Piknik could access their photo data. The user would use Piknik to edit the photo, and then the photo would be sent back to Flickr, all behind the scenes. Flickr was one of a group of websites—two other notable examples are Twitter and Del.icio.us—which gave users access to each other's data. This allowed users to use the sites socially—they could share links, information, and photos. Because the data was interlinked, these services came to be known as social networks rather than simply websites.

Before web 2.0, online services were provided by heavy enterprise programs (like a learning management system) that would access data either locally or using web services to obtain it from other systems. These programs would present that data as web pages, much like a course page that might be viewed on an LMS. After web 2.0, online services began to be provided by lightweight web applications (or "apps") that could access data directly from the source and manipulate it inside the web browser.

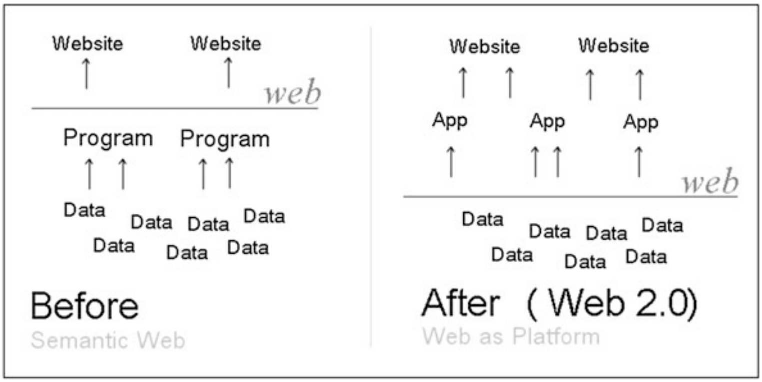

Fig. 1.3 Web architecture before and after web 2.0. Image by the author

The concept of E-Learning 2.0 was based on this idea. It merged the idea of the "net generation" learner with the concept of social networks and "web 2.0" developed by Tim O'Reilly. The idea was that individual learners could find and share resources with each other using social networks. For example, they could each create their own blogs and use these blogs to link to photos or videos they may have found on the web. These blogs were saved as data feeds that could be read using feed readers. Thus a student could use a web application, such as "Google Reader", to read everyone else's blogs.

While much of the attention paid to e-learning 2.0 focused on social networks, it is important to understand how e-learning 2.0 changed the data model underlying online learning:

- Before—learning resources were collected by institutional learning management systems and stored locally; these resources would then be combined to form course packages that would be presented to students as an online course
- After—students would link to resources wherever they may occur around the web and make these links available to other students; these resources would be viewed individually with no preset order or organization.

E-learning 2.0 thus represents an unbundling of educational resources; what was once presented as a single package is now presented as a set of discrete resources. It marked the transition from the World Wide Web as a medium for presenting documents and other static content to the web as a platform for social networking, interactive applications, and communications networks.

1.7 Social Learning

As noted above, examples of informal learning could be found in communities like Slashdot, Yahoo Groups, and content management systems. These communities followed the development of the World Wide Web through the evolution of social networks and web 2.0. Though large and informal, these communities became cohesive and offered substantial value to their members.

One example of a distributed social learning community is the "Webheads in Action" community. The Webheads, a community of language instructors, emerged out of online sessions held at the Electronic Village prior to the community's annual TESOL conference. Eventually some conference sessions were held online as speakers presented remotely using Wimba for voice and Yahoo for webcam broadcasts. By 2004 the community had created its own Yahoo group, which was active for about a year. They used a variety of media to collaborate, including a PBWorks wiki, online chats and more.

Another example is the "Edubloggers" community. The community began as a loose collection of individuals who blogged about education and found each other through comments on each other's blogs. Over time, loose networks of edubloggers developed. Those who attended the NECC conference in the United States created an "edubloggercon" ahead of the conference, and a large informal network of school teachers using blogging. Another branch developed with James Farmer installed a multi-user version of WordPress, an open-source blogging tool, and set up edublogs.org and invited teachers to join for free. Edublogs now hosts 1.3 million blogs created by and for educators.

Another important example is Wikipedia. Most readers will be familiar with Wikipedia, created by Jimmy Wales and Larry Sanger in 2001. It has 22 million articles (over 4 million in English alone) and about 100,000 regularly active contributors. The principle behind Wikipedia is that any reader may contribute to, or edit an article (this process has become more formalized over time). Wikipedia has expanded in other ways as well; the Wikimedia Commons, mentioned above, is a branch of Wikipedia and hosts several million images and other resources.

Wikipedia is just one example of a wiki. The wiki has become an alternative form of content management and can be found everywhere from corporate intranets, school divisions, and informal learning. They are a popular way for a learning community to gather and store knowledge and resources. One example of this is the Audacity Wiki. Audacity is a widely used open-source audio editing application. The Audacity wiki is used by the community to share notes and tips about the software.

Some major education wiki initiatives have emerged as well:

- Wikiversity—an extension of Wikipedia, "devoted to learning resources, learning projects, and research for use in all levels, types, and styles of education from preschool to university, including professional training and informal learning."
- Curricki—"the result of work done for GELC—the Global Education and Learning Community—an online project started by Sun Microsystems to develop works for education in a collaborative effort." Curricki is focused on K-12 schools and contains about 43,000 resources.
- WikiEducator—"WikiEducator is a community project working collaboratively with the Free Culture Movement toward a free version of the education curriculum by 2015." This wiki is focused on offering full online courses in collaboration with participating institutions (Fig. 1.4).

These wiki-based initiatives have led to what may be called the hybrid institutional model of online learning. There are several versions of this model, but it is most clearly articulated by the "logic model" authored by James C. Taylor and adopted by WikiEducator (Taylor 2007).

The idea is that educational institutions and other collaborators provide free online learning materials, much along the model of Open Courseware. These resources are used to create online courses with learning support and tutoring provided by a network of volunteers. Finally, credentials are provided by accredited educational institutions through some sort of learning assessment. This logic model was used as the basis for OERu, founded by the Commonwealth of Learning with Wikipedia and formally inaugurated by founding partners at a meeting in New Zealand in 2011.

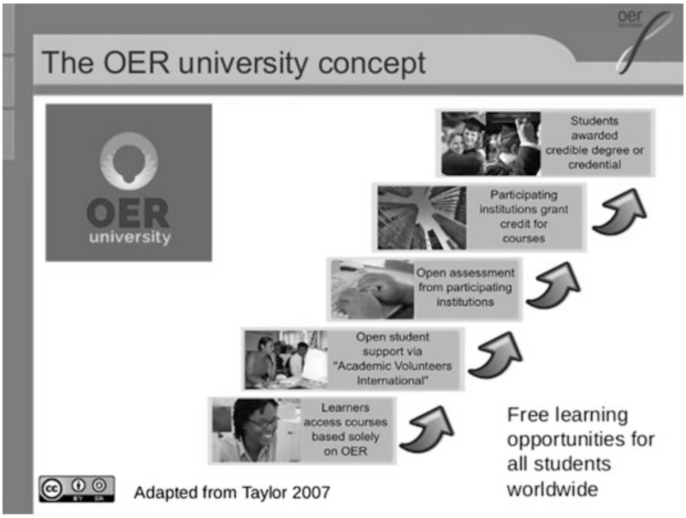

Fig. 1.4 OERu logic model. Used with permission. http://www.slideshare.net/mackiwg/summary-of-oeru-for-2nd-meeting-of-anchor-partners

Another example employing a similar model is P2P University which "provides an online space for people to work together to learn a particular topic by completing tasks, assessing individual and group work, and providing constructive feedback." Yet another example is CodeAcademy, which provides community-contributed resources helping people learn to write software. Yet another is Khan Academy, which features about 3000 resources on mathematics and physics. Once again, the model is to offer a set of open and freely accessible learning resources, and then to provide some degree of coaching or tutoring offered by volunteers.

1.8 Personal Learning

A major objective of online learning has always been to provide more personalized learning. As indicated above, new pedagogies enabled by Internet technologies allows designers to adapt to an individual's learning styles, adapt to prior learning, and respond to a students' needs and interests. Learning management systems adapted to these needs through a combination of customization and personalization#:

- Personalization is the process of tailoring content and presentation to an individual's characteristics or preferences. For example, when Google logs what sites you have visited and tailors search results, that is personalization.
- Customization is provision of mechanisms that allow a user to explicitly state what content they want and how they want it presented. For example, when you narrow a Google search range to "Creative Commons only", that is customization.

The combination of customization and personalization provides some, but not all, of the objectives set my new pedagogies. Students are limited by the capacity of the LMS. Community formation is limited to the students enrolled in the course. Students can participate and interact, but their creativity is limited by the LMS environment, and they lose access to their work at the end of the semester.

Many LMS developers have been adapted by adding e-portfolio capability. An e-portfolio is a collection of a student's work presented for display to an external audience, much like the way an artist would collect a portfolio of her work to show to prospective clients. Students can select their best work and customize how the work is presented. LMS vendors began offering e-portfolio applications as extensions to learning management systems. Additionally, open-source e-portfolio systems, such as Mahara, were developed for use with open-source e-learning software.

But what if the e-portfolio were a web 2.0 application instead of just another part of a learning management system? This idea led to the development of what has come to be known as the personal learning environment, or PLE. Although no commercial PLE software yet exists, the concept of the PLE represents a significant transformation in the idea of online learning:

- The PLE uses lightweight data and communication standards characteristic of web 2.0 rather than the server-side application-based LMS software.
- The PLE is centered around the person rather than around the institution; each person has his or her own PLE, which they customize according to their own tastes.
- The PLE connects to a variety of services and resources around the web rather than being limited to course contents contained in a single LMS (Fig. 1.5).

The idea of the personal learning environment is that it takes advantage of the many sources of open educational resources available on the web, including not only those available in formal learning repositories, but also those contained in sites such as YouTube and Flickr. In addition, the design of the PLE encourages students to create and contribute to this wider community by creating blog posts and uploading images and videos. Finally, the PLE supports participation in open social networks to a much greater extent than the traditional LMS, for example, by reading from and sharing to social network services such as MySpace, Twitter, and Facebook.

While the PLE is thought of as being based on a particular application, a secondary concept, that of the Personal Learning Network has also emerged, this not being based on an application at all. The idea of the PLN is that a learner uses existing social network applications, the most popular being Facebook and Twitter, and assembles a network of contacts with whom to share educational experiences such as discussions, live chat sessions, and learning resources.

Both the PLE and the PLN emphasize learning as something that takes place in a network. As such, PLEs and PLNs support informal learning based on open educational resources (indeed, it is arguable that they require open educational resources, in order to support modification and resharing). But in addition, learning networks differ from traditional LMS-based learning in four major respects:

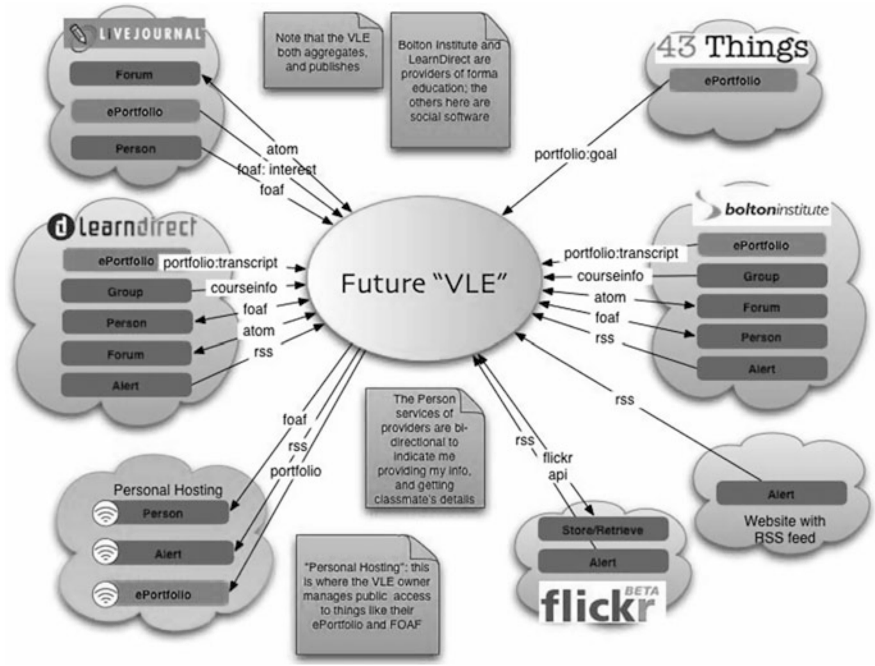

Fig. 1.5 Future VLE—the prototypical PLE diagram by Scott Wilson. Used with permission. https://www.flickr.com/photos/elifishtacos/90944650

- Autonomy—because each learner supports and manages his or her own learning environment, PLEs and PLNs support a great deal of individual autonomy, with each learner making his or her decision about which resources to use and what course of studies to follow.
- Diversity—while an LMS and the resources offered in traditional courses tend to be standardized and formalized, learning networks support a diversity of resources, online learning systems, pedagogical styles and formats, and more. In addition, the members of a learning network will use diverse technologies and resources.
- Openness—a learning management system is typically a closed environment, meaning that only those with appropriate credentials may access the resources and community, typically by means of a login. A network, by contrast, is formed by means of peer-to-peer communications between its members, which means that any person may join and share resources.
- Interactivity—in a learning management system, the same content is passed from an instructor to all participants; this content forms the core of the learning, and communications are distributive, that is, from the center distributed to the whole. In a network, however, there is no centralized content, and consequently communications are interactive, with diverse contents being passed from many distinct sources.

1.9 Connectivism

Concurrent with the development of e-learning 2.0 and the personal learning environment was the development of a web pedagogy known as connectivism. Coined by George Siemens in 2004, the term captures the essence of a new model of online learning based on networks and community.

As Siemens writes, connectivism integrates some important properties of networks such as chaos, complexity, and self-organization. Learning, meanwhile, is a process that occurs within these networks, "nebulous environments of shifting core elements".

Importantly, knowledge is something that does not simply exist inside a learner—it exists as well in the wider community or network. Learning therefore can occur in any network, not merely in the individual. Learning is constantly changing, constantly shifting, and as Siemens says, "the connections that enable us to learn more are more important than our current state of knowing."

Siemens summarizes the principles of connectivism as follows:

- Learning and knowledge rests in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in nonhuman appliances.
- Capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections is needed to facilitate continual learning.
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision-making is itself a learning process.

Connectivism offers a new model of online learning because it presents a different view of the nature of knowledge and learning themselves. It draws not only on the formal theory of networks but also on recent work in artificial intelligence and neuroscience.

Normally we think of knowledge as something that is concrete and discrete. A sentence like "Paris is the capital of France" is a typical example. The meaning is contained in the sentence, it is true by virtue of correspondence or reference to the external world, and "learning" this bit of knowledge is tantamount to acquiring or remembering the sentence that contains the information.

But as noted above, educators have come to view learning as more than merely remembering bits of knowledge. Connectivism explains why. The knowledge that "Paris is the capital of France" is not actually contained in the sentence itself. Understanding the sentence requiring understanding an entire language, and understanding the language requires knowing things about thousands of other words, the people that speak them, and the community that gives those words meaning. The knowledge, in other words, is distributed—it does not exist in any one place, but is rather spread out across a network of interconnected entities, whether these entities are words, brain cells, textbooks, or computer circuits.

The theory of connectivism therefore amounts to this: the knowledge is itself a set of connections in network, a pattern of connectivity. A person cannot simply acquire this pattern of connectivist, it has to be grown through repeated interactions. Learning therefore needs to be active, it needs to be network-based, and it needs to be constituted essentially of interactions between networks of users.

1.10 Massive Open Online Courses

In the fall of 2011 Sebastian Thrun, a professor of Computer Science at Stanford University, and Peter Norvig, Director of Research at Google, announced that they would offer an open online course in artificial intelligence. No credit would be offered, but students who finished the course would be issued a Statement of Accomplishment. 160,000 people signed up, and the world took notice of what had become a phenomenon, the Massive Open Online Course, or MOOC.

The MOOC had two major precedents: the Wiley Wiki and the open course. The Wiley Wiki pioneered the idea of open online content that can be edited by course participants; created by David Wiley in 2007. Like other wiki course initiatives, it could be edited by participants and accepted contributions from the web as a whole. What made the Wiley Wiki different was that the wiki was the online home for a university course being offered at Utah State University. Participants from outside and people enrolled in the course would enjoy the same resources and the same interactions (Wiley 2010).

Open Teaching, meanwhile becomes possible when you take the synchronous conferencing application you are using and open it up to visitors from across the Internet. The model was pioneered by Alec Couros in his online Social Media and Education class beginning in 2007. Sessions were offered using the Elluminate conferencing system (now Blackboard Collaborate) and typically featured guest presenters as well as visitors from around the world (Couros 2010).

The first MOOC was offered by Stephen Downes and George Siemens at the University of Manitoba in 2008. Originally planned as a small course on connectivism, 24 students signed up for credit. When the course was opened to anyone who was interested, however, an additional 2200 signed up. This large contingent of students helped create some of the innovations that made the course a MOOC, rather than simply a large course online.

When the course—called "Connectivism and Connective Knowledge 2008", or CCK08—was set up, the authors decided to follow an explicitly connectivist model. This meant that thought here would be a start date and an end date with a list of course topics in between, there would be no "official" curriculum. Additionally, the course was designed as a network, with participants encouraged to use their own websites and weblogs and to register RSS feeds with the central course website. An application designed to aggregate feeds and distributed the results as a daily email newsletter, gRSShopper, was incorporated into the course design.

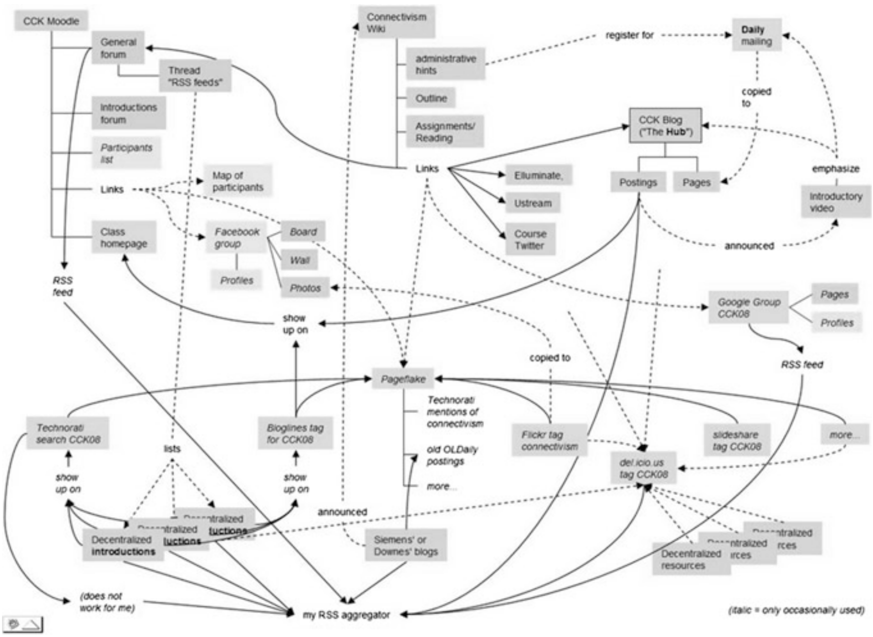

Fig. 1.6 Structure of the MOOC. Matthias Melcher. Used with permission. https://x28newblog.wordpress.com/2008/09/06/cck08-first-impressions/

One of the course participants created a map of the course on launch day (Fig. 1.6). In the upper left of the diagram are the last vestiges of a formal course structure: the structured design of a learning management system, in this case, an open-source Moodle installation. Another square structure, at the top middle of the diagram, is the course wiki, on which the planning for weekly course topics took place. The remainder of the structure of the MOOC consists of distributed services linked together by the RSS aggregator: a Technorati search on the #CCK08 tag, a Bloglines harvester, a PageFlakes web portal, Flickr, del.icio.us and Twitter tags, a Google Group, a CCK08 blog, and The Daily, the course newsletter.

The second year the same course was offered, a new wrinkle to the model was added. Students returned from the first year, began adding their own materials, and in many ways began to teach the course themselves. This mirrors a phenomenon that was beginning to be seen in traditional classrooms: the idea of the "Fisch Flip" (Pink 2010) whereby students watch videos, read books, and otherwise receive instruction on their own time, outside of class, and then bring their knowledge and insight into the class, which is focused on students relating these insights to one another in discussions and other activities.

In 2010, two MOOCs combined the idea of personal learning with the MOOC. Offered by Will Richardson and Dave Warlick (educational consultants who were influential in the edublogger movement), the "Personal Learning Networks" course used a PBWiki for course content and offered a series of "challenges" leading participants to construct their own personal learning networks (PLNs). Downes and Siemens were joined by Dave Cormier and Rita Kop to offer "Personal Learning Environments, Networks and Knowledge" (PLENK2010) to explore the idea of the personal learning environment and related concepts.

Another MOOC of note, offered by Jim Groom at Mary Washington University, was "Distributed Storytelling 106". This MOOC was based on a WordPress blog. Students (and participants from around the world) were asked to submit storytelling assignments (for example, describe a movie in four icons; create an animated image; rewrite a movie poster to reflect a current event). Participants would complete the assignments; these were then aggregated and displayed on the central DS106 blog. The course spawned some innovative side projects, such as DS106 Radio, a live web radio service created by participant to share their audio projects.

1.11 The MOOC Model

The structure of the MOOC was essentially established by these early MOOCs. (Fournier and Kop 2015) The course could be as short as 8 weeks or as long as 30. Each week would have its own topic, would be introduced with a set of readings, would involve a guest speaker or host, and would invite participants to add their own resources and build on the comments offered by the hosts.

Basic MOOC technology entailed the following elements:

- A host website—very often a wiki, either hosted at an institution website or using a free wiki services; a content management system such as Drupal or Joomla could also be used, or a site hosting service such as Google Sites.
- A synchronous conferencing environment such as Elluminate, Big Blue Button, WizIQ, Adobe Connect, or Wimba. Some MOOCs used what might be called the "WorldBridges" option, broadcasting audio using ShoutCast or IceCast, and video using UStream or LiveStream. In more recent years, Google Hangout has been widely used.
- An RSS aggregation service – the Downes–Siemens courses used gRSShopper, and thus added an email newsletter to the mix; other courses used WordPress, which has a feed aggregation module, or Drupal, which has the same.

Students used:

- Blogging tools, for the participants: recommended services include Blogger, WordPress, EduBlogs, Tumblr, or Posterous.
- Media upload sites such as Flickr or YouTube.
- Social networking services such as Twitter or Facebook (the open-source identi.ca service was also used).
- Discussion boards such as Google or Yahoo Groups; some MOOCs also offered discussion boards through LMSs such as Moodle (but these tended to be less useful with large numbers of participants).

As important as the basic MOOC model was the structure of activities. Participants in MOOCs were expected to interact with each other and the wider web, actively searching for relevant learning materials. The overall structure of MOOC participation is the "ARRFF model":

- Aggregate—though the course hosts might provide a central email newsletter or feed, participants in the course were encouraged to find their own sources and aggregate their own learning materials. As Siemens explains in his Connectivism paper, the decision of what to select is as important a part of the learning process as reading what is inside it.
- Remix—this refers to the idea of combining resources from different sources to create a new resource. This could consist either of assembling them in the same environment, like a bricolage, or to meld them into a single new entity, called a mashup.
- Repurpose—this refers to the idea of shaping the aggregated and remixed materials into a new form or adapting it to a new purpose. For example, two images might be combined into a single graphic, thus remixing them, and then turned into a cartoon image, thus repurposing them.
- Feedforward—this refers to the practice of sharing the new creation with a wider network, most easily accomplished by posting it into a blog, where the blog contents are harvested or aggregated by the course hosts and other participants.

Also in 2010 Downes and Kop offered another MOOC, "Critical Literacies". "The intent of the course was to determine whether it would be possible to use a MOOC in order to teach the skills needed to be successful in a MOOC. But what were these skills? We determined that they would be described by critical literacies, as described by six major elements of language and cognition: syntax, semantics, pragmatics, cognition context and change."

1.12 Learning Environments

Though the design and development of personal learning environments and massive open online courses have caught most of the attention in the online education community, the reality is that the same design and structure can be observed in a wide range of applications varying from corporate communications to arts to fire management.

For example, Cisco's own internal learning network, called the Integrated Workforce Experience (IWE), is based on open and distributed learning resources (albeit behind a corporate firewall). (Beretta 2015). Company employees established their own network of informal tools, including a wiki, microblog tools, and video sharing. These tools were combined to give each employee a "single place to access tools for asking questions; finding and sharing documents, videos, and other content; and exploring ideas with colleagues."

Lessons learned in the Cisco experience were similar to those observed elsewhere. Staff will not participate in online social learning if it becomes burdensome or involves a lot of overhead. They need to be able to customize their experience. Subcommunities will form, and in some cases, will not be visible to the wider community as a whole (Cisco 2011).

In another example, the Royal Society for the encouragement of Arts, Manufactures and Commerce in Great Britain (Dellot et al. 2012) conducted an analysis of social networks used by its members. Its Connected Communities action research program was established in 2009 "to explore how social networks and social capital can be better understood, visualized and mobilized to address local social and economic problems." It identified a thickly clustered network core, "the ideal network structure through which to address community problems and make change." (Broome 2010).

Emergency services in Australia employed learning networks to facilitate the development of adaptive management to deal with rapidly changing situations. They write, "successful adaptive management depends on effective facilitation. When individual conversations are strategically linked for broader learning and sharing they become a learning network." The networks link not only firefighters but also residents, friends' groups and staff from other government organizations. The same learning dynamic exists in this case as in connectivist courses: "As people shared their different perspectives, a broader understanding of the land and fire management 'picture' evolved. As understanding grew, participants' perspectives began to change."

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Author Biography

Stephen Downes is a specialist in online learning technology and new media. Through a 25-year career in the field Downes has developed and deployed a series of progressively more innovative technologies, beginning with multi-user domains (MUDs) in the 1990s, open online communities in the 2000s, and personal learning environments in the 2010s. Downes is perhaps best known for his daily newsletter, OLDaily, which is distributed by web, email, and RSS to thousands of subscribers around the world, and as the originator of the Massive Open Online Course (MOOC), is a leading voice in online and networked learning, has authored learning management and content syndication software. He is known as a leading proponent of connectivism, a theory describing how people know and learn using network processes. Hence he has also published in the areas of logic and reasoning, twenty-first century skills, and critical literacies. Downes is also recognized as a leading voice in the open education movement, having developed early work in learning objects to a world-leading advocacy of open educational resources and free learning. Downes is widely recognized for his deep, passionate, and articulate exposition of a range of insights melding theories of education and philosophy, new media, and computer technology. He has published hundreds of articles online and in print and has presented around the world to academic conferences in dozens of countries on five continents.

Chapter 2
Survey and Reflection of Open Education Policies

Junfeng Yang and Kinshuk

2.1 Introduction

Comparing with the book *The World is Flat* (Friedman 2005) describing the influence of modern technologies on peoples' daily communication, the book *The World is Open* (Bonk 2009) gives a full picture of open web learning by using different kinds of web 2.0 technologies. Indeed, technology has the potential to revolutionize education to open it to all with less inequity, imbalance, and more quality. The development of OERs and Massive Open Online Courses (MOOCs) have made quality education more accessible to more people all over the world.

The term OER was proposed in 2002 during the UNESCO Forum, which was defined as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes" (Chen and Panda 2013). In 2006, Salman Khan started to use video technology to revolutionize traditional teaching and produced thousands of video clips on various subjects, such as mathematics, physics, chemistry, and so on, which was later developed into Khan Academy. Khan Academy proved that the small video clips were suitable for students' learning as OERs. The first MOOC emerged from the OER movement. It was actually introduced to refer to a course on "Connectivism and Connective Knowledge" conducted by George Siemens and Stephen Downes in 2008, which was later known as cMOOC (Belawati 2014), where c stands for connectivism. One of the most cited MOOCs has been the course on "Introduction to Artificial

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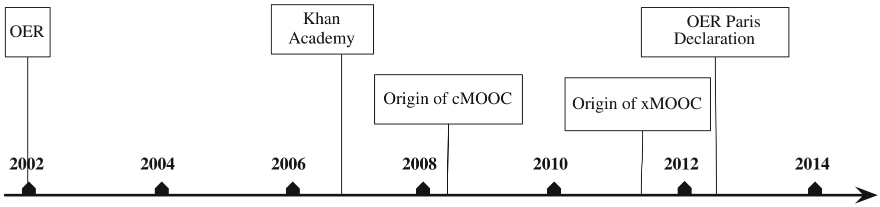

Fig. 2.1 The development of OER

Intelligence" offered in 2011 by Sebastian Thrun and Peter Norvig of Stanford University, which was later known as xMOOC, where x stands for eXtended. The world OER congress in 2012 organized by United Nations Educational, Scientific and Cultural Organization (UNESCO) and Commonwealth of Learning (COL) released the OER Paris Declaration 2012 that urges Governments, educational institutions and teachers to release educational materials as OER (UNESCO 2012a, b). The 2012 OER Paris Declaration recommends to "reinforce the development of strategies and policies for the production and use of OER within wider strategies for advancing education." The Declaration shows the importance of Open Educational Resources and gives recommendations to governments and institutions around the globe. In order to fully understand the role and importance of OER, it could be viewed in a broader view of OE (Fig. 2.1).

The concept of OE is based on the belief that education and knowledge are public goods and that everyone has the right to access quality education (Belawati 2014). Education may be broadly understood as incorporating a wide range of pedagogical and scholarly activities which can take place inside and outside formal institutions. These activities include learning, teaching, assessment, accreditation, policymaking, and administration. Initially, OE emerged as the concept of removing barriers to education. It can be traced back to the inaugural speech of the first chancellor of Open University in UK in 1969, when he said it would be "open as to people, places, methods and ideas" (Lane 2012). Hodgkinson-Williams and Gray (2009) gave the four dimensions of openness for OE, namely financial openness, legal openness, technological openness, and social openness. According to Wikipedia, OE describes institutional practices and programmatic initiatives that broaden access to the learning and training traditionally offered through formal education systems.[1] Therefore, OE could be understood as the openness of education to all by open sharing resources, tools, and practices in financial, legal, technological, or social aspects, to let students learn from anyplace, with any methods, at anytime. OE encompasses resources, tools and practices that employ a framework of open sharing to improve educational access and effectiveness worldwide.[2] OE is often discussed in terms of using or creating OERs. Open

[1] https://en.wikipedia.org/wiki/Open_education.

[2] http://www.oeconsortium.org/about-oec/.

education promotes knowledge as a public good based on the following elements: redistribution (sharing with others), remixing (combining resources to create new content), free reuse of whole or partial educational materials with proper attribution, the ability to revise resources in order to make modifications, enhancements, and adaptations according to context, and peer reviewing to ensure resource quality.[3] However, it must be noted that OE does not apply open just to content, data and resources; rather, openness is part of wider change and movement toward equity and quality. OE provides learning opportunities for those who have no access to education resources, materials, and practices, thus promoting educational equity. OE provides high-quality learning resources across borders for those who want to achieve higher goals, thus enhance educational quality.

National-level OE policy is one of many strategies to quicken the development of OE/OER for accessible OER to improve educational equity and quality with cost-effective operations at country-level. After OER Paris Declaration 2012, some countries started to issue national OE policies to promote the practice of OE. The following sections look at comprehensive overview of these polices.

2.2 The Categories of Open Education Policies

Investigating OE policies in different countries is a big challenge, as it is very difficult if not impossible to cover all the policies due to limited time and resources. In order to cover as many policies as can be found, peer-reviewed research papers on "OE policies" or "OER policies" were initially collected in this research, before a deeper analysis was conducted on each of the policies mentioned in the literature. In addition, three open education policy databases were also identified. The following analysis is mainly based on the text of each polices that was found in those three databases and the literature.

One of the databases is the survey on governments' OERs policies prepared for the world OER congress in June 2012 by Sarah Hoosen of Neil Butcher & Associates on behalf of the Commonwealth of Learning and UNESCO (Hoosen 2012). The other is the POERUP (Policies for OER Uptake) funded by European Union (EU) from 2011 to 2014, of which 500 selected OER initiatives (some policies) from 33 countries were documented in a wiki database.[4] The third database is the Creative Common (CC) OER Policy Registry which covers the current and proposed open education policies from around the world.[5] National-level policies, state-level policies, and institution-level policies were included in the database, covering more than 100 policies form 29 countries.

[3]http://creativecommons.org/weblog/entry/42286.

[4]http://poerup.referata.com/wiki/Main_Page.

[5]https://wiki.creativecommons.org/wiki/OER_Policy_Registry.

This study focused on the country-level policies. The nature and extent of OE/OER policies vary across countries, with more countries in Asia-Pacific, Europe, and North America reporting that they have such policies, as mentioned in the report for world OER congress (Hoosen 2012). Four the national-level policies in different regions, four categories were identified, as shown in Table 2.1. Please note that Latin America and Caribbean were not included in the table as the OE/OER in those regions is still in its early stages (Torres 2013). It could be found from Table 2.1 that OE policies in Europe and North America were more developed.

2.2.1 Overall Policies for OE Development

The overall polices for OE development contain the national-level policies that state the macro open education development strategies in a country. Examples of policies included in this category are the Wales Open Education Declaration of Intent in 2013, the Opening up Slovenia in 2014, the Scottish Open Education Declaration in 2015, the India Open Licensing Policy Guidelines for NMEICT in 2014, and the Framework for the Provision of Distance Education in South African Universities in 2012.

The Wales Open Education Declaration of Intent was signed by Vice-Chancellors of Higher Education Wales in 2013, with the aim to make Wales at the forefront of OE developments as the first nation to fully embed OE within a national strategy.[6] Through the declaration, universities in wales are committed to providing and using OER to widen access to higher education, providing flexible virtual pathways for learners, ensuring that educational materials developed with public funds are made available to everyone, promoting quality assurance, and peer review of learning and teaching materials, ensuring that any designated teaching and learning material released under open license can be adapted and redistributed without cost or restriction, and working with the Coleg Cymraeg Cenedlaethol to support the publication and distribution of learning and teaching materials through the medium of Welsh.

The Opening up Slovenia was announced by the country's Minister for Education in 2014 during the OCWC Global conference, with the aim to explore means for a fully fledged open educational system, develop innovative projects, and apply for European Commission funds related to ICT and new aspects of open education.[7] Strategies in the Opening up Slovenia include improvement of OE institutional digital leadership, fostering research in OE, developing digital capability throughout the complete educational system, redesigning educational services to meet a new Open by Default Service Standard, building common technology

[6]Open Education Working Group (2014) http://www.oerwales.ac.uk/?p=22.

[7]http://www.ouslovenia.net/the-idea/.

Table 2.1 Categories of OE policies

Categories	Regions			
	Africa	Arab states	Asia and Pacific	Europe and North America
Overall policies for OE development	South African: Framework for the Provision of Distance Education in South African Universities, 2012		India: Open Licensing Policy Guidelines for NMEICT, 2014	Wales: Open Education Declaration of Intent, 2013 Slovenia: Opening up Slovenia, 2014 Scottish: Open Education Declaration, 2015 Canada: MOU on OER, 2013
Policies for open standards			New Zealand: Government Open Access and Licensing framework (GOAL), 2010 Australian: GOAL, 2011	UK: Government Licensing Framework, 2014 Canada: Tri-Agency Open Access Policy on Publications, 2015
Specific policies for constructing OER	South Africa: OER Africa, 2008	Arab League: Open Book Project, 2013	China: Quality Video Online Course 2011–2015	European Union: Open education Europa, 2013 Netherlands: Wikiwijs; 2011–2013 Poland: Digital School, 2012 USA: Open College Textbook Act of 2009/2010
OE Policies imbedded in other education strategic plans	South Africa: Strategic plan for 2010–2014 Mauritius: Education and Human Resources Strategy Plan 2008–2020	Morocco: GENIE program, 2006–2013	China: NEIP (2011–2020)	Romania: Strategic national governmental plan for 2013–2016 USA: National Education Technology Plan (2010) UK: Harnessing Technology strategy 2005–2014

platforms for Open by Default Services, removing unnecessary legislative barriers, designing new pedagogical and didactic structures, and collaborating with partners across public, private, and voluntary sectors to help more people use OE.

The Scottish Open Education Declaration (SOED)[8] has been drafted by Open Scotland which is led by the Centre for Education Technology, Interoperability and Standards (Cetis), the Scottish Qualifications Authority, the JISC Regional Support Centre in Scotland and the Association for Learning Technology's Scotland Special Interest Group. The SOED is inspired by the UNESCO Paris OER Declaration in 2012, which builds on the principals of the UNESCO declaration but expands its scope to encompass more aspects of open education practice. SOED calls on the Scottish Government, the Scottish Funding Council and all sectors of Scottish education to endorse several principles proposed in SOED. The principles include fostering awareness of all forms of open education practice, encouraging the use of CC-BY licenses[9] for all educational materials produced with public funds, facilitating enabling environments for the appropriate use of technology in education and linking these with strategies to improve digital literacies, and promoting the understanding and use of open licensing frameworks to enable different kinds of use.

The Open Licensing Policy Guidelines for India's National Mission on Education through Information and Communication Technology (NMEICT)[10] was issued in 2014. They provide a set of principles, guidelines, and implementations to ensure that content produced under the NMEICT is openly licensed, current preference being CC-BY-SA. The memorandum of understanding (MOU) on OER in Canada was signed in 2013 by three Canadian provinces of Alberta, British Columbia, and Saskatchewan. The purpose of the MOU was to facilitate cooperation between the participants in the sharing and development of OER, to identify, share, and encourage the use of best practices in OER, and to foster greater collaboration and understanding of key issued and trends in OER between and among postsecondary institutions.

2.2.2 Policies for Open Standards

Policies for open standards are the policies that state the government's open access and licensing methods in a country. Examples of these policies include the New Zealand Government's Open Access and Licensing framework (NZGOAL), the Australian Government's Open Access and Licensing Framework (AusGOAL), the UK Government's Licensing Framework (UKGLF), and the Canadian Tri-Agency Open Access Policy on Publications.

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[8]http://declaration.openscot.net.

[9]CC-BY license is one of Creative Common licenses, which was illustrated in Sect. 2.2.2.

[10]http://www.sakshat.ac.in/Document/OER_Policy.pdf.

Before discussing the government policies for open standards, it is necessary to understand the Creative Commons (CC) licenses. Creative Commons is a nonprofit organization that enables the sharing and reuse of creativity and knowledge through free legal tools. A CC license is one of the several public copyright licenses that enable the free distribution of an otherwise copyrighted work. The latest version 4.0 of the CC licenses was released on November 25, 2013. There are several types of CC licenses, including CC-BY, CC-BY-NC, CC-BY-SA, CC-BY-ND, CC-BY-NC-SA, CC-BY-NC-ND.[11] The most liberal CClicense is CC-BY, which allows for unrestricted reuse of content, subject only to the requirement that the source work is appropriately attributed. Other licenses allow possible restrictions, like no commercial use (NC), no derivatives (ND), and share-alike (SA).

NZGOAL was approved by the New Zealand government in 2010, in the form of the government guidance for agencies to follow when releasing copyrighted works and non-copyrighted material for reuse by others.[12] NZGOAL version 2 was released in April 2015. NZGOAL seeks to standardize the licensing of government copyrighted works for reuse using Creative Commons New Zealand law licenses and recommends the use of 'no-known rights' statements for non-copyright material.

AusGOAL[13] was nationally endorsed and administered by Australia Cross-Jurisdictional Chief Information Officers Committee in 2011, which provides support and guidance to Australia's government and related sectors to facilitate open access to publicly funded information. AusGOAL is aligned with numerous open government initiatives around the world and supports the Australian Information Commissioners Open Access Principles. AusGOAL endorses the Creative Commons Australia Version 3.0 Licenses, and the Creative Commons Public Domain Mark.

UKGLF was issued by the UK government in 2014, and provides a policy and legal overview of the arrangements for licensing the use and reuse of public sector information, both in central government and the wider public sector.[14] It sets out best practice, standardizes the licensing principles for government information, and recommends the Open Government License (OGL) as the default license for public sector information, which is compatible with the Creative Commons Attribution License 4.0 and the Open Data Commons Attribution License.

Canadian Tri-Agency Open Access Policy on Publications was released in 2015. The policy requires that any peer-reviewed publication(s) arising from grants received from any of the three agencies (Canadian Institutes of Health Research,

[11] https://en.wikipedia.org/wiki/Creative_Commons_license.

[12] https://www.ict.govt.nz/guidance-and-resources/open-government/new-zealand-government-open-access-and-licensing-nzgoal-framework/quick-guide-agencies/.

[13] http://www.ausgoal.gov.au/overview.

[14] http://www.nationalarchives.gov.uk/information-management/re-using-public-sector-information/licensing-for-re-use/ukglf/.

Natural Sciences and Engineering Research Council of Canada, Social Sciences, and Humanities Research Council) be made freely accessible within 12 months of publication.

2.2.3 Specific Policies for Constructing OER

Specific policies for constructing OER are the policies that encourage the construction of OER in a country, often associated with some initiatives with financial resources. Many countries, for example, Brazil, China, Indonesia, Japan, Korea, Poland, South Africa, Turkey, UK, and Vietnam have introduced policies for constructing OER with government funded initiatives to stimulate OER (Mulder 2013). Examples of these policies include OER Africa, Open Book Project in Arab League, Quality Video Online Course in China, and Open education Europa.

OER Africa commenced in 2008 through seed funding from the William and Flora Hewlett Foundation, as an initiative established by the South African Institute for Distance Education (Saide). The mission of this initiative is to establish dynamic networks of African OER practitioners by sensitizing and connecting like-minded educators—teachers, academics, trainers, and policy makers—to develop, share, and adapt OER to meet the educational needs of African societies.[15]

Open Book Project was initiated by the U.S. Department of State in cooperation with the Arab League Educational, Cultural, and Scientific Organization (ALECSO) in 2013, with the aim to lead education innovators to expand access to free, high-quality education materials in Arabic.[16] One of the objectives was to put a full year of high-quality college-level science textbooks—biology, chemistry, physics, and calculus—online, for free, in Arabic. The aim is to release these resources under open licenses that allow their free use, sharing, and adaptation to local context.

Quality video online course (QVOC) was initiated by Ministry of Education China in 2011, with the aim to promote the access to quality tertiary curriculum resources which could reflect the idea of modern education, demonstrate the advanced concepts of teaching, and enhance students' self-regulated learning. 1000 QVOCs have been planned to be built during 2011–2015.

The European Commission launched Open Education Europa in September 2013 as part of the Opening up Education initiative to provide a single gateway to European OER. The main goal of the Open Education Europa portal is to offer access to all existing European Open Educational Resources in different languages for learners, teachers, and researchers.[17]

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[15] http://www.oerafrica.org/about-us/who-we-are.

[16] http://iipdigital.usembassy.gov/st/english/article/2013/01/20130128141555.html#ixzz3oUCH1z00.

[17] http://www.openeducationeuropa.eu/en/about_this_portal.

In addition, an assortment of policies exists in Europe and North America to promote the construction of OER, such as the Wikiwijs in Netherlands, Digital School in Poland, and Open College Textbook Act of 2009/2010 in USA.

2.2.4 OE Policies Imbedded in Other Education Strategic Plans

In order to grasp the opportunity of digital revolution, lots of countries have implemented national education policies for promoting educational equity and quality by using information technology. In some of these national policies, the policies on development of OE have been imbedded. Examples of these polices include Mauritius Education and Human Resources Strategy Plan 2008–2020, GENIE program in Morocco, China National Educational Informatization Plan (NEIP) 2011–2020, USA National Education Technology Plan (2010), and UK Harnessing Technology strategy 2005–2014.

Promoting e-learning and Open Educational Resources by setting up online learner support system was mentioned as one of the target indicators in Mauritius Education and Human Resources Strategy Plan 2008–2020. There is a policy decision in South Africa, through the process of the Integrated Strategic Planning Framework for Teacher Education Development that all educational resources developed through funded projects have to be released under a CC license.

Generalization of Information Technologies and Communication in Education (GENIE) in Morocco was launched in 2006, revised in 2009, and lasted to 2013. Its implementation at the primary and secondary education levels help ensure access to ICTs facilities and services to more than 22 % of the Moroccan population, with appropriate content, throughout the Kingdom of Morocco. Acquisition of digital resources and the creation of a digital resources national laboratory and a national ICT portal was listed as one of the four main areas of this project.[18]

China's National Educational Informatization Plan (NEIP) (2011–2020) was released in 2012 to state the overall development goals of ICT in education in China (MOE 2012). The development goals of the ongoing 10 years' plan for ICT in Education could be termed as ConnectSCS, which stands for connecting Schools through broadband network, connecting Classes with quality digital resources, and connecting Students in cyber learning space. The construction of open educational resources platform was listed as one of the main tasks in the plan.

In Europe and North America, the development of OE is fast and advanced. Lots of government policies on the development of education by utilizing information technology have mentioned the development of OE/OER, for example, the USA National Education Technology Plan (NETP) (2010), and the UK Harnessing Technology strategy 2005–2014. However, there are still some countries in these

[18] http://www.anrt.ma/en/missions/genie/presentation-genie-program.

regions in which the progress is slow. For example, the Romanian Strategic National Governmental Plan for 2013–2016 states for the first time that the Romanian Government, together with the Ministry of Education, will 'support innovative methods for integrating web 2.0 educational resources and open educational resources in the learning process'.[19]

2.3 Critical Analysis of OE Policies

In the previous discussion, OE polices were categorized into four levels: the overall policies for OE development, policies for open standards, specific policies for constructing OER, and OE policies imbedded in other education strategic plans. The four categories of policies reveal the levels in association with the aim of OE.

The overall policies for OE development associated directly with the strategies for developing OE in a country. From the resources collected and analyzed, it is apparent that only few countries have such policies. Wales claimed to be the first nation that fully embedded OE within a national strategy with Wales Open Education Declaration (WOED) in 2013. It focused on the obligation of universities to provide high-quality learning materials under the open license to make sure the materials could be adapted and redistributed with no cost. In comparison with WOED which has focused only on higher education, the Scottish Open Education Declaration (SOED) promotes adoption of open licensing frameworks for educational materials in all education sectors. SOED has been inspired by the UNESCO Paris Declaration in 2012, similar to Open Licensing Policy Guidelines for India's National Mission on Education through Information and Communication Technology (NMEICT), which has also been enlightened by the UNESCO Paris Declaration. In short, countries with OE policies intend to bring quality and equity education to more people by adopting open licenses to provide more open learning resources and removing unnecessary legislative barriers. Some policies still are focused on higher education, while others have started to cover both higher education and basic K-12 education. UNESCO OER Paris Declaration 2012 is important reference when a country develops their OE policies. OE policies may contain the open license and development of OER, but they should involve more than just OER to include transformation of educational mechanism to embrace open education. Policy of open education should focus on equity, access and quality. It is not only having equal access that leads to equity, it is also having equal access to success, regardless of learning difficulties, social backgrounds and other barriers.

The open license/standard plays a critical role for prompting the reuse, revision, remittance, and redistribution of OER. Smith and Casserly (2006) believe that the use of open licenses is a necessary prerequisite for an educational resource to be "open." Some countries have started to realize the importance of open license for

[19]http://oermap.org/sector/informal/page/2/.

OER, and have begun to implement the policies for open standards, for example, New Zealand and Australia. The NZGOAL and AusGOAL are the governmental policies following CC license when releasing copyrighted works for reuse, remix or redistribution. While the UKGLF is not under the CC license, it is compatible with Creative Commons Attribution License 4.0. Canadian Tri-Agency Open Access Policy on Publications is also not under the CC license, but the policy was created by considering CC license. CC license is having more and more influence on open education policy making. Although several counties have begun to issue polices on open standards, majority of the countries do not specify which open licenses are used in their OER policy (Hoosen 2012). This is becoming the bottleneck for creating and reusing OERs in countries without such policies.

Countries appear active in the OER movement mainly through initiatives by institutions and engaged individuals, and through specific projects or programs with public funding (Hoosen 2012). In late first decade and at the beginning of the second decade of twenty-first century, we have started to witness emerging efforts of a few countries to develop and establish their national OER approach (Mulder 2013), for example, China's QVOC. For these policies, the sustainable development of OER construction supported with government funds should be considered, and governments must decide for themselves the best use of public funds (Stacey 2013). From a public policy perspective, it is important to understand how to integrate public and nonpublic funding models in order to reduce education cost and maximize public investment returns (Sabadie et al. 2014). In fact, some initiatives even happen cross boarders, for example, OER Africa intends to meet the education needs of all African societies, and OE Europa offers OER in different languages for various countries in European Union. This suggests that the international OER partnerships will be the norm in the future and new models of funding will be required to support this trend which will need to be based on collaboration as opposed to current models which foster competition (Stacey 2013). Therefore, the open license must be taken into consideration from the very beginning of OER construction. However, it has seldom been seen in various country policies at present. It should also be noted that the objective of these policies is not to just produce OER but also to use the OER to broaden access to quality education and ensure the learners' success.

Information and Communication Technology (ICT) in education plays a decisive role for promoting educational equity and quality (MOE 2010), which has been recognized by lots of governments. Lots of countries have issued some education strategic policies to promote the ICT usage in education. Four levels of construction for promoting ICT in education have emerged, namely infrastructure, learning resources, teaching capacity, and administrative capacity. The concept of OER has been treated as an important issue/task in some of the national education strategic policies, such as Morocco GENIE, China NEIP (2011–2020), and USA NETP (2010). On the other hand, in some of the country policies, the OER construction is just mentioned, with no specific strategies promoting OER construction and usage, for example, Romania SNGP (2013–2016). In some developing countries in Arab states, limited internet penetration, challenges of piracy, issues related to the rule of law and censorship, and vast disparities in purchasing power[20] have been some of the main challenges for creating and using OER. In some regions, such as Latin America, OER is still in its early stages and faces many challenges that need to be addressed (Torres 2013).

2.4 Suggestions for Developing OE Policies

Since the beginning of OER movement, it has grown mainly in developed countries, with some exceptions, such as Africa, Brazil, India, and China (Torres 2013). Similar patterns can be seen with the initiation of OE policies, which have also grown mainly in developed countries in Europe and North America, with some exceptions, such as India, South Africa, and China. In general, there are very few functioning national-level policies supporting open education and open licensing standards, although there are multiple OER projects being implemented with public funding. Even for the existing policies of the overall OE development and open standards, policy matters are often difficult to understand beyond a narrow circle of policymakers, experts, and stakeholders (Touzé 2014). Many countries have not released any OE policies. However, OE is being recognized as one of the important methods for promoting educational equity and quality, with many countries all over the world working together for a better education for all. If any country fails to grasp the opportunity in this digital revolution age, it would be a big loss for its education development, especially for the developing countries. As indicated by previous research, one of main barriers to reap the benefits of OE/OER is fragmentation combined with a lack of clear and uniform legal policies (Sabadie et al. 2014). Therefore, it is imperative for both developed countries and developing countries to release OE policies urgently to reap the benefits of OE.

The world has become more of a global village nowadays. Developed countries are slowly realizing their obligation to provide quality education resources in different languages to help some poor countries to broaden learning opportunity and promote educational quality. The Open Book Project in Arab League is a good example, supported by the U.S. department of State. It is critical for the developing countries to also be aware of the importance of grasping the opportunity of digital revolution by releasing OE policies according to their economic and education situations. Both the developed countries and developing countries should develop their policies from a global point-of-view. Policies for OE are not just about access to content and resources; more should be taken into consideration to promote learning success through the revolution of education methods and practices.

A “government policy development template to progress effective implementation of open educational resources (OER): draft document” was announced by

[20]http://publishingperspectives.com/2012/03/survey-what-is-the-biggest-obstacle-to-arab-digital-publishing/.

UNESCO in 2012 (UNESCO 2012a, b), which gave a reference for making OE policies. Components, such as mission and objective of the policy, policy context, overview of OE, scope of the policy, a brief explanation of how the proposed strategy articulates with or requires changes to the existing policy (in the instance of a standalone policy), areas of responsibility, and status of the policy could be included in the overall OE development policies. In addition, the SOED could be referenced as it is the national-level policies enlightened from the OER Paris Declaration 2012. Open licensing policy or open standard policy is the foundation for creating and sharing quality learning resources, which should either be integrated in the OE policy or be released alone as a separated policy. The NZGOAL and AusGOAL are good references for making open licensing policies under the CC license.

For releasing policies on constructing OER, sustainable development approaches must be taken into consideration as it is one of main barriers for mainstreaming the OER approach in national educational systems (Mulder 2013). For now, virtually all of the existing policies are concentrating on the production and distribution of OERs; however, a further shift is needed to focus on the infrastructural conditions that support the proliferation of OERs (Kerres and Heinen 2015). The infrastructure, learning resources, teaching ability, and administrative ability are the four levels of construction for ICT in education, which should also be reflected in national policies for promoting the creation and use of OER.

Governments must take the threefold responsibility of accessibility, quality, and efficiency for education development (Mulder 2013), and releasing OE policies is one of the most effective methods. For the commonwealth of learning in a global village, (inter) national OE policies will play a vital role for improving educational equity, quality, and efficiency with more and more counties, and international organizations taking part in OE practices.

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Chapter 3
Educational Design for MOOCs: Design Considerations for Technology-Supported Learning at Large Scale

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3.1 Introduction

Massive open online courses (MOOCs) have emerged in the public discourse on potential transition to education using digital technologies (Yuan and Powell 2013; Siemens 2013). Two major MOOC strands have been concretely identified, namely the cMOOC and the xMOOC (Terras and Ramsay 2015). The former strand adopts a learner-oriented approach aiming to actively engage learners toward the formulation of collective knowledge and artifacts through their active participation to the particular xMOOCs community (Kop 2011). The latter, which in practice is the dominant strand, adopts a more traditional teacher-centered approach relying on a centrally designed course from a subject domain expert (Ferguson and Clow 2015).

Despite the considerable differences between cMOOCs and xMOOCs, still MOOCs are considered by many as an extension of existing online courses, introducing the "Massiveness" and "Openness" dimensions (Alario-Hoyos et al. 2014; Ferguson and Sharples 2014). These additional dimensions reasonably introduce new requirements on their educational design. Thus, the educational design of MMOCs is an important issue to study further, especially since certain

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shortcomings have been attributed to poor educational design of MOOCs, such as the significantly high participant drop-out rates, (Guàrdia et al. 2013; Daradoumis et al. 2013), limited learner motivation (Zheng et al. 2015) and learner engagement (Hew 2015), and the overall poor instructional quality (Cooper and Sahami 2013; Yuan and Powell 2013; Margaryan et al. 2015). Within this context, this chapter presents an ADDIE-based educational design considerations framework (EDCF) for xMOOCs, which aim to accommodate the specific characteristics of the "Massiveness" and "Openness" in xMOOCs.

The remainder of this chapter is structured as follows. Section 3.2 presents background information on MOOCs, as well as an analysis of their "Massiveness" and "Openness" dimensions. This analysis will highlight specific characteristics that can affect the educational design process. Section 3.3 discusses existing educational design frameworks and/or guidelines for MOOCs. The existing works are benchmarked against the identified characteristics of the "Massiveness" and "Openness" dimensions and shortcomings are identified. Section 3.4 proposes an xMOOC EDCF based on the ADDIE Model. Section 3.5 discusses the conclusions of the chapter and suggests future work.

3.2 Massive Open Online Courses

3.2.1 Overview

MOOCs have been receiving a significant level of research attention and, as a result, a range of approaches for classifying them has been recently proposed (e.g., Clark 2013; Conole 2014). Two major MOOC strands have been concretely identified, namely the cMOOC and the xMOOC (Terras and Ramsay 2015). These two strands are described, as follows:

- **cMOOCs**. Typically, cMOOCs adopt a learner-oriented approach aiming to actively engage learners toward the formulation of collective knowledge and artifacts through their active participation to the particular xMOOCs community (Kop 2011). cMOOCs can be delivered through a wide range of distributed services connecting the participants and fostering multiple means of knowledge creation (Rodriguez 2012).
- **xMOOCs**. Typically, xMOOCs adopt a more traditional teacher-centered approach relying on a centrally designed course from a subject domain expert (Rubens et al. 2014; Hew and Cheung 2014). xMOOCs are usually delivered through a single infrastructure which hosts all the required educational resources, tools, and services, as well as the interactions and communication channels (Rodriguez 2012).

Even though the initial MOOCs were explicitly cMOOCs, the current reality is that xMOOCs have become the dominant MOOC type, typically designed and delivered by elite world universities (Stewart 2013; Ebben and Murphy 2014).

In this book chapter, we focus on xMOOC, given that it is the most widely deployed type of MOOC for "transforming" existing (online, blended or face–to–face) courses to a massive and online delivery (Daniel 2012; Kay et al. 2013).

The following subsections discuss the two core MOOC dimensions, namely "Massiveness" and "Openness," from an xMOOC perspective. This analysis aims to identify specific educational design consideration categories for each dimension which can then be used to evaluate existing works on the educational design of xMOOCs.

3.2.2 Massiveness Dimension

Massiveness mainly refers to the capacity of xMOOCs to deliver learning experiences at a large-scale transcending the coverage barriers of existing online and blended approaches (Stewart 2013; Terras and Ramsay 2015). Massiveness is commonly linked to the overarching fact that xMOOCs usually attract a considerable number of participants (Kop 2011; Daniel 2012; Conole 2014). More specifically, the level of participation can range from as little as 150 participants (Dunbar's number) which is usually considered to be the threshold for a course to be considered as massive (Downes 2013; cited in Koutropoulos and Zaharias 2015), to as many as a few thousand participants (Ho et al. 2015). Therefore, the delivery of xMOOCs at a large scale (compared to small-scale online courses) can influence the choices that the instructional designer makes in terms of the educational design of xMOOCs.

More specifically, the main aspects of xMOOC's educational design that are directly affected by the massiveness dimension include:

- **Learner analysis**. Given the fact that the participants are not known a priori to the instructional designer, their educational design is very difficult to be based on a solid analysis of their background competences, preferences, and needs. This limitation is even more important considering the usual diversity of the participants in terms of culture, competences, and initial motivation (Ho et al. 2015).
- **Teaching strategy and assessment method**. Considering the large size of the participant group, the instructional designer is often required to exclude specific teaching strategies and assessment methods, due to the anticipated effort in order to handle their delivery. As a result, the vast majority of xMOOCs employing teaching strategies and assessment methods that can be automated to a large degree, namely distribution of digital video-based resources and automatic quizzes (Yousef et al. 2014a). This is a significant shortcoming, however, since it can hinder the overall educational quality of the course (Margaryan et al. 2015). Recent attempts to alleviate this "behaviorist" approach to xMOOC educational design argue in favor of incorporating collaborative learning and assessment activities aimed at artifact formulation and social interaction, thus incorporating aspects of cMOOCs (Purser et al. 2013).

- **Selection and/or Development of educational resources**. As the participants are not known a priori to the instructional designer the selection and/or development of educational resources is typically performed from a "generic" standpoint, i.e., cultural issues of the participants are usually not considered (Nkuyubwatsi 2014). Furthermore, extending the second aspect of the educational design, the selected educational resources are usually disseminated by the instructor, with very limited contribution from the participants, in the formulation of collective knowledge (Rubens et al. 2014).
- **Participant performance monitoring and feedback provision**. Monitoring the progress of individual xMOOC participants and provide individual feedback by tutors is almost impossible considering their vast numbers and diversity of participants. Thus, the instructor should rely on automated analytics mechanisms to monitor the performance of the participants (deBoer et al. 2014). More specifically, such mechanisms can facilitate the instructor to have a granulated overview of a wide range of participants' performance indicators, including among others their forum activity (Kizilcec et al. 2013) and their video viewing and assignment submission patterns (Coffrin et al. 2014).

In order to address the aforementioned issues, first the concept of "Massiveness" should be analyzed in a set of strands, i.e., elements that are directly affected (or caused) by the aforementioned vast number of participants in xMOOCs. Each of these strands can impact the educational design (and delivery) of xMOOCs, and therefore need to be taken explicitly into account when initially designing such courses. Two of the most commonly reported "Massiveness" strands are the participant *cultural diversity* and the participant *motivation*.

These two strands are analyzed as follows:

- **Participant cultural diversity**. The term "culture" in educational design is difficult to pinpoint and it is sometimes reduced to mere generic "national differences" between people (Hofstede 1986; Maitland and Bauer 2001). However, for the purpose of this chapter, Powell's definition of "culture" is adopted: "the sum total of ways of living, including values, beliefs, aesthetic standards, linguistic expression, patterns of thinking, behavioral norms, and styles of communication, which a group of people has developed" (Powell 1997). As the definition implies, culture is not merely defined and restricted within national contexts, but, instead relates to a diverse set of "attributes" that groups of people can possess and which influence their everyday practices, including the manner in which they engage in the learning process. Therefore, the diverse cultural aspects which each participant can possess within a MOOC can greatly affect the way of engagement and interaction with the learning environment (online, blended or face–to–face) (Bentley et al. 2005; Edmundson 2007).

  From this perspective, accommodating learner cultural diversity has been proposed as an important area of research in the overall educational design field (Thomas et al. 2002; Rogers et al. 2007), as well as the specific context of MOOCs (Liyanagunawardena et al. 2013b; Literat 2015). More specifically, the fact that xMOOCs are designed without the capacity to effectively analyze and profile the participants a priori (Macleod et al. 2015), designing such culture-aware courses is an even more difficult task. Therefore, it is increasingly being argued that xMOOC educational designs should inherently incorporate cultural design considerations in order to enhance the quality of participants' engagement (Tapanes et al. 2009; Parrish and Linder-Van Berschot 2010).

Initial works to alleviate this issue include Marrone et al. (2013) and Nkuyubwatsi (2014), who explicitly addressed the need for providing culturally aware MOOC experiences. More specifically, Marrone et al. (2013) presented a small-scale evaluation of a sample of eight MOOCs against a set of preliminary criteria aiming to depict cultural aspects of the design of these MOOCs. Nkuyubwatsi (2014) performed a qualitative evaluation of a set of five MOOCs based on a self-created cultural translation instrument and utilized their findings to support their argument on the need to provide cultural "translations" in MOOCs, namely to make them more relevant to participants in their respective cultural settings.

Toward addressing the issue of participant cultural diversity, a review of the literature on culture-aware educational design was performed in order to identify recurring cultural design consideration categories and characteristics which influence the process (and product) of educational design (in general). Table 3.1 presents the set of educational design Cultural Consideration (CC) categories, which is the resulting superset of the identified cultural consideration categories and characteristics. Each codified CC category is analyzed and mapped to a set of specific cultural consideration characteristics (CCC). Furthermore, a brief description of each of these characteristics is provided toward presenting the manner of influence it can have on the process of educational design.

- **Participant motivation**. The second commonly reported strand of the "Massiveness" dimension of xMOOCs is the level of learner motivation (Knox 2014). Learner motivation is defined as the reasoning behind a person's behavior which leads to the actual actions (i.e., to the learner's engagement or drop-out) (Darr 2012).

  A key identified problem of xMOOCs is the high drop-out rates (Jordan 2014; Alraimi et al. 2015; Zheng et al. 2015). Despite the fact that these rates cannot be fully attributed to the educational design of the xMOOCs (e.g., different initial participant motivations can influence their level of participation-Chang et al. 2015; Pundak et al. 2014), their significantly high level and recurring appearance has been connected with the limited capacity of existing xMOOCs to effectively motivate the participants (Zheng et al. 2015; Rai and Chunrao 2016). Therefore, research attention has been placed on identifying methods and indicators in order to measure and increase the participant's level of motivation, and thus, engagement (Hew 2015). Examples of such methods include designing and delivering problem-based learning and/or assessment activities (Spoelstra et al. 2014), promoting and monitoring participant collaboration

Table 3.1 Educational design cultural consideration categories and their characteristics

ID	Cultural consideration categories	Cultural consideration characteristic	Description
CCC1	Instruction/interaction	CCC1a. Method of instruction and collaboration	Cultural differences can impact the manner in which participants approach learning, in terms of structured autonomous work or flexible instruction based on collaboration (Hofstede 1986; Banks 1993). More specifically, cultural understandings can implicitly impede (or promote) autonomous individual work, resulting in participants' difficulty (or tendency to) in efficiently expressing their opinion and arguing for it (Liu et al. 2010; Parrish and Linder-Van Berschot 2010; Richter 2011)
CCC2	Communication	CCC2a. Barriers during synchronous communication	Time-zone barriers related to the learners' place/country of residence can significantly impede synchronous communication. Therefore, this aspect should be taken into account when designing for synchronous communication between learners (Liu et al. 2010)
CCC3	Assessment	CCC3a. Assessment methods	Need for accommodating potentially diverse participant culture-based needs and requirements in terms of the preferred assessment methods, e.g., exam-oriented or process-oriented (Liu et al. 2010; Marrone et al. 2013; Nkuyubwatsi 2014)
		CCC3b. Assignment templates	Participants might have a diverse understanding on the ideal deliverable for a given assignment description, based on their own cultural understanding (Mercado et al. 2004). Therefore, explicit descriptions and/or templates of the expected quality and format of the deliverables should be provided (Parrish and Linder-Van Berschot 2010; Higbee et al. 2010)
		CCC3c. Academic conduct	Participants might have a different perspective on what constitutes acceptable academic conduct, e.g., what constitutes plagiarism or what

(continued)

Table 3.1 (continued)

ID	Cultural consideration categories	Cultural consideration characteristic	Description
			are the allowed margins for adhering to the assessment timetable (Mercado et al. 2004). Therefore, explicit guidelines describing the academic conduct rules should be explicitly provided (Hayes and Introna 2005; Liu et al. 2010)
CCC4	Feedback	CCC4a. Diversity in feedback method	Participants from different cultural backgrounds might expect and value diverse "methods" of feedback provision, for example direct feedback in contrast to indirect feedback which is elicited through challenges (Mercado et al. 2004; Richter 2011)
		CCC4b. Diversity in feedback provider	The provider of feedback might be a differential attribute of participants, for example, tutor-based feedback vs peer-based feedback (Mercado et al. 2004; Richter 2011)
CCC5	Subject domain content	CCC5a. Examples/content to support instruction	Culture-specific content or examples used to support instruction might lead to imposing difficulty on specific groups of participants due to their unfamiliarity and/or indifference on the specific case (Liu et al. 2010). For example, studying specific societal problems of a particular country or group, might not be relevant to participants who are not familiar to this context (Parrish and Linder-Van Berschot 2010; Higbee et al. 2010; Nkuyubwatsi 2014)
CCC6	Language	CCC6a. Language proficiency and use	Language barriers are an important issue in multi-cultural education (Liyanagunawardena et al. 2013b). Such barriers can develop during learner-content, interactions due to either low language proficiency of the learners (Marrone et al. 2013; Nkuyubwatsi 2014) or use of culturally specific terminology and symbols (Bentley et al. 2005; Rogers et al. 2007). Furthermore, learner–learner and learner-instructor

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Table 3.1 (continued)

ID	Cultural consideration categories	Cultural consideration characteristic	Description
			asynchronous communication can be impeded due to lack of visual cues which can potentially support the participants to make their point clear (Reeder et al. 2004; Liyanagunawardena et al. 2013b; Nkuyubwatsi 2014)
CCC7	Technological infrastructure and educational resources	CCC7a. Diversity in available technological infrastructure	Participant diversity in terms of availability of technological infrastructure (e.g., in their country or place of living) which can affect their capacity to engage in learning activities (e.g., low internet connection bandwidth) (Rogers et al. 2007; Yousef et al. 2014a)
		CCC7b. Restrictions in access in educational resources	Participants from specific countries might face restrictions when accessing educational resources required for the course (e.g., YouTube website is restricted in certain countries) (Rogers et al. 2007; Young 2008; Marrone et al. 2013). Furthermore, issues related to learning/physical needs of participants can also hinder their capacity to engage with specific learning resource types

(Hew 2015), and engaging participants in peer-assessment methods (Luo et al. 2014).

Apart from the aforementioned, a commonly reported promising method to increase participant motivation at large scale is the "gamification" of the educational design of xMOOCs (Anderson et al. 2014; Voulgari and Sampson 2014). More specifically, the process of gamification relates to the use of game-based mechanics in nongame situations with the aim of enhancing participant motivation and to promote their engagement in activities (Kapp 2012; Dicheva et al. 2015). Gamification elements can also be traced to the aforementioned examples of methods to enhance participant motivation.

In the context of technology-enhanced education, gamification has been reported to effectively achieve the aforementioned goals of enhancing learner motivation (Domínguez et al. 2013) and has also been used as a method to increase learner motivation (and engagement) in online learning contexts (e.g., Denny 2013; Cheong et al. 2013). Therefore, this potential could be also expanded in the context of xMOOCs toward addressing the aforementioned shortcoming of low level of participant motivation and engagement at a massive scale. Indeed, existing works toward this direction have highlighted promising results. For example, van Hentenryck and Coffrin (2014) incorporated gamification elements in a MOOC and positively evaluated its influence on the participants' level of motivation. Similarly, Anderson et al. (2014) reported positive results related to participants' level of engagement in the forum discussions in a MOOC, after incorporating a gamification badge system. Therefore, research so far indicates that incorporating gamification elements in the educational design of MOOCs, can potentially enhance the level of motivation (and engagement) of the participants (Gené et al. 2014).

Under this light, a potentially appropriate field for eliciting such gamification elements for xMOOCs, is the field of massively multiplayer online games (MMOG) (Tan 2013; Voulgari and Sampson 2014). MMOG are online games, hosting vast virtual worlds in which massive numbers of players can interact with each other and the environment toward reaching specific objectives (Lin and Lin 2011). The MMOGs' capacity to (a) provide effective methods for supporting educational interventions (de Freitas and Griffiths 2009; Suh et al. 2010; Wu et al. 2014) and (b) effectively foster players' motivation at a *massive scale* (Williams et al. 2008), reveals their potential to act as a basis from which specific design considerations could be extracted toward efficiently "gamifying" xMOOCs (Tan 2013; Gené et al. 2014).

Therefore, in order to incorporate such MMOG-based design considerations in the proposed ECDF, a review of the literature was performed in order to highlight characteristics of MMOGs which have been reported to effectively foster participants' motivation. This set of characteristics, presented in Table 3.2, are based on the motivational categories proposed by Yee (2006) and will be regarded as educational design motivational considerations (MC) categories for xMOOCs. Each codified MC is mapped to a set of specific characteristics (MCC) that further analyze it. Furthermore, a brief description of each of these characteristics is provided toward presenting the manner in which it can affect the process of educational design.

The following subsection is focused on describing and analyzing the "Openness" dimension of xMOOCs, based on existing approaches to define openness in the wider technology-enhanced education domain.

3.2.3 Openness Dimension

"Openness" relates to an overarching trend in the field of online and digital education (Tuomi 2006; OECD 2007). "Openness" has been reported to comprise a set of elements, which in this book chapter will be referred to as "Openness" Considerations (OC) for the educational design of xMOOCs. An "Openness" aspect which is common for all MOOCs relates to the tuition-free registration and

Table 3.2 Educational design motivational consideration categories and their MMOG characteristics

ID	MMOG characteristic category (MC)	MMOG characteristic (MCC)	Description (this characteristic relates to the …)
MCC1	Sociability	MCC1a. Participant communication (a) synchronously	Capacity of MMOG to allow direct communication channels between participants (Dickey 2007; Hung et al. 2009; Peterson 2010). Creating and maintaining communication channels in the context of xMOOCs has been positively correlated with higher learner motivation (Anderson et al. 2014)
		MCC1b. Create and Share user-generated content	Capacity of MMOG to allow participants to create their own content and share it with others, thus engaging them in the process of creating and/or exploiting such content (Peterson 2010; Voulgari et al. 2014). In the context of xMOOCs, actively engaging the participants in the formulation/dissemination of their artifacts is proposed as an effective way to enhance their motivation (de Freitas et al. 2015)
		MCC1c. Collaboration in achieving tasks related to the attainment of learning objectives	Common MMOG principle to require participants' collaboration in groups (e.g., guilds), thus promoting the cultivation of a group experience and resulting in increased levels of motivation (Hung et al. 2009; Suznjevic and Matijasevic 2010) The quality and level of collaboration in MOOCs has been attributed with the capacity to enhance motivation (Voulgari and Sampson 2014)
MCC2	Immersion	MCC2a. Role-playing with avatars	Capacity of MMOG to allow players to engage in the activities by performing a specific role while represented by a unique avatar acting as their personalization in the web-space (Hsu et al. 2009; Suznjevic and Matijasevic 2010). Role-playing with the use of an avatar has been

(continued)

Table 3.2 (continued)

ID	MMOG characteristic category (MC)	MMOG characteristic (MCC)	Description (this characteristic relates to the …)
			proposed as a method to promote learner motivation in the educational context (e.g., Dickey 2007; Peterson 2010)
		MCC2b. Narrative	Envelop the educational problem within a progressing nonlinear storyline (Williams et al. 2008) which can facilitate (novice) participants (e.g., in MOOCs) to keep on track in terms of the tasks they have to perform (Voulgari and Sampson 2014). Moreover, having (short) appealing narratives can increase the level of participants' motivation, by allowing them to engage in small tasks that will lead to rewards (see MCC3b) and will help them become more immersed (Dickey 2007)
MCC3	Achievement and advancement	MCC3a. Character advancement and point ranking	Aggregation of "experience" points to the participant profile as a consequence of engaging with tasks. (Hung et al. 2009; Hsu et al. 2009; Voulgari and Sampson 2014). Such approaches have been shown to enhance the participants' motivation in the educational context as well (Muñoz-Merino et al. 2013)
		MCC3b. Rewards	Provision of unique "gifts" to participants when meeting specific criteria within a task or performing specific tasks (Dickey 2007; Hsu et al. 2009; Voulgari and Sampson 2014). Such reward approaches have been shown to enhance the participants' motivation in educational contexts as well (Anderson et al. 2014)
		MCC3c. Diverse methods of accomplishment	Diverse methods that MMOG allow for achieving a specific objective, (Choi and Kim 2004; Lisk et al. 2012; Voulgari and Sampson 2014). In the educational

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Table 3.2 (continued)

ID	MMOG characteristic category (MC)	MMOG characteristic (MCC)	Description (this characteristic relates to the …)
			context of MOOCs, multiple methods to attain (educational) objectives can relate to offering flexibility to the participants in the manner in which they will engage with the learning activities (for example, select their own subject in a project task or formulate their own group in a collaborative activity) towards making them more interesting to their own needs and preferences (Guàrdia et al. 2013)
MCC4	Challenges	MCC4a. Direct and regular feedback	Provision of direct and regular feedback to participants based on in-game actions (Choi and Kim 2004). Providing direct and regular direct feedback is considered to be a significant element for fostering participant motivation, since it can potentially facilitate learners to alter their behavioral standpoints regarding drop-out from challenges (Erhel et al. 2013; de Freitas et al. 2015)
		MCC4b. Engagement with tasks	Engagement of participants in specific (problem-solving) tasks which are highly challenging (Kong and Kwok 2009; Hung et al. 2009; Peterson 2010) Providing such tasks, which have also increasing level of difficulty as the tasks progress, is a significant factor for maintaining participant motivation (Tan 2013)

participation (Klobas 2014; Yousef et al. 2014a). Since this aspect is a common practice in MOOCs, it was not considered as an aspect that can inform the educational design process of MOOCs.

The xMOOCs Openness Considerations are based on the four Openness pillars identified in the “Opening Up Higher Education” report (cited in Yuan and Powell 2013) and are described as follows.

- **OC1—Open Curriculum**. This consideration can relate to the capacity of learners to select their own pathway in terms of the curriculum they wish to follow, based on their own needs and preferences. Moreover, it also refers to the lack of entry requirements for participation in courses (Anderson 2013; Yousef et al. 2014a). More specifically, in the context of xMOOCs, key prerequisites for participation (in terms of prior knowledge or demographics) are usually merely described (e.g., in the course syllabus), however are not utilized as a means for blocking registration (Klobas 2014). Therefore, even participants who do not meet the defined pre-requisites are allowed to register to the xMOOC. This should provide insights for the educational design of MOOCs in order to adapt the course to the characteristics of individual learners. For example, learners with low level of initial interest to the course could be provided with a more simplistic version which will exclude specific learning activities (deBoer et al. 2014).
- **OC2—Open Learning**. This consideration is related to the need for allowing participants to engage in collective (and/or individual) knowledge creation and dissemination, moving beyond the mere instructor-participant interactions (Yuan and Powell 2013; Anderson 2013). Despite the fact that this openness consideration is not fully promoted by existing xMOOCs, there has been an emerging trend toward its incorporation and exploitation for increasing the level of participants' engagement (Blom et al. 2013; Conole 2013). More specifically, such approaches argue for the extension of usually employed quiz-based assignments to include evaluation methods comprising artifact formulation (Hew 2015) and social interaction (Grünewald et al. 2013). In order to effectively perform these assessment tasks at large-scale research has been focusing on either automated approaches such as essay scoring (Balfour 2013) or forum posts analysis (Yang et al. 2013) as well as peer-assessment approaches (Suen 2014).
- **OC3—Open Assessment**. This consideration relates to the capacity to allow for assessment led by peers or the instructor, during the learning process, possibly on an "on-demand" basis (Yuan and Powell 2013).
- **OC4—Open platform**. This consideration relates to the requirement for exploiting platforms and educational tools that allow the collection and exploitation of information and educational data. Additionally, it also encapsulates the aspect of educational resources which are either learner-generated (Alraimi et al. 2015) or instructor-generated but have been assigned an open copyright licence, such as a creative commons(CC) licence (OECD 2007; Anderson and McGreal 2012). Existing xMOOCs mainly focus on providing educational resources which are freely accessible but are not subject to CC licences (Rodriguez 2013). Therefore, they only partly accommodate this openness consideration (Tuomi 2013). Moreover, the aspect of platform is usually restrictive since the majority of xMOOCs are being delivered through a specific platform, e.g., Coursera, edX and Udacity (Liyanagunawardena et al. 2013a). The latter characteristic of xMOOCs can affect the educational design of these courses, since they can limit the degrees of freedom that the designer has

(e.g., the existing functionalities of a platform in terms of supporting collaborative activities can influence whether such activities will be designed).

The aforementioned "Openness" considerations, in combination with the considerations derived from the analysis of the "Massiveness" dimension will be exploited in the following section, toward evaluating existing proposed MOOCs educational design frameworks and/or guidelines. As aforementioned, the conclusions drawn from this process will inform the formulation of the proposed EDCF (presented in Sect. 3.4).

3.3 Existing Educational Design Considerations Frameworks for MOOCs

3.3.1 Presentation of Existing Educational Design Considerations Frameworks for MOOCs

In order to address the identified issues related to the need for revisiting the educational design of (x)MOOCs, research has been focusing on proposing specific educational design frameworks and/or guidelines. This section will provide an overview of these works.

Kauffman and Kauffman (2015) proposed the 5C Model which is loosely based on the ADDIE Educational Design Model (Branch 2010) and is aimed at designing MOOCs which can provide active learning experiences, present clear information and informative (intrinsic or extrinsic) feedback. The 5C model outlines the steps to be followed toward creating an effective MOOC, which are generally defined as follows:

- *Construct*, that is, design clear and measurable intended learning outcomes, which are communicated to the learners.
- *Consider*, that is capture learners' prior knowledge and motivation (through online instruments such as questionnaires). This information allows the instructors to track learners' performance during the delivery and potentially offer more personalized feedback.
- *Create*, that is, identify an engaging and appropriate teaching method for structuring the MOOC. The authors argue for the use of problem-based and collaborative approaches.
- *Conceive*, that is, select learning activities to promote learners' active engagement.
- *Conduct*, that is, formative and summative assessment for both assessing the learners as well as for gathering information to evaluate the overall learning process.

The underlying principle in the 5C Model is to consider and align the aforementioned elements towards designing student-engaging learning experiences however no specific guidelines on how to do so are provided.

Margaryan et al. (2015) performed a critical analysis of the educational design quality of existing MOOCs based on a set of ten evaluation criteria. The underlying quality principles of the evaluation criteria relate to the level in which the MOOC design fosters problem-centered and active contribution from the learners. Furthermore, the authors argue in favor of teaching approaches that both demonstrate the intended learning outcomes to the learners as well as engage them in hands-on practice to apply and reflect on them. Furthermore, they argue for the need of collaborative knowledge construction (e.g., through discussion fora and wikis) as well as the provision of feedback and flexible flows of activity engagement. While these criteria were primarily addressed at evaluating existing MOOC designs, they could also serve as a set of guidelines for informing future MOOC designs.

Rosewell and Jansen (2014) reported on the OpenupEd Quality Label (OEOL), which is a quality assurance framework providing 32 quality “guidelines” for good practice for MOOC design (and delivery). These “guidelines” are loosely related to the educational design process described in the ADDIE model. The OEOL is an extension of the existing E-xcellence label which has been proposed for assessing the quality of e-learning in European higher education. Additionally, the OEOL framework describes considerations both from a design as well as from a delivery standpoint.

Rubens et al. (2014) proposed a set of 13 pedagogical considerations for designing MOOCs (called online master classes in this work). The formulation of these considerations was based on insights from a series of deliveries of online master classes, and (overall) aim to promote high and diverse levels of interaction for the learners (with the content, the instructor and among themselves) and to engage them in active participation in the course’s activities through hands-on formulation of artifacts. Furthermore, the authors highlight the importance of collecting learners’ prior competence levels so as to exploit them during the delivery (e.g., for formulating appropriate groups and providing more personalized feedback).

Yousef et al. (2014b) present a set of 74 criteria for driving the design and implementation of MOOCs. They have identified two overarching criteria pillars (i.e., Pedagogical and Technological) which are further distributed in six categories, namely instructional design and assessment (under the pedagogical pillar) and user interface, video content, learning/social tools, and learning analytics (under the Technological pillar). Each category defines a wide range of ‘best-practice’ indicators that can be exploited by designers in order to improve their MOOC designs. The full set of criteria was validated through a survey of students and professors.

Lackner et al. (2014) proposed a set of 71 indicators that instructors/designers should consider when designing their MOOC, based on the literature study. These indicators are organized under seven categories, namely core requirements, structure, participant requirements, assignments, media design, communication, and resources. In each of these categories, the authors define a series of checklist items to be followed so as to potentially increase the effectiveness of the MOOC during its delivery.

Read and Rodrigo (2014) report on a set of generic guidelines for designing MOOCs, organized under a set of five aspects:

– *Topic*, that is, the need for defining a clear and specific topic (and educational objectives) for the MOOC.
– *Contents*, that is, the potential of re-using existing educational resources, adapted to meet the specific needs of the MOOC.
– *Duration*, that is, the definition of the expected MOOC duration (overall between 25 and 125 h).
– *Structure*, that is, guidelines for structuring the internal modules of the MOOC and their corresponding educational resources.
– *Specific Instructional Design Guidelines*, that is, the need for selecting teaching methods and activities for promoting learners' active engagement and reflective self-assessment.
– *Social Channels*, that is, the exploitation of diverse social channels (e.g., web 2.0 social media) so as to effectively promote dissemination of experiences and knowledge among learners.

Conole (2013) has proposed the 7Cs of Learning Design framework as a method to guide educational design, also in the context of MOOCs. More specifically, seven generic categories of considerations have been outlined which can be used to design and evaluate the educational design of MOOCs, structured as follows:

– *Conceptualize*, that is, considerations regarding learner analysis and the definition of educational objectives.
– *Capture*, that is, the selection of educational resources for supporting the intended educational objectives (with a focus on Open Educational Resources).
– *Communicate*, that is, the definition of tools and methods to foster asynchronous and synchronous communication.
– *Collaborate*, that is, the definition of tools and methods to foster collaboration.
– *Consider*, that is, the definition of tools and methods to promote reflection and different forms of assessment.
– *Combine*, that is, the process of synthesizing all the aforementioned in a consolidated, structured learning pathway.
– *Consolidate*, that is, the delivery of the (MOOC) design and the process of evaluating and refining it.

Finally, Guàrdia et al. (2013) presented a set of principles for MOOC design based on an exploratory analysis they performed on students' comments from a series of MOOC deliveries. Therefore, the ten principles highlighted reflect the students' opinions on the MOOC design considerations that should be accommodated. Overall, the guidelines of Guàrdia et al. stress the need for competence-based, student-engaging learning experiences. Furthermore, the need for promoting learners' self-regulation and self-assessment is stated, supported by the definition of explicit educational objectives and flexible learning pathways within the MOOC. Additionally, the authors highlight the importance of designing for collaborative activities that will also foster knowledge dissemination and peer-support and peer-assessment. Finally, the appropriate selection of emerging technologies for supporting the aforementioned tasks is also highlighted as an aspect that needs to be explicitly considered when designing and delivering a MOOC.

The aforementioned existing works will be evaluated in the following section in order to assess the level in which the identified set of characteristics of the "Massiveness" and "Openness" dimensions (from Sects. 3.2.2 and 3.2.3) are accommodated.

3.3.2 Evaluation of Existing Educational Design Considerations Frameworks for MOOCs

This section presents the evaluation of existing works in revisiting the Educational Design of MOOCs, toward identifying potential shortcomings and building on them to propose the unifying/extended ECDF. More specifically, the list of identified existing works (presented in the previous section) was benchmarked against the identified characteristics of the "Massiveness" and "Openness" dimensions.

The evaluation process comprised a thorough analysis of the principles and/or guidelines proposed by each existing work, in terms of the level of accommodation they offered for each of the characteristics of the "Massiveness" and "Openness" dimensions. The outcomes of this process, for readability purposes, are depicted in this section as occurrence frequency percentages, i.e., the percentages in which each characteristic is being (fully) accommodated by existing works.

Figure 3.1 presents the results of the evaluation process regarding the educational design *Cultural Considerations* (*CC*).

As the Fig. 3.1 depicts, existing works commonly address cultural aspects related to the provision of feedback to participants from multiple providers (e.g.,

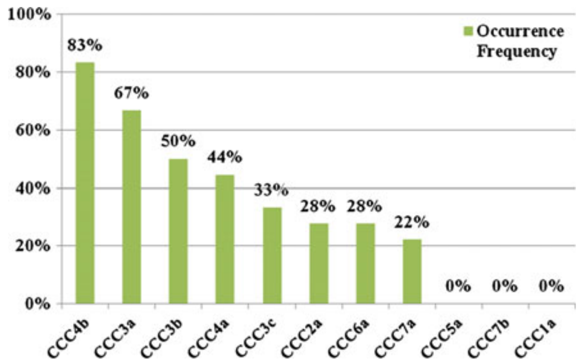


Fig. 3.1 Occurrence frequency (percentage) of the educational design cultural considerations in existing works

peers, instructor, tutor) (CCC4b − x = 83 %) and the design of multiple assessment methods towards evaluating the attainment of educational objectives (CCC3a − x = 67 %). Additionally, other explicitly referenced CC include the provision of clear and elaborated rules related to the expected quality and format of assignments (CCC3b − x = 50 %) and the expected academic conduct of participants (e.g., plagiarism and netiquette rules) (CCC3c − x = 33 %). The aspects of providing diverse methods of feedback (for example, through instructor feedback reports or quiz-based feedback) (CCC4a − x = 44 %) and explicitly considering time-zone differences when designing synchronous collaboration activities (CCC2a − x = 28 %) are also explicitly addressed, even at a less consensual degree. The very significant CC aspect of the language proficiency of participants is not commonly referenced (CCC6a − x = 28 %). However, it has been explicitly accommodated by proposing educational design considerations on limiting the use of symbols and culture-specific language formats, as well as by providing translations of the provided educational content (e.g., translated transcripts of educational videos) (Lackner et al. 2014). Finally, CC aspects related to the diversity of technological infrastructure in different countries, despite being referenced in a very low degree (CCC7a − x = 22 %) are being addressed by proposing the use of multi-versioning of the provided educational content, in terms of technical format and quality toward enabling participants with low capacity technological infrastructure to access it (Yousef et al. 2014b).

The results of Fig. 3.1 show that three CC are not being accommodated, namely (a) the provision of multicultural educational content or examples for supporting instruction (CCC5a), (b) the explicit consideration related to potential restrictions in accessing educational resources in specific countries (CCC7b) and (c) the explicit considerations related to the potential cultural differences of participants which can impact the manner in which they engage with collaborative activities (CCC1a). Therefore, these CCs will need to be accommodated in the proposed EDCF, toward providing educational design considerations to address them.

Figure 3.2 presents the results of the evaluation process regarding the educational design *Motivation Considerations (MC)*, namely the percentages in which each MC was accommodated by existing works.

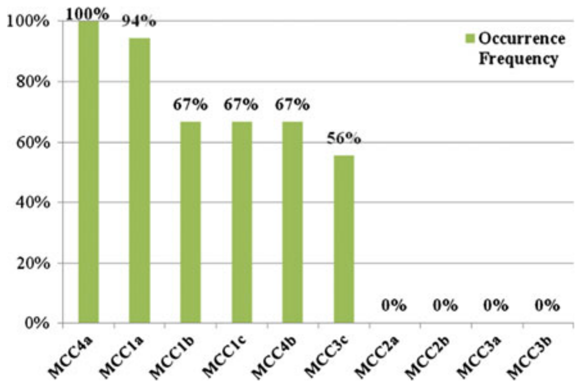


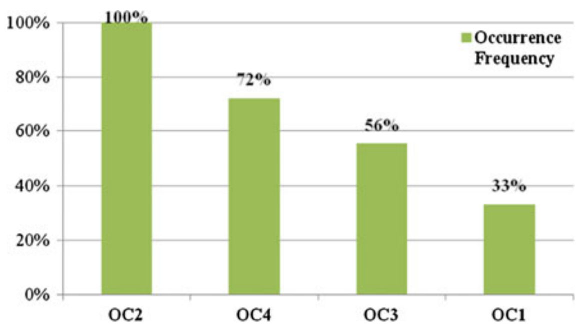
Fig. 3.2 Occurrence frequency (percentage) of the educational design motivational considerations in existing works

As the Fig. 3.2 depicts, existing works commonly reference motivational aspects related to the provision of regular and direct feedback to the participants (MCC4a − x = 100 %) and the formulation of communication channels amongst them (MCC1a − x = 94 %). Additionally, other commonly referenced MC include educational design considerations aiming to promote (a) the creation and sharing of participant-generated educational content (MCC1b − x = 67 %), (b) the formulation of collaboration teams (or "guilds") among participants toward collaboratively achieving specific learning tasks (MCC1c − x = 67 %) and (c) the design of (progressively) challenging learning tasks and activities (MCC4b − x = 67 %). Finally, the aspect of providing diversity in the method of accomplishing specific educational objectives is also commonly referenced (MCC3c, x = 56 %).

The results of Fig. 3.2 show that four MCs are not being fully accommodated. The four MCs which are currently not accommodated are (a) the incorporation of role-playing aspects (supported with avatars) (MCC2a), (b) the design of a progressing nonlinear storyline toward facilitating participants to become immersed in the educational problem of the xMOOC (MCC2b), (c) the incorporation of mechanisms to aggregate "experience" points to the participants' profile as a consequence of engaging with learning tasks (MCC3a) and (d) the provision of reward to participants when meeting specific criteria within an task or performing specific tasks (MCC3b). All these aspects can be related to the "gamification" of xMOOCs, a process which has been shown to be effective in enhancing participant motivation in xMOOCs (Gené et al. 2014). Therefore, these MC will be explicitly accommodated in the proposed EDCF, toward providing educational design considerations to address them.

Figure 3.2 presents the results of the evaluation process regarding the educational design *Openness Considerations (OC)*, namely the percentages in which each OC was accommodated by existing works. As the Fig. 3.3 depicts, existing works reference all "Openness" aspects. More specifically, the Open Learning (OC2) consideration is universally accommodated, namely all approaches argue toward actively engaging the participants in collective (and/or individual) knowledge creation and dissemination. Furthermore, all existing approaches support the engagement of participants in community building through communication channels. The latter has been proposed as a significant aspect to be considered (de Freitas et al. 2015).

Fig. 3.3 Occurrence Frequency (percentage) of the educational design openness considerations in existing works



The open platform (OC4) consideration is also commonly accommodated. More specifically, collecting and exploiting educational data for providing better learning experiences is commonly discussed (e.g., deBoer et al. 2014). Additionally, (and related to the OC1) existing approaches argue toward the engaging participants to actively create (and disseminate) their own educational content, toward moving beyond using merely the instructor-generated educational resources. The latter (which is a common characteristic of cMOOCs) has been proposed as improve the design of xMOOCs in terms of participants' motivation (Hew 2015).

The Open Assessment (OC3) consideration despite being commonly referenced, it is not widely accommodated. More specifically, despite the fact that providing both peer-led and instructor-led means of assessment to the participants is commonly reported as an educational design consideration, the aspect of "on-demand" assessment is not explicitly described. The latter includes the capacity of participants to be assessed and certified (if successful) on an "on-demand" basis, without having to complete the entire course first (Yuan and Powell 2013).

Finally, the open curriculum (OC1) consideration is also partly addressed by existing approaches. More specifically, the aspect of allowing participants to select their own curriculum pathway based on their own needs and preferences is indeed accommodated. However, based on the latter, existing educational design considerations do not propose exploiting the profiling data of the registered participants in the xMOOC. Therefore, given that there are no entry restrictions for entering a xMOOC, educational design considerations should take into account the aforementioned characteristics in order to adapt the course flow to meet them. That is, based on their individual characteristics, the participants could be proposed to follow a different path within a xMOOC, possibly comprising a subset of the overall learning activities (deBoer et al. 2014).

Overall, the existing works on the educational design of MOOCs are either not structured based on an educational design model (but instead comprise general considerations to adhere to), or they do not provide explicit guidelines to follow. Furthermore, despite implicitly aiming to address the "Massiveness" and "Openness" dimensions of MOOCs, they do not report on how these dimensions can been accommodated, since they do not base their design in the detailed analyses of these dimensions, i.e., what are their constituent elements and how these can inform the process of educational design of MOOCs. This has led to a significant degree of diversity in terms of the educational design considerations proposed for MOOCs, as well as to the lack of accommodation of specific characteristics of the "Massiveness" and "Openness" dimensions.

Thus, to alleviate these shortcomings we propose a unifying/extended Educational Design Considerations Framework (EDCF) for xMOOCs, structured based on the widely accepted ADDIE Educational Design model. The proposed xMOOCs-EDCF is presented in the following section.

Table 3.3 Educational design considerations framework for xMOOCs

ADDIE phases	Phase elements	xMOOC characteristics	EDCF guideline	Existing works
Cross-phase considerations		CCC6a	**EDCF 1**: All instructor-participant and participant-content interactions should avoid the use of cultural symbols and context-specific language. Translated transcripts/subtitles/glossaries should be provided for participant-content interactions	Lackner et al. (2014), Yousef et al. (2014b)
		Cross-Characteristic	**EDCF 2**: The xMOOC should provide a clear, detailed and informative syllabus	Lackner et al. (2014), Rosewell and Jansen (2014)
			EDCF 3: Pre-requisite competences for effective participation should be clearly defined to allow the instructor/designer to build on and exploit the participants' prior competences	Rubens et al. (2014), Margaryan et al. (2015)
Analysis	A1. Educational problem identification	CCC5a	**EDCF 4**: The educational problem should be designed in order to be relevant (or adaptable to) to a wide range of cultural contexts	Lackner et al. (2014)
		MCC2b	**EDCF 5**: The educational problem should be designed as an overarching progressing narrative offering potential side-tracks to follow	–
		MCC4b	**EDCF 6**: The educational problem should be specific and oriented at engaging participants with problem-solving tasks (i.e., not topic-oriented)	Read and Rodrigo (2014), Margaryan et al. (2015)
	A2. Contextual Analysis	CCC2a CCC7a	**EDCF 7**: The overall duration of the xMOOC (if not self-paced) and the duration of each unit/lesson should consider time-zone differences and diversity in the quality of access from different participants	
	A3. Learner Analysis	OC1 Cross-Characteristic	**EDCF 8**: The xMOOC should gather and exploit participant data related to their cultural background (e.g., language, country of origin, profession, and expertise) and initial motivation for engaging in the course	Kauffman and Kauffman (2015)
Design	Des1. Definition of educational objectives	CCC5a	**EDCF 9**: The educational objectives should be mapped to international professional competence standards, in order to facilitate participants to map them to their own context	Rosewell and Jansen (2014)

(continued)

Table 3.3 (continued)

ADDIE phases	Phase elements	xMOOC characteristics	EDCF guideline	Existing works
		MCC4b	**EDCF 10**: The educational objectives should be clearly defined and aimed at cultivating state-of-the-art competences (i.e., knowledge, skills, and attitudes)	Guàrdia et al. (2013), Kauffman and Kauffman (2015)
		MCC3c OC1	**EDCF 11**: Different levels can be defined for the stated educational objectives in order to allow different attainment thresholds for participants with diverse prior competences/motivation/preferences	–
	Des2. Selection of teaching approach/strategy	CCC1a	**EDCF 12**: Collaboration groups should be formulated by the participants themselves considering their cultural characteristics (e.g., language, country of origin)	–
		CCC2a	**EDCF 13**: Learning activities which require participant synchronous communication and collaboration should allow for alternative timeslots to engage	Lackner et al. (2014), Yousef et al. (2014b)
		CCC5a	**EDCF 14**: Learning activities should include cases of study and examples from multiple cultural contexts	–
		CCC7a MCC3c	**EDCF 15**: Learning activities should provide alternate methods of engagement in order to allow participants with diverse quality of technological infrastructure to engage (e.g., videoconference-based activities should allow for substitute methods, such as chat or forum)	–
		MCC1a OC2	**EDCF 16**: Learning activities should promote/require communication among the participants	Conole (2013), Rubens et al. (2014)
		MCC1c	**EDCF 17**: Collaboration groups should include the definition of specific participant tasks to be performed by each group member	Guàrdia et al. (2013)
		MCC2a	**EDCF 18**: Participants can be assigned an avatar to represent them in the digital space during engagement with learning activities	–
		MCC2b	**EDCF 19**: Learning activities should be clearly structured (in topics) and enveloped in an engaging, progressing narrative offering potential side-tasks to achieve	–
		MCC3c OC1	**EDCF 20**: Participants should be allowed to engage with learning activities in a nonlinear, conditional manner (e.g., based on their initial motivation, preferences, and/or competences)	Lackner et al. (2014), Rubens et al. (2014)
		MCC4b OC2	**EDCF 21**: The teaching approach should be relevant to the educational objectives and actively engage the participants in challenging tasks and artifact formulation	Kauffman and Kauffman (2015)

(continued)

Table 3.3 (continued)

ADDIE phases	Phase elements	xMOOC characteristics	EDCF guideline	Existing works
	Des3. Selection of assessment method	CCC3A MCC3c	**EDCF 22**: Multiple assessment methods for successfully evaluating the level of attainment of the course's educational objectives should be provided	Rosewell and Jansen (2014), Margaryan et al. (2015)
		CCC3b CCC3c	**EDCF 23**: Clear requirements to be met for each assessment activity should be provided, including evaluation criteria, exemplary deliverables, submission timetables (in international time), and academic conduct rules	Guàrdia et al. (2013), Lackner et al. (2014)
		CCC4a MCC4a	**EDCF 24**: Regular and/or direct feedback should be provided to the participants, either directly (e.g., by the instructor/tutor) or through their engagement with assessment activities	Guàrdia et al. (2013), Margaryan et al. (2015)
		CCC4b	**EDCF 25**: Feedback provision should be performed in a 360° manner, by the instructor, tutors, peers, and automated mechanisms (e.g., analytics dashboards)	Rubens et al. (2014)
		CCC5a	**EDCF 26**: If the assessment method includes project formulation, the xMOOC could allow participants to select their own project subject	–
		CCC7a	**EDCF 27**: Assessment activities should alternate methods of engagement in order to allow participants with diverse quality of technological infrastructure to engage	-–
		MCC3a	**EDCF 28**: Engaging in learning/assessment activities will assign the participants' avatar/profile with points, which can be utilized as a method of assessment of educational objectives' attainment	–
		MCC3b	**EDCF 29**: Reward mechanisms can be employed in order to acknowledge participants' achievements (e.g., badges)	–
		MCC3c	**EDCF 30**: Diverse assessment methods can be employed to evaluate the attainment of educational objectives by the participants (e.g., formative, summative, stealth assessment)	Read and Rodrigo (2014)
		MCC4b	**EDCF 31**: Assessment activities should be designed with progressing difficulty and level of challenge	–
		OC2	**EDCF 32**: assessment methods which engage participants in artifact formulation (ideally in a collaborative manner) should be exploited	Margaryan et al. (2015)
		OC3	**EDCF 33**: Assessment activities contributing to the certification of participants should be available on an "on-demand" basis	–

(continued)

Table 3.3 (continued)

ADDIE phases	Phase elements	xMOOC characteristics	EDCF guideline	Existing works
Develop	Dev1. Development/selection of educational resources	CCC5a	**EDCF 34**: Diverse educational resources should be selected in order to meet the local contexts of a wide range of participants	–
		CCC7a	**EDCF 35**: Different versions of the required educational resources with diverse technical quality in order to accommodate different participants' level and quality of access should be utilized	Yousef et al. (2014b)
		CCC7b	**EDCF 36**: Different versions of the required educational resources using different (but widely used) technical formats and meeting diverse accessibility standards	Yousef et al. (2014b)
		MCC1b OC2	**EDCF 37**: Participants should be promoted to engage in the formulation/dissemination of their own educational resources	Rubens et al. (2014)
		OC4	**EDCF 38**: Educational resources under Creative Commons licenses should be formulates/utilized	Lackner et al. (2014)
	Dev2. Development or selection of educational tools and/or services	CCC3a	**EDCF 39**: Instructions of expected use for the utilized tools and/or services should be provided	Guàrdia et al. (2013)
		CCC4a MCC4a	**EDCF 40**: Educational tools that allow for the provision of automatic and/or personalized feedback should be selected	Rosewell and Jansen (2014)
		CCC7a	**EDCF 41**: Educational tools with high levels of interoperability, exploiting common technical formats and offering cross-device compatibility should be used	Yousef et al. (2014b)
		MCC1a MCC1c	**EDCF 42**: Educational tools that support the formulation of communication and collaboration channels should be selected, based on the type of learning/assessment activities of the xMOOC	Lackner et al. (2014)
		MCC1b OC2	**EDCF 43**: Educational tools that support the formulation of educational content by participants (depending on the requirements of the xMOOC) should be selected	Rosewell and Jansen (2014)
		OC4	**EDCF 44**: Freely available and accessible educational tools and/or services should be utilized (Open)	Yousef et al. (2014b)
	Dev3. Arrangement of the appropriate delivery setting	Cross-characteristic	**EDCF 45**: The most appropriate technical platform should be selected in order to provide affordances to accommodate all the required educational design considerations for a given xMOOC	Rosewell and Jansen (2014)

(continued)

Table 3.3 (continued)

ADDIE phases	Phase elements	xMOOC characteristics	EDCF guideline	Existing works
Implement	I1. Delivery	MCC3a	**EDCF 46**: Mechanisms should be utilized to inform participants on their completion status (e.g., a progress bar)	Yousef et al. (2014b)
		CCC4a MCC4a	**EDCF 47**: Notification/reminder emails can be sent on a regular interval regarding aspects of the course (e.g., upcoming deadlines, next lesson overviews, or individualized progress reports)	Lackner et al. (2014)
	I2. Monitoring	MCC3b	**EDCF 48**: The instructor should identify high contributing participants at regular intervals and provide unique rewards in order to engage others	Guàrdia et al. (2013)
		MCC3a MCC4a OC4	**EDCF 49**: Learning analytics mechanisms should be used to identify participants at risk of drop out or high achievers (e.g., through assessment results, level of activity engagement or contributions in discussions)	Yousef et al. (2014b)
Evaluate	E1. Formative evaluation	MCC4a	**EDCF 50**: Feedback on assessment activities should be provided quickly and inform/scaffold the participant in terms of their specific shortcomings	Yousef et al. (2014b)
		MCC3a MCC4a	**EDCF 51**: Formative evaluation results and feedback could be provided using diverse means to signify the participant's progress (e.g., text, badges, or ratings) and allow for self-reflection	Margaryan et al. (2015)
	E2. Summative evaluation	CCC3c	**EDCF 52**: (Diverse) Accreditation information and requirements should be clearly defined	Lackner et al. (2014)
		CCC4b	**EDCF 53**: Summative evaluation could be performed by both instructors and peers in order to actively engage the latter. Peers could be selected in terms of culturally similar attributes	Guàrdia et al. (2013), Lackner et al. (2014)
		OC3	**EDCF 54**: Summative evaluation (and possible accreditation) should be available on-demand	–
		Cross-characteristic	**EDCF 55**: The instructor/designer should consider both provided and generated evaluation data both in a consolidated manner as well as in a group-level manner, to identify and remedy for shortcomings concerning all participants as well as specific groups	–

3.4 Educational Design Considerations Framework for xMOOCS

This section presents the Educational Design Considerations Framework for xMOOCs. As aforementioned, the EDCF is structured using the ADDIE model as a foundational framework. Furthermore, it extends previous works to incorporate design considerations for "Massiveness" and "Openness" characteristics that have not accommodated elsewhere.

Table 3.3 depicts the proposed xMOOC EDCF, which comprises 55 educational design considerations. As aforementioned, these considerations are structured based on the ADDIE Educational Design model and are defined in order to fully accommodate the identified characteristics of the "Massiveness" and "Openness" dimensions. Therefore, for each of the identified characteristics (i.e., CC, MC, or OC), Table 3.3 presents the manner in which each one is accommodated at the various ADDIE Phases. Furthermore, given that certain characteristics of the "Massiveness" and "Openness" dimensions were already accommodated in existing works, any educational design considerations that emerged from these works are supported by an indicative sample of the supporting references.

Overall, the proposed xMOOC EDCF aims to fully accommodate the identified characteristics of the "Massiveness" and "Openness" dimensions of xMOOCs in order to facilitate instructional designers to explicitly consider in their designs specific factors that can potentially affect their xMOOC delivery.

3.5 Conclusions and Discussion

Recently, MOOCs have been a popular development in online education. The key characteristics of MOOCs are "Massiveness" and "Openness." These dimensions, however, despite presenting the "added value" of (x)MOOCs, have also contributed in their identified shortcomings relating to the overall "quality" of the educational value (Margaryan et al. 2015).

This chapter discussed issues related with the educational design of MOOCs with emphasis to cultural and motivational issues, presents an analysis of existing educational design frameworks and/or guidelines for MOOCs and, finally, proposes an ADDIE-based educational design considerations framework (EDCF) for xMOOCs, which incorporate the "Massiveness" and "Openness" requirements.

Future work in this agenda could include an evaluation of the aforementioned EDCF in terms of its actual capacity to address the identified key shortcomings of xMOOCs. More specifically, the ECDF could be utilized to identify existing or design new xMOOCs which would accommodate these considerations. These xMOOCs could undergo a scrutinizing evaluation process in line with the emerging research-based MOOC foci (e.g., Veletsianos et al. 2015) in order to identify whether the incorporation of the EDCF actually resulted in addressing (or minimizing) xMOOC shortcomings and improving the learning experiences of the participants.

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Chapter 4
Toward Empowering Open and Online Education in the Arab World Through OER and MOOCs

Mohamed Jemni and Mohamed Koutheair Khribi

4.1 Introduction

The Arab League Educational, Cultural and Scientific Organization ALECSO[1] represents the Arab world's equivalent of UNESCO organization. ALECSO works under the umbrella of the Arab League and has a membership of 22 Arab countries. Premised on the values of tolerance, moderation, respect for others, and cultural diversity, ALECSO strives to create and coordinate projects and activities in the fields of education, culture, and science in the Arab region.

Recognizing the potentials of information and communication technologies (ICT), in general, and Open Educational Resources in particular, to enhance education on the one hand, and being involved in the international movement to support open and online education on the other hand (ALECSO 2008), the ALECSO organization is endeavoring, through the projects that it leads in the Arab region, to promote the development and use of ICT in education to make it more effective, accessible, and smarter.

It is noteworthy that using ICT in education has not started today, it has rather a long history, in such a way that education is being changed continuously following the rapid growth of ICT. Accordingly, several new learning terms, and notions, and concepts have appeared, namely, e-learning, online learning, blended learning, mobile learning, pervasive and ubiquitous learning, social learning, flipped classroom, open learning, Open Educational Resources (OER), open licensing, Massive

[1] http://www.alecso.org.

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Open Online Courses (MOOCs), Small Private Online Courses (SPOCs), etc. Therefore, the realm of learning and education is rapidly evolving and changing, so as expectations of individualizing learning become more pressing. Giving these points, the more the technology is providing new opportunities in learning context, the more the learning process is becoming smarter, with further possibilities of individualization, adaptability, effectiveness, efficiency, engagement, flexibility, thoughtfulness, and accessibility (Spector 2014; Essalmi et al. 2013; Khribi et al. 2014). Accordingly, in recent years, the emerging concept of smart learning has actually become the new umbrella under which all aspects related to effective use of ICT to enhance learning can be aggregated, including technological infrastructures (bandwidth, cloud computing, connectivity, mobile technologies, etc.), policies and strategies, awareness, capacity building, learning resources, practices, openness, learning tools and systems, learning technologies, learning communities, etc.

Based on the analysis of several surveys and studies on the status of ICT and its use in education in Arab countries, and being involved in a regional and international synergy aiming to enhance education harnessing educational technologies and open educational resources (Jemni 2014), ALECSO ICT Department has proposed an entire framework for smart learning empowerment. This framework is based primarily on three key dimensions, namely, open learning, mobile technology, and cloud computing. Each of this highly topical dimension embraces a number of projects. Actually, this framework and all related projects and activities meet very well the mainspring of the organization and its current guidelines since ALECSO is indeed leading the implementation of a "Plan for the Development of Education in the Arab Countries" (ALECSO 2008). The overall goal of this plan is to develop the Arab educational system, mainly through empowering the effective use of ICT in education. This implies the promotion and empowerment of the three aforementioned dimensions of the ALECSO Smart learning framework to serve Education in the Arab region. This chapter gives an overview of the ongoing ALECSO ICT projects within that framework, and a profound description of its implementations and related activities. The chapter is arranged in the following way: In Sect. 4.2, we give a quick overview of ICT use in education in the Arab world. In Sect. 4.3, we describe the ALECSO Smart learning framework, and all underlying projects and activities. In Sect. 4.4, we present an ongoing multimodal training program called ALECSO M-Developer Program aiming to build and reinforce capacities in the region in the field of mobile applications' development harnessing smart learning facilities. Finally, conclusions and future works are presented.

4.2 Overview of ICT Use in Education in Arab Countries

There is no doubt that the level of education is disparate and diverges significantly in various parts of the Arab world (Magin 2010). Millions of people are still illiterate (about 70 million people according to UNESCO statistics), many others fled their countries; others are refugees; many Arab countries are still under civil wars or crises or starvation, which has led millions of children out of school, the majority being girls.

Thankfully, the Arab states have realized these challenges and have aroused the importance of reviewing the state of education, and formulating appropriate strategies and plans to improve education, benefiting from new technologies and their myriad advantages. In this context, ALECSO expressed a great interest and willingness to provide valuable contributions for the achievement of regional initiatives, implementation plans, and projects to promote and develop education and technologies in the Arab world. Indeed, Arab leaders charged ALECSO organization earlier in March 2006 (Khartoum Summit), to prepare a plan for the development of education in the Arab countries. This plan was presented in the Riyadh Summit in March 2007 and focused on several key points forming the cornerstone of any envisioned educational reform. Actually, this ongoing plan entitled “Plan for the Development of Education in the Arab Countries” is being implemented by ALECSO over 10 years (2008–2018). Its implementation aims, among others, to enhance education in Arab countries through the promotion of the use of ICT in education.

The review of available literature on the status of ICT and its use in education in Arab countries (Magin 2010; Agency 2014; Bannayan et al. 2012; Darwish 2013; HBMSU 2015) uncovered disparate level of readiness and preparedness among various countries. These differences embrace both strategic and implementation aspects, including technological infrastructure, online learning, open education resources, etc. It is also worth noting that existing initiatives in the Arab region are mostly governmental initiatives, sometimes involving partners from the private sector and in some cases nongovernmental organizations.

Furthermore, a survey was conducted in collaboration between ALECSO and the International Telecommunication Union (ITU, Arab Regional Office), in November 2014, and addressed to both Ministries of ICT and Ministries of Education in the Arab region. This questionnaire survey aims to assess the status of Smart Learning in the Arab countries as a first step toward a new Regional Comprehensive Initiative on Smart Learning. This initiative should include all the aspects related to the effective use of ICT in Education, especially harnessing new technologies (e.g., mobile, cloud computing, etc.) to improve access to education and to make the learning process more open, personalized, flexible, thoughtful, and engaged. The survey contained questions related to the current state of ICT use in learning and teaching, smart learning strategies, the existence of various related policies and the future roadmap, and details of any learner-centered initiatives.

In summary, as results of the survey, completed in 2015, it was reported that there are some strategies already in place in many countries promoting online lessons and assessment in schools, web-based tools and platforms for enhancing educational experience. There are several areas where efforts are currently underway, which would help countries move forward in the realm of smart learning. Authoring tools, digital content development, content repositories, evaluation tools, content quality, etc., are areas with still ongoing efforts. More advanced web-based tools for improving classroom education and school administration represent also current priority for some countries. There seems to be a greater recognition toward involving various stakeholders in the education process, including parents. While informal learning is not a priority, access to digital content outside of the classroom within the context of formal education is also on the radar. The survey also revealed emphasis on newer technologies and methodologies, such as big data and cloud computing. Several countries also reported national level smart learning pilot projects. However, as seen above, and based on literature, these are isolated initiatives that have not yet materialized into large implementations, or have been partly implemented but not properly used in a way that would make them come really to fruition.

In the same context, ALECSO, in collaboration with ITU Arab regional office, have conducted a specific study entitled “Guidelines for formulating national strategies on smart learning in Arab countries”. This study aims to provide a holistic view of how various Arab countries can approach formulating their national strategies for smart learning, mindful of the aforementioned dimensions, and taking into account existing differences in the preparedness at both national policy and implementation level. A draft of this study was presented in the first ALECSO-ITU Forum on Smart learning held in Dubai in December 2015. Currently, the study is being finalized, taking account of comments and recommendations stemming from partners and different stakeholders involved in the project. Furthermore, the second edition of the Smart Learning Forum will be held at the end of 2016 with the aim to prepare and launch the ALECSO Smart Learning Initiative. Hopefully, this global initiative will be presented for approval and adopted by Arab ministries of education during the forthcoming high-level Smart learning Ministerial Conference that will be held in 2017, toward its localization and implementation in Arab countries thereafter.

In short, based on the analysis of survey findings, the outputs of the study, and the review of literature, a set of key elements meeting the demands of smart learning in the Arab region can be identified, namely, policy development, raising awareness and capacity building, technological infrastructure (mobile access, cloud computing, smart classroom infrastructure), and open learning. These key elements make up in fact the basis of the proposed ALECSO smart learning Framework.

4.3 ALECSO Smart Learning Framework

Based on the recommendations issued from the analysis of the ALECSO survey and studies on the status of ICT' use in education in Arab countries, and being already involved in a regional and international synergy aiming to enhance education harnessing new technologies, appropriate tools and open educational resources, ALECSO, via its ICT Department, has proposed an entire framework for smart learning empowerment. This framework is based primarily on three dimensions, namely, mobile technology, cloud computing, and open learning. Each of these highly topical dimensions embraces a number of projects that we intend to describe briefly in what follows. All of these projects encompass commonly three key milestones: policies, awareness and capacity building, and technical infrastructure.

4.3.1 ALECSO Mobile Initiative

ALECSO launched a study to assess the status of Mobile technologies in Arab countries as a first step, in order to propose and implement a new regional mobile initiative intending to promote the mobile industry and empower and foster both, the use and development of mobile apps for all adults and young people in the region. This study has shown that the mobile industry has grown rapidly over the last few years in the Arab world. Official stats (GSM Association 2015) say that 54 % of the population subscribed to a mobile service as of mid-2015. In 2014, mobile technologies and services generated 4 % of GDP in the Arab States, a contribution that amounted to around $115 billion of economic value across 18 Arab countries (GSM Association 2015; Business 2015). Naturally, with such rapid increase in mobile phones adoption, apps have become increasingly more popular. Indeed, around half users in Egypt, Lebanon, Saudi Arabia, and the UAE downloaded more than five apps (both paid and free) in June 2015; the most popular application types are tied to gaming and social media. However, in spite of such techie population highly interested and even addicted to mobile devices and smartphones, the number of Arabic language-based mobile applications developed so far is still limited, especially educational applications and serious games. It is worth noting that most customers who paid for apps have also made in-app purchases. According to the aforementioned ALECSO study, this fact could be explained based on the following:

– Lack of relevant regional initiatives and policies to promote mobile technology and mobile learning and to develop the twenty-first century skills, especially for Arab young developers;
– Difficulties to access and reach well-known app stores from Arab countries;
– Few commercially successful Arab mobile markets;
– Inadequacy of curricula in schools.

Endeavoring to address some of these drawbacks, ALECSO has proposed a comprehensive and strategic initiative (ALECSO Apps) aiming to provide the necessary technological and institutional environment for the promotion of an emerging digital creative Arab mobile industry, related to the fields of education, culture, science, and serious games. The ALECSO mobile apps initiative has started in 2015 and is still running. This initiative involves 22 Arab country members in the Arab League of States. Some partners including universities, and ministries of education and ICT, and mobile phone and telecommunication companies in the Arab region are included in this program. The ALECSO Apps initiative is composed of the following four key component parts (Jemni et al. 2015):

- ALECSO Apps Store: it is a web-based application aiming to host and gather Arab mobile applications. This platform is also installable on supported mobile devices that run Android OS. This Arab marketplace provides the opportunity for Arab developers involved in mobile technology to innovate and to share their creations without any fees, restrictions, or barriers.
- ALECSO Apps Editor: it represents a comprehensive mobile applications development studio. It enables users to create their applications in few intuitive steps. The main specificity of ALECSO Apps Editor is its ability to build Arabic mobile apps based on a set of embedded easy-to-use tools. The process of generating the final mobile app is done in a transparent way where the user receives the compiled app according to the target platform that she/he specifies.
- ALECSO Apps Award: it is an annual Pan-Arab competition aiming to motivate and encourage Arab developers to meet high-level standards in terms of mobile applications quality, innovation, and entrepreneurship. The competition is set over two stages: The first stage is national, led by and held locally in Arab countries. The second stage is rather at a Pan-Arabic level: winning applications are selected among those getting successfully the first round. The amount of the ALECSO Apps Awards is about US$50,000. The first edition (2015) of the competition was held in Doha, Qatar; and the second edition (2016) is going to be held in Dubai, UAE.
- ALECSO Apps training programs: aiming to introduce adults and youth in the Arab region to the mobile technologies realm, and build and reinforce capacities in mobile apps development. ALECSO offers varied training programs ranging from short workshops to specific mobile development programs for a wide range of trainees from all Arab countries. ALECSO Apps training programs provide trainees with continuous and consistent access to training, technology, and networks. The educational resources, material, and activities used during training workshops and covering the required skills for the development of mobile apps are available online via the ALECSO online training platform.[2] So that discussions and interactions via the platform can continue after the official duration of workshops. Trainees are mainly teachers, students, and developers from Arab countries. The ALECSO Apps training programs are ensured basically via three modes:

[2]http://training.ALECSO.org.

- Face-to-face training workshops consolidated with online training material and tools available in the ALECSO online training platform;
- Online learning, in the form of SPOCs and MOOCs;
- Blended learning, in partnership with academic and industrial partners in the region.

A set of learning and training online environments with necessary technical cloud-computing-based infrastructure are used to ensure these training programs, including e-learning platforms, SPOCs and MOOCs platforms, and a compiler which is a specific tool allowing the conversion of generated HTML5 apps to specific mobile OS format binaries (Android, Windows Phone, etc.).

A specific training program “M-Developer” based on blended learning has just started when writing this chapter. The pilot experience of this program is being held with the partnership of the Tunisian Ministry of Communication Technologies and Digital Economy, and Tunisian universities, with the aim of training 500 students enrolled in graduating classes or newly graduated, on mobile apps development. The program embraces several phases, ranging from face-to-face workshops, online training and coaching sessions. Further details about this program are provided below in this chapter.

4.3.2 ALECSO Cloud Computing Project

As for the cloud computing technology dimension, the ALECSO ICT department is conducting a project aiming to improve the use of cloud computing technology in education and research in Arab countries. To this end, several activities are proposed in order to shed the light on the multiple benefits of this innovative technology in Arab educational institutions whenever well planned and deployed. It is in this perspective that ALECSO, jointly with ITU Arab regional office, endeavors to achieve the following objectives of the cloud computing project:

- Raising awareness on cloud computing technology and its benefits and advantages for the education field.
- Developing specific guidelines to ensure a cloud migration taking into account several parameters and national contexts for Arab countries.
- Delivering a cloud migration policy for decision makers.
- Defining and Implementing an Arab cloud computing pilot project for education and research.

Therefore, several activities have been realized so far; others are whether ongoing or planned for the rest of the current year:

- A preliminary Study on Cloud Computing for Education and Research in the Arab World was prepared in 2014. This study aims to provide a soft introduction to the realm of cloud computing technology. It presents to a target readership the cloud architecture and service and deployment models, with a focus on motivations and benefits of using cloud computing in education, that can let decision makers, directors of educational institutions and departments, teachers, and even students opt for cloud-based solutions.

– Arab cloud computing study days held in Tunis in December 2014, with the aim to exchange experiences in adopting cloud-computing-based solutions in educational institutions in Arab countries.
– A thorough study with the aim to deliver specific guidelines to improve the use of cloud computing technology in education in Arab countries. These guidelines provide to a wide range of stakeholders in the education field (decision makers, teachers, researchers, students, and IT managers), suitable strategies and action plans for the effective use and implementation of cloud-computing-based infrastructure, software, and services for education and research at different levels. Several parameters to take into account when opting to adopt cloud-based solutions are identified and presented.
  This study aims at:
  - Raising awareness on cloud computing technology and related benefits and advantages especially for the education field;
  - Developing specific guidelines for migrating to the cloud taking into account several parameters and national contexts for the Arab countries;
  - Delivering a cloud migration policy for decision makers;
  - Defining a roadmap to develop and deploy cloud infrastructures and platforms for education and research.

  An expert meeting to draw up the progress of the study and to discuss further related details was held in November 2015 in conjunction with the ICT4 all event.
– An international conference on cloud computing is going to be held at the end of the year 2016, during which the study will be presented and discussed toward being officially adopted, with preparation of an action plan to implement a pilot cloud computing experience in a selected Arab educational institution.

4.3.3 ALECSO Efforts Toward Promoting Open Learning

Educational resources, content, and courseware refer to a large range of resources and materials in any medium used to support learning and teaching and research. According to the UNESCO description, Open Educational Resources (OER) provide a strategic opportunity to improve the quality of education as well as facilitate policy dialogue, knowledge sharing, and capacity building (Butcher 2011). In fact, the term of Open Educational Resources was coined at UNESCO's 2002 Forum on Open Courseware and designates «Teaching, learning, and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation, and redistribution by others with no or limited restrictions».[3] It was likewise formally adopted at the 2012 World OER Congress (Paris declaration), which marked a historic moment in the growing worldwide movement for promising Open Education. The number of institutions offering free or open courseware has been increasing since the organization of the OER first Forum. Besides, the most powerful asset of open educational resources remains in its ability, when digitalized, to be easily accessed and shared online. This refers to open licensed resources that can be legally used and reused in an educational context. To this end, one of the best known legal frameworks, governing how OER are licensed for use, is the Creative Commons licensing framework. Indeed, the Creative Commons (CC) license,[4] which has become widely used thanks to its flexibility to content authors and publishers, provides a set of sublicenses giving people the right to share, use, and even build upon a work they have created (Anderson and McGreal 2012). Generally, in order to create such educational content, authors are relying initially on existing available content and their personal notes. Indeed, content authors use and get insight/inspiration from preexisting resources (adapt, contextualize, translate, annotate, enrich, combine, and modify), and eventually turn them into OER. To get these resources, teachers and students, or simply OER' users, have to follow web searching mechanisms, since OER are available online somewhere whether through directories (e.g., OER Commons, Commonwealth of Learning, OER Africa, Peer to Peer University, Open Education Consortium, Saylor, etc.) and portals, or by means of dedicated repositories, courseware, platforms, and specific databases (Sampson et al. 2011) (e.g., Open UCT, MIT OCW Open Yale Courses Stanford courses on iTunes Havard courses on itunes Berkely Courses, OpenLearn, Merlot, Wikieducator, REFRER, COSMOS, etc.) (McGreal et al. 2012).

In the Arab world, there exist different levels of awareness and mastery of using and developing OER, in the absence of an explicit vision or policy to empower and encourage such movement. Aside from some digital educational content repositories, mostly not open, existing through Arab virtual and/or classic universities, and schools, consortiums, and initiatives (Tunisia, Morocco, Egypt, GCC countries, etc.), there is a real lack in terms of OER development and use in Arab countries, especially in Arabic language. In most cases, the majority of initiatives and projects are to a greatest extent issued from specific organizations acting in the field of education such as UNESCO and OIF. However, those initiatives lack sustainability, and after a number of years, projects generally fade away. Regarding regional projects and initiatives for the promotion of openness in education in Arab countries, we can mention the Open Book initiative.[5]

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[3] http://www.unesco.org/education/news_en/080702_free_edu_ress.shtml.

[4] http://creativecommons.org/.

[5] http://iipdigital.usembassy.gov/st/english/article/2013/01/20130128141555.html#axzz2vr6NP51W.

4.3.3.1 The Open Book Initiative

Earlier in 2013, secretary Clinton Launched the Open Book Project, an initiative of the U.S. Department of State and the Arab League Educational, Cultural and Scientific Organization (ALECSO), leading education innovators to expand access to free and high-quality open educational resources in Arabic, with a focus on textbooks in science and technology. It was considered that offering access to these resources will help to expand educational opportunities, further scientific learning, and foster economic growth. The U.S. Department of state and ALECSO serves as the primary coordinators for activities on the project. As OER are expected to offer the potential to dramatically lower the cost of educational resources and improve access to learning materials, governments and educators can readily draw from existing OER libraries to supplement existing education materials or integrate OER directly into textbooks and curricula. Thanks to their open licensing, OER can be localized and adapted without requesting permissions. In this context an action plan representing the different steps to be followed within the project is proposed:

- Activity 1: Creation and dissemination of a comprehensive array of Arabic OER courseware;
- Activity 2:
  - Offering training and support;
  - Training for higher education institutions in Arab countries on the use and development of OER (Training program and OER fellows program);
  - Giving support to governments for the creation of enabling environments for the use of OER (All stakeholders engagements);
- Activity 3: Expansion of the OER Community in the region (Raising awareness, Hosting Conferences, Annual prizes);

In that regard, two phases of the exchange program were set with the aim of:

- Developing an increased awareness of OER in Arab countries and the U.S., including refining the concept and identifying connections with copyright and open licenses;
- Exploring the benefits of OER for governments, institutions, faculties, students, and the public, specifically examining how OER affects teaching and learning practices including the interrelationships and synergy of OER with open access, open data, open policy, open science;
- Evaluating the impact of OER on education business models and practices in Arab countries and the U.S.

World Learning, which is an American educational and development organization, ensured the preparation and the implementation of the exchange program. The two phases of that program are as follows: Phase I consists in the selection of a group of Arab fellows to travel to the U.S. in order to pursue a rich and varied program encompassing several activities and visits. Two participants from each

Arab country are selected and traveled to the U.S. in March 2014 for 3 weeks. The objectives of the program are the following:

– Learning about the day-to-day operations and projects that the American organization is engaged with;
– Sharing aspects of the foreign organizational practices and challenges (especially as pertains to OER) with U.S. counterparts;
– Working with the host organization on the development of an action plan or methodology to create/develop and apply OER in the foreign fellow's originating academic institution.

In Phase II, which took place at the end of 2014, a group of practitioners and experts from the U.S. traveled to Arab countries (Tunisia and Jordan) in order to work with the fellows on implementation of the plans created in Phase I, and to meet and identify key stakeholders in academia, government, and the NGO community that are already involved in the OER movement.

In that light, an Arab/American coordination meeting on the exchange experience and expertise in the field of Open Educational Resources was held in ALECSO in October 2014. The purpose of this meeting was to draw up a state of progress of the Open Book Project and to identify and discuss the areas of future potential collaboration with the American side, related to the promotion of Open Educational Resources in the Arab countries. As recommendations, it was mainly concluded to continue coordination in all aspects regarding the implementation of the Open Book Project and its potential amendment to cover OER promotion activities. In fact, it was proposed by ALECSO that collaboration should be drawn up based on the new American strategy related to the promotion of Openness and especially the new U.S. Commitments concerning the Open Educational Resources. Consequently, an entirely new OER project with a set of core activities for the promotion of Open Educational Resources in Arab countries should be proposed beyond the Open Book project.[6] These activities include mainly the formulation of OER Policy and Raise awareness Plan in Arab countries, and preparation of suitable OER infrastructures at Pan-Arabic level. This represents nearly what ALECSO intends to ensure as plan, toward the empowerment of OER in the Arab region. The whole ALECSO OER project will be described with more details further below in this chapter.

4.3.3.2 Collaboration on Regional and International OER Activities

Besides its participation and co-coordination of former projects aiming to promote OER in the region, namely the open book initiative, ALECSO has also joined the ongoing OER activities initiated by UNESCO in the region. In this respect, ALECSO participated and/or co-organized recently the following seminars and workshops:

[6]https://edtechfrontier.com/tag/open-book-project/.

- The regional seminar on Open Educational Resources for GCC States and Yemen, held in Doha, Qatar—March 18–19, 2015, Organized by UNESCO and funded by William and Flora Hewlett Foundation. The main objectives of this regional seminar are to:
  - Present the approved National OER Policies of Oman and Bahrain and lessons learned from the policy development process to policy makers representing other GCC states with a view to facilitate policy dialogue in the field of ICT in education.
  - Demonstrate essentials of OER and its potentials to transform education.
  - Promote the national adoption of OER in GCC states and Yemen.
  - Explore the possibility of developing Arabic-based digital content that are to be openly licensed to boost sharing and innovative use.
- The UNESCO–ALECSO inception meeting on 'ICT-CFT: contextualization harnessing OER', held in Tunis, Tunisia, August 17–18, 2015. This meeting brought together senior national representatives from seven Arab countries: Algeria, Egypt, Jordan, Mauritania, Morocco, Sudan, and Tunisia as well as regional and international experts to discuss about the following issues:
  - Review of the Project objectives and concepts, ICT-CFT, and OER;
  - Alignment of the Project objectives to the national education goals and policy objectives of partner countries;
  - Drafting of viable implementation project work plans for 2015–2017.

  This project aims to support the implementation of teacher training standards for ICT in education by:
  - Developing OER-based teacher training materials to reach these objectives;
  - Implementing pilot training workshops based on the OER–based teacher training materials with Teacher Training Institutions;
  - The project activities support capacity building for Ministries of Education, Teacher Training Institutions and teachers in the effective use of ICT by teachers in their professional practice, and the development and use of OER for education.
- The OER National Meeting in Doha, Qatar, October 27–28, 2015. This meeting was organized by the UNESCO Doha office and the Ministry of Education in Qatar. The objective of the workshop was to guide policy makers and education experts in Qatar, not only at a high level, but also at the level of universities and education institutions in the country to formulate strategies and policies that can further promote OER.
- The international expert meeting, toward preparing the OIF action plan on OER. The workshop was held in Tunis November 18–20, 2015, and organized by the International Organization of Francophonie OIF, with the collaboration of the Virtual University of Tunis and participation of UNESCO and ALECSO Organizations. The OIF Organization had already organized a similar expert

meeting earlier in 2013 in Moncton, Canada, with the aim of preparing an action plan for the promotion of OER in French-speaking countries. The implementation of that plan gave rise to several activities, in particular, the development of a Massive Open Online Course MOOC on OER in 2014, the holding of many regional training sessions, the establishment of an expert committee for the purpose of developing a competency framework on OER. It is actually in this perspective that the international expert meeting was held, with the aim to:

- Update the Moncton Action Plan;
- Finalize with the experts approval of the OER competency framework;
- Formulate specific projects for the development of OER and MOOCs.

One of the most important outcomes of this workshop is the approval of the participating international organizations (in particular, UNESCO, OIF, and ALECSO) of the OER competency framework, and its translation into Arabic and English. It was also decided to develop jointly learning material on the development and use of OER on the basis of that framework.

– Open Educational Resources Road Map Meeting, held in Paris, March 30–31, 2016, and organized by UNESCO. The main objectives are to:

  - Present the proposal of establishing a normative instrument on Open Educational Resources (OER)
  - Identify a vision, strategies, and partnerships to move forward.

In addition to all of the aforementioned activities ensured in collaboration and partnership with international organizations, ALECSO ICT department has proposed a comprehensive project aiming to promote and empower OER and MOOCs use and development in Arab countries.

By proposing such tremendous and innovative projects, ALECSO organization intends to promote the use and production of Open Educational Resources and Massive Open Online Courses in the Arab region, which will ensure consequently:

– Better access to education;
– More opportunities in individual anytime and anywhere learning;
– Extra learner-centric focus;
– Lifelong learning promotion;
– Flexible, adaptive, and engaged learning;
– High-quality online educational content development.

4.3.3.3 The ALECSO OER Project

The promotion of open educational resources at Pan-Arabic level presents several benefits related primarily to OER':

- Exchange: OER can be exchanged widely across borders of the different Arab countries;
- Scope: OER that are developed at Pan-Arabic level have a wider scope, since they are not driven only by local/national needs or requirements;
- Community: educational communities across borders of the different Arab countries can be created around OER, which can lead to the exchange of good educational practices;
- Quality: OER that are developed and promoted at Pan-Arabic level can increase their quality through extensive authentic use, reflections, and modifications from communities of educational practitioners.

Description

The ALECSO OER project aims to promote the effective use of OER in school education at Pan-Arabic level. To this end, three main milestones are defined:

– Policies for OER: to support different stakeholders (decision and policy makers, institution staffs, unions/teachers' associations, administrators/school leaders, teachers, students and parents) in Arab countries toward using and developing OER at both national and Pan-Arabic level, ALECSO should draw from international OER' best practices and from existing guidelines (Stacey 2013). These guidelines must be contextualized and localized according to each country's status and specificities, and should include:

    - Best practices for sustainable development of OER,
    - Ensuring quality while developing OER,
    - Open licensing schemes during and after developing OER,
    - Developing national OER repositories.

– Raise Awareness and capacity building on OER: It is of the utmost importance to raise awareness, inform and train different stakeholders about the added value of OER and their expected benefits in accessing and enhancing education.
– Technical Infrastructure: Promoting OER at Pan-Arabic level means somehow offering a Pan-Arabian OER Infrastructure where teachers will be able to search and retrieve suitable OER. The proposed infrastructure could be deployed nationally at different Arab counties (as national OER Portals) and then it could be integrated into a federated Pan-Arabian infrastructure promoting interoperability of these national OER portals.

Table 4.1 The ALECSO OER project activities' description

Activities/Subactivities	
Activity 1: Policies for OER	A1.1—Analyzing and selecting existing guidelines for OER development
	A1.2—Preparing translating/localizing guidelines for OER development
Activity 2: Raise awareness	A2.1—Raise awareness plan to conduct local, regional, and national activities (e.g., mission awareness campaigns and training workshops for key stakeholders in Arab school education)
	A2.2—Training workshops: (a) preparing training material (b) organizing training workshops
Activity 3: Technical infrastructure setup	A3.1—Architecture and specifications of technical infrastructure
	A3.2—Set up national OER' repositories progressively in selected Arab countries
	A3.3—Set up federated infrastructure integrating all national OER' repositories developed in A3.2 into a Pan-Arabian OER Infrastructure
Activity 4: Technical infrastructure take up/deployment	A4.1—Detailed implementation plan for the use of the technical infrastructure in selected Arab countries
	A4.2—Pilot deployment showing the technical infrastructure under exploitation for stakeholders from selected Arab Countries
Activity: Evaluation	A5.1—Evaluation plan with appropriate evaluation instruments to be used for evaluating the use and development of OER at Pan-Arabic level
	A5.2—Evaluating the use of OER based on analytical approach

Activity Breakdown
The proposed OER project is divided into a set of activities, each of which are further divided into subactivities that correspond to specific deliverables, as described below in Table 4.1.

4.3.3.4 ALECSO MOOCs' Project

The Massive Open Online Courses MOOCs concept, which emerged from open educational resources and e-learning, represents currently one of the newest and latest trends in the realm of online learning (Siemens 2013). Two key distinctive dimensions characterizing those courses can be drawn obviously from the term MOOC itself: "Massiveness" and "Openness". Indeed, by providing MOOCs, it is intended to offer open learning for free to a wide range of online learners through the Internet, with the aim to gain new knowledge and skills in a specific major of studies. This new trend of learning fits also into the international movement of openness whose benefits in education are endless since it ensures actually several opportunities to open up access to learning (Belawati 2014), not only for deprived communities but also in a wider context of lifelong learning meeting thus SDGs (Sustainable Development Goals) toward knowledge societies' end.

Since the first MOOC called Connectivism and Connective Knowledge (CCK08), which was developed in 2008 by Stephen Downes and George Siemens, and designed to explain and expand the connectivism learning theory, several projects were initiated, and the concept of MOOCs has evolved and became much more widespread. In fact, Stanford launched its own courses in 2011, attracting thousands of enrolled students. It is noteworthy that both forms of MOOCs, the connectivist MOOC (cMOOC) and the Stanford MOOC (xMOOC) are based around a common core of content, weekly designed with synchronous events (Yousef et al. 2014). In addition, both offer supplementary materials, such as additional videos, articles, and learning activities, involving the creation and distribution of open educational resources OER. However, xMOOCs, are based on traditional university courses and curricula, whereas cMOOCs are delivered by groups of people learning together, so that interactions and communication around the content are very developed. Many tools and varied sources (blogs, learning communities, social media, etc.) are also used to design and share suitable content in cMOOCs (Yuan and Powell 2013). MOOCs Platforms like edX, Coursera, and Udacity provide generally xMOOCs type.

It is to be noted that MOOCs can be used in both contexts of formal and informal learning. In formal learning, a new concept has also emerged in relation with the use of MOOCs: Flipped Classroom (Known also as the backwards classroom or inverted classroom). Indeed, in a flipped classroom, students access to the content, learn even in a social context, before class, thanks to MOOCs and free online courses and lectures (Belended learning approach). Once in class, students deal with problems, make discussions, ask for clarifications, and they are therefore able to get more guidance from instructors (considered rather as facilitators, tutors, and coaches) on the actual application of the material associated with the course.

Actually, one can find varied online content and courses available through known MOOCs providers and/or open educational repositories. However, such high-level and mostly non-Arabic-based online courses are neither available nor adapted to the specific needs of a large range of applicants in the Arab region, especially in education. To address such shortcoming, and given the interest in promoting and empowering the use and development of Open Educational Resources and Massive Open Online Courses, whether in the scope of formal or informal learning, ALECSO organization expressed a need to develop a capacity in this promising field throughout the Arab World. In this perspective, ALECSO organization prepared a scope study for an ambitious project on promoting Arab MOOCs. The purpose of this study is to lay down the scope of the different activities to be undertaken under the ALECSO MOOCs project. The general goals of the intended ALECSO MOOCs project are as follows:

- The mastering by instructors from institutions within the ALECSO member states of the MOOC approach to online learning and the technologies to develop them.
- The choice and possible development of a set of tools to form a platform for Arabic language MOOC courses development, hosting, and referencing (and supporting obviously Multilanguage).
- The use of the MOOC platform to develop prototype courses as Arabic language teaching MOOCs.
- The evaluation of the developed prototype MOOCs on a set of students from the ALECSO member states.

Project goals

The project goals and objectives can be resumed as shown in Table 4.2 below.

Table 4.2 The ALECSO MOOCs project's goals

Goals	Objectives
Define MOOC capacity building steps in ALECSO member states' institutions	• Determine MOOC approach and technology needs of Arab states' institutions • Develop workshop material to address those needs • Run a number of these workshops in ALECSO member states
Propose a platform for Arabic language MOOCs development and hosting	• Review any available technologies supporting Arabic language MOOCs development, hosting, and referencing • Determine gaps in currently available MOOC technologies to accommodate Arabic language MOOC development, hosting, and referencing • Propose a plan (adaptation of available technologies, development of technologies) to fill these gaps • Deploy a platform for Arabic language MOOCs development, hosting, and referencing
Build teaching MOOC prototypes (with a focus on Arabic language MOOCs)	• Based on digital material supplied by teachers in Arab universities and ALECSO, produce MOOC courses on the developed platform
Host and evaluate the developed prototype MOOCs and their delivery to target audiences	• Ensure the proper hosting of the platform and MOOC courses material • Run (with ALECSO designated instructors) the MOOC courses developed on the targeted audiences • Carry an evaluation of the delivered MOOC courses (technology, delivery to target audiences)

Activity breakdown and scopes
The activities envisioned for this project can be broken down as shown in Table 4.3.

4.4 M-Developer Program: A Smart Learning Project with Respect to the Alecso Smart Learning Framework

The M-Developer Program is a specific hybrid training program which is still ongoing at the time of writing this chapter. This project, initiated by ALECSO, is the result of a fruitful and successful collaboration between the organization and the Tunisian Ministry of Technologies of Communication and Digital Economy. Cofinanced and monitored by both entities, the project aims to build a capacity in the realm of mobile technology for a young audience of regular students enrolled in Tunisian universities. ALECSO is in charge of designing and implementing the program. For this purpose, a specific hybrid model of training is set up taking into consideration a number of constraints related mainly to students' attendance, technical aspect of the course, etc., and taking full advantages of ICT use in education. In fact, 500 Tunisian students among those enrolled in graduating class or newly graduated, belonging to the ICT major, are selected to attend such a specific training on mobile apps development. (this number was raised later to 569 enrolled students). These students are, then, grouped into 20 cohorts (Fig. 4.1), each of which is taken up by an instructor who is in charge of all the training phases, ranging from face-to-face workshops, to online training and coaching sessions. For this purpose, a set of platforms and tools are used in order to offer appropriate learning experience to students.

As a second stage, ALECSO organization intends to duplicate this pilot project for other Arab countries expressing an interest in disseminating and localizing mobile technologies, and especially, preparing new generations of skilled and competitive mobile developers in the Arab region.

4.4.1 M-Developer Core Activities

The program includes primarily five milestones in terms of training:

– Training of trainers' workshop, with the aim of providing to trainers a profound description of the program and its specificities, and to explore deeply the training material (Fig. 4.2). Twenty instructors among interested teachers in Tunisian universities, experts in the field of ICT and mobile development, are

Table 4.3 The ALECSO MOOCs project's activities

Stream 1:		Arabic language supporting MOOC platform technology review and deployment
Activity	Description	Actions
1	– Review and identification of suitable MOOC platforms	– Review of platforms with multilanguage capabilities (support for Arabic language content) – Evaluation of the different technologies for content delivery – Evaluation of licensing and IP issues – Assessment of available alternatives for MOOC hosting (infrastructure) optimized for delivery and access in the Arab world – Review and evaluation of the available Arabic language MOOC courses
2	– Development and deployment of MOOC platforms	– Software needs assessment and specification (tools available in the platform, content development and integration tools, usability features) – Hosting infrastructure needs assessment and hosting party identification – Development needs assessment for adaptation of potential MOOCs' platforms (dependent on the Activity 1 outcomes) – Development of new technologies for content delivery (for various multimedia formats for example) – Deployment of an Arabic language-specific MOOC hosting platform
Stream 2:		MOOC approach and technology capacity building
Activity	Description	Actions
3	– Training material for workshops on "How to create and develop MOOCs" for teachers in Arab educational institutions.	– Workshop presentations content – Support/handed material – Material on how to develop MOOC infrastructure and content delivery technologies
A	– Organization of an inception meeting/conference	– Kickoff of the project – Meeting presentations content – Support/handed material – Meeting's logistics (facilities, audiences, and schedules)

(continued)

Table 4.3 (continued)

Stream 1:		Arabic language supporting MOOC platform technology review and deployment
Activity	Description	Actions
B	– Organization of raising awareness workshops for ALECSO member countries	– English/Arabic content – 1-day workshop – Provision of workshop material (in English/Arabic language) – Workshops' logistics (facilities, audiences, and schedules) – Supplementary workshops beyond the three already identified – Dispensing the workshops
4	– Delivery of training workshops for ALECSO member countries.	– English/Arabic content – 3 days maximum each – Provision of workshop material (in English/Arabic language) – Workshops' logistics (facilities, audiences and schedules) – Supplementary workshops beyond the three already identified – Dispensing the workshops
Stream 3:		MOOCs development and deployment
Activity	Description	Actions
5	– Development, delivery, and evaluation of specific MOOCs	– Provision of MOOCs' content by professors or ALECSO or partners – Integration of content in MOOCs' platform – Provision of the MOOCs in the hosting platform – Securing content copyrights – Selection of target audiences – Provision of instructors (subject matter experts) – Analysis and evaluation of MOOCs delivery
6	– Development of specific MOOCs: • 'How to create and develop a MOOC' *for teachers* • 'How to create and develop OER' *for teachers*	– Provision of the English content. – Integration and formatting of English and translated to Arabic content (if any) in MOOC platform – Provision of the MOOC in the hosting platform – Translation of MOOC (if any) content to Arabic – Proofing of Arabic MOOC content for delivery and provision of instructors (subject matter experts)

(continued)

Table 4.3 (continued)

Stream 1:		Arabic language supporting MOOC platform technology review and deployment
Activity	Description	Actions
7	• Delivery of the developed MOOCs	– Organization of the delivery of the MOOCs' (activities 5, 6, 7) to intended audiences – Selection of target audiences – Provision of instructors (subject matter experts)
8	• Evaluation of the developed MOOCs	– Analysis of MOOC delivery: • Usability of the platform • Accessibility • Performance • MOOC content adequacy

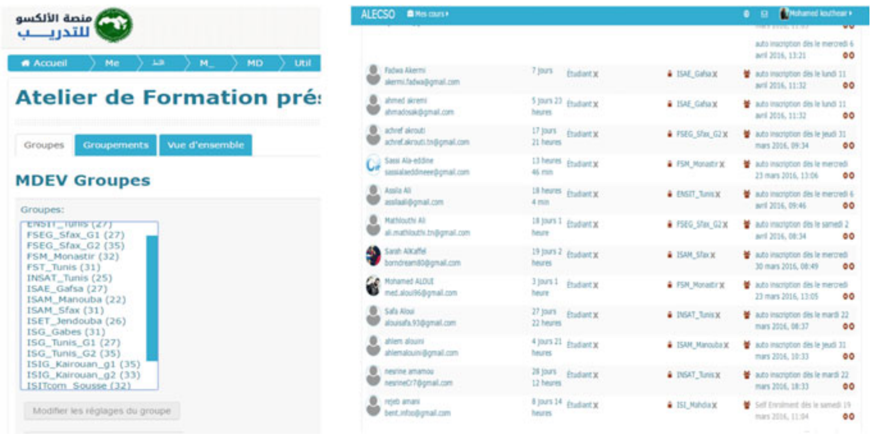

Fig. 4.1 Registered students and cohorts

hired as contractual trainers under M-Developer program to ensure all the training phases for a duration of 6 months.

– Face-to-face phase, each trainer is asked to organize a 5-day face-to-face training workshop for his/her group of students. Even in these face-to-face workshops, an online learning platform is used in order to host the training material designed and developed by ALECSO to conduct in total 25-day face-to-face workshops throughout Tunisian universities and Tunisian regions, with several possibilities to use communication and collaborative tools whether between students themselves and/or with instructors (Fig. 4.3). It is to be noted that first face-to-face workshops are 3-days based. Then, there will be one-day

Fig. 4.2 Training of trainers online course

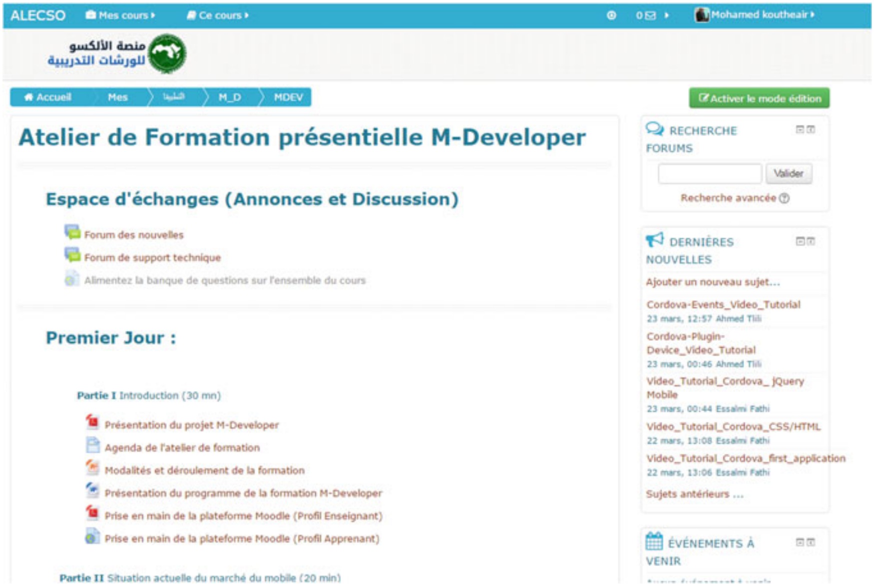

Fig. 4.3 ALECSO online training platform

workshops held in the mid of the online phase and finally, last one-day workshops at the end of the online phase.

– Online phase via a dedicated Small Private Online Course SPOC, this phase lasts 6 weeks during which students access to several videos and different learning resources. They are also asked to make quizzes and assignments.

During this phase, students are supervised and guided by their instructors (tutors).

- First coaching phase lasting 1 month with the aim to help students finding appropriate project's ideas and defining properly their mobile apps' ToRs;
- Second coaching phase lasting 1 month aiming to develop and finally deliver and publish the required mobile apps.

4.4.2 M-Developer SPOC

It is noteworthy that M-Developer project represents actually a kind of results-based project, which means that at the end of the program, we should get as concrete outcomes, besides the students' completion of all training phases, some 500 decent mobile apps developed and published. Moreover, given that the program was initially designed for a relatively small number of regular students throughout Tunisian universities, gathered in several groups, with focus on the instructor role during the training phases, This would avoid somehow students' potential dropouts or disinterest. It was therefore agreed that the online phase would be ensured using a SPOC course type instead of MOOC, even though in terms of content, there are almost no differences between both types, except the "massiveness" and "openness" dimensions. Indeed, the M-Developer SPOC is only accessible for those who are registered via the M-Developer program, and thus not open for all, and the number of registered students is relatively small, added to that, gathered in tiny groups, with an instructor for each.

4.4.2.1 M-Developer Syllabus

The SPOC lasts 6 weeks; it is a 42 h equivalent semester module in university. Each week includes specific tasks to ensure progressively week by week the completion of the entire training phase and then be able to step ahead to the next stage in the Program. During each week of the SPOC, students are asked to get through the following (Fig. 4.4):

- Access available short video lectures,
- Explore available presentations, documents, tutorials, and extra learning resources if any,
- Answer to quizzes (involving corrections to better understand learning material),
- Make assignments, problem sets, and submission in due date,
- Pass a final quiz test (weekly and at the end of the SPOC).

Obviously, students can interact with each other, ask for clarifications, launch discussions, and put questions using available forums within the course. Basically, lecture topics are organized among the 6-week SPOC as follows:

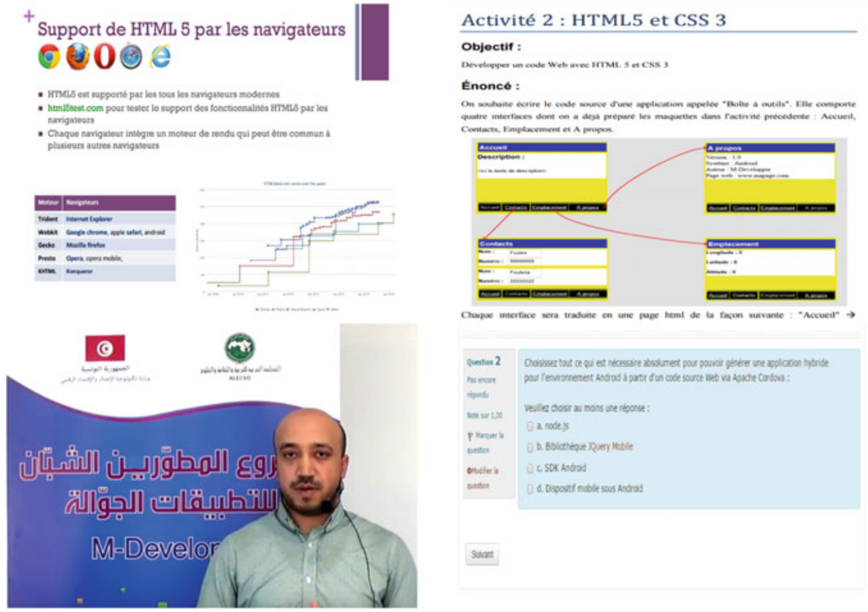

Fig. 4.4 M-developer SPOC material

– Week 1:

- Welcome address and Introductory remarks
- M-Developer Syllabus
- Pitching Project Ideas
- Mobile Apps Opportunities
- Status of Mobile Technology
- Mobile Operating Systems

– Week 2:

- Mobile Development
- Native and Hybrid Programming
- Design and Interfaces

– Week 3:

- Web Programming Languages HTML5, CSS3, JavaScript, JQuery
- Mobile Apps Ads

– Week 4:

- Cordova Environment

– Week 5:
  - JQuery Mobile
  - Interactions with eternal services (Client–Server Architecture, JSON, Examples, etc.)
– Week 6:
  - Cordova Plugins
  - Mobile Apps Sample Project
  - Mobile Apps publishing
  - Business Models.

4.4.2.2 Grading Policy

In this SPOC course, as shown above, there are varied types of assignments. The obtained final grade is weighted average of the following:

– Problem sets: 40 %
– Weekly quiz: 30 %
– Final quiz: 30 %.

In order to earn a certificate at the end of the SPOC, students must pass the course with a grade of C or better. The following grading breakdown will apply:

– > = 80 %: A
– > = 70 %: B
– > = 60 %: C.

In order to earn a certificate at the end of the Whole M-Developer Program, students must:

– Attend all the training phases,
– Earn a SPOC certificate,
– Prepare and pitch a project idea,
– Prepare and submit the project's ToRs,

Develop and publish the developed mobile application.

It is noteworthy that, following the new ALECSO vision to open up digital content and training material, all developed learning resources are planned to be openly licensed using creative common licenses.

4.5 Conclusion and Future Work

Doubtless, with the tremendous growth of ICT that we are constantly witnessing nowadays, education is rapidly and radically changing. Mindful of these major advancements in technologies and big shifts in education, several policies, strategies, and action plans for the effective use of ICT in education are formulated worldwide. In this respect, many projects and activities have been carried out to promote the use of ICT in education. At the core of these activities is an emphasis on open and free access anytime and anywhere to quality educational resources with focus on twenty-first-century teaching and learning. Within this context, the present chapter provides a quick review of the status of ICT in education in Arab countries and presents varied ongoing and planned activities undertaken so far by the ALECSO organization toward promoting and empowering smart and open learning in Arab countries, drawing from international practices, former experiences, and collaboration with partners.

Later on, ALECSO intends to develop a MOOC on mobile development for Arab countries on the basis of the ongoing M-Developer SPOC. Many other MOOC courses and training materials on OER and MOOCs development and use, will also be offered likewise.

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Chapter 5
MOOCs in Taiwan: The Movement and Experiences

Stephen J.H. Yang, Jeff C.H. Huang and Anna Y.Q. Huang

5.1 The Purpose and Core Mission of MOOCs in Taiwan

The popularity of Massive Open Online Courses (MOOCs) has increased by Stanford University, Massachusetts Institute of Technology (MIT), and Harvard University since 2012. The main factor underlying the growing trend of MOOCs is the use of a two-way interactive learning model that overcomes the teaching limitations of one-way lecturing common in traditional education. MOOCs realize the educational spirit of the flipped classroom, and further become the part of mainstream academia as the twenty-first century progresses (Bali 2014; Muñoz-Merino et al. 2015; Tayeb and Akila 2015).

MOOCs flip the roles of the instructor and learner during the learning process, thereby developing a learner-centered learning model that further realizes the flipped classroom concept. As part of MOOCs, learners must perform self-paced online learning before class (Toven-Lindsey et al. 2015). Learners can thereby receive basic knowledge about their learning topics at their own learning pace. The instructor and learners then discuss the learning content deeply in the class to integrate and extend the application of the learning knowledge. The instructor and

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learners engage in two-way interactive learning through the real and virtual integrated method and further realize the flipped classroom concept. Therefore, through the learning process, the instructor's role shifts from a knowledge provider to a facilitator who leads learners to explore and think about questions independently. Furthermore, learners' learning model shifts from passively accepting knowledge to actively exploring knowledge. Thus, the learning rights returned to learners for realizing the flipped classroom concept in MOOCs (Bali 2014; Muñoz-Merino et al. 2015; Tayeb and Akila 2015).

As stated, the advantage of MOOCs is in the realization of the flipped classroom. MOOCs return the learning rights to the learners by applying the learner-centered learning model and integrating the virtual and real learning fields to extend learners' learning space. Virtual and real learning integration and two-way interactive learning not only constitute the learning method reform initiated by MOOCs but also inspire teaching ideas, leading teachers, and learners to determine their roles during the learning process. MOOCs gained widespread exposure in the U.S. academic world when three successful MOOC platforms, Coursera (https://www.coursera.org/), Udacity (https://www.udacity.com/), edX (https://www.edx.org/) were released in 2012. The number of courses available through Coursera, Udacity, and edX dramatically increased to 2500. In February 2016, more than 18 million students from hundreds of partner schools and institutions worldwide have registered for courses on these platforms. These data demonstrate the growing global prevalence of MOOCs (Alraimi et al. 2015; Chen and Chen 2015; Lucas 2013; Mehaffy 2012).

In Taiwan, the Department of Information and Technology Education, under the Ministry of Education (MOE), implemented a MOOC project in 2013 to upgrade the quality of domestic online courses and developing a digital teaching model for teachers. In 2014, after observing the MOOCs trend in the United States, the MOE began promoting various types of MOOCs projects at the elementary school, high school, and university levels. MOOCs platforms adopted by universities in Taiwan include Coursera, eWant (http://www.ewant.org), ShareCourse (http://www.sharecourse.net) and Open Edu (https://www.openedu.tw). Approximately 100 universities have partnered with these platforms, which provide approximately 500 Chinese courses.

In 2014, the MOE initiated the 4-year New Generation of Digital Learning Project: MOOC Subproject to assist colleges and universities develop classical MOOCs. For elementary and high schools, the MOE launched the 2-year K-12 MOOCs Innovative Teaching Project in 2015. Utilizing the well-developed 4G mobile broadband infrastructure in Taiwan, the MOE began the 3-year Mobile MOOC service project in 2015 to provide innovative learning services. Through these various MOOCs projects at various education levels, the MOE aimed to reform the nature of education and realize the spirit of flipped classroom.

MOOC development in Taiwan has also come from outside the education sector. Popular MOOC platforms developed by the private sector include (a) DeltaMOOCx, developed by Delta Electronics, Inc. for high schools and colleges; (b) Taipei City CooC Cloud, developed by Wistron Corporation and the Taipei City government for elementary and high schools; and (c) Junyi Academy, developed by TrendChip Education Foundation for elementary and high schools. Accordingly, we can infer that the influence of MOOCs in Taiwan can extend from a learner's school life to career; in other words, MOOCs foster both active learning attitudes and lifelong learning.

5.1.1 Pursuit Better Teaching and Learning

Because MOOCs realize the educational spirit of the flipped classroom concept, they can be considered the next stage of OpenCourseWare (OCW) and have become a mainstream part of the academic world in the twenty-first century. More than 18 million users have registered for U.S.-based MOOCs, further demonstrating the substantial influence that MOOCs exert on global education.

The main learning limiting of OCW is the lack of interaction between teachers and learners. To enhance the learning quality and outcomes of self-learners, OCW makes higher education resources accessible to the public (Rhoads et al. 2013). However, OCW adopts a one-way lecturing model; thus, it lacks teacher–learner interaction and yields poor learning effectiveness. MOOCs overcome the OCW problem of low learning effectiveness by building a two-way interactive learning model (Bali 2014; Tayeb and Akila 2015; Muñoz-Merino et al. 2015).

The learner-centered learning model (Mascolo 2009) of MOOCs is realized through the provision of highly interactive learning activity by using the interactive mechanism in the course platform. In this model, the learning rights are returned to learners by guiding them to actively explore problems and develop active learning attitudes. As part of MOOCs, teachers divide the course content into several learning segments before class. Learners access this content online before class; for example, they might watch 5–10 min lecture videos (Loya et al. 2015; Breslow et al. 2013). Learners can determine their learning progress by taking a self-test before beginning the next learning segment. If learners pass the test, they can move to the next unit; that is, they can configure their learning schedule according to their learning pace. In the MOOCs, the teacher leads learners to in learning practice and group discussion to develop their critical learning and problem-solving abilities. Moreover, to facilitate interaction among learners and between learners and the teacher, MOOC platforms provide features such as discussion and feedback forums and virtual labs. These mechanisms aid learners to engage in self-regulated learning (Toven-Lindsey et al. 2015).

Among the MOOCs founded in the United States are those developed by Stanford University, MIT, and Harvard University in 2012. The three leading U.S.-based MOOC platforms are Udacity, Coursera, and edX, all of which were developed in 2012 (Baturay 2015; Liyanagunawardena et al. 2013; Kennedy 2014; Hew and Cheung 2014). *The New York Times* called 2012 the first year of MOOCs (Pappano 2012). Professor Sebastian Thrun, from the Department of Information Engineering at Stanford University, uploaded videos of his lecturers for the course

Introduction to Artificial Intelligence at part of a MOOC (Hu 2013). The course was taken by approximately 200 traditionally enrolled Stanford University students, attracted 160,000 online learners. With the success of the course, Sebastian Thrun established education technology company Udacity in February 2012 for developing a profitable MOOC (Cabiria 2012). Similarly, Andrew Ng, a computer science professor at Stanford University, made his course Machine Learning available online in 2012, and 100,000 people registered for the course. This motivated Ng and Daphne Koller to found Coursera. Established in April 2012, Coursera is a MOOC platform based on the idea of changing the world through free education. Following the founding of Udacity and Coursera, Harvard University and MIT computer science Professor Anant Agarwal established the education technology nonprofit company and MOOC platform edX in September 2012.

The more than 18 million registered users worldwide of U.S.-based MOOC platforms demonstrate the global trend in MOOC adoption. The reason that MOOCs have become a part of mainstream learning in the twenty-first century is that they adopt a two-way interactive learning model, realize the flipped classroom concept, and develop learners' self-learning ability. The one-way learning model is still predominant in the education system in Taiwan. However, the flipped classroom concept has begun to spread in recent years. The two-way interactive learning model adopted in MOOCs, which have become a key force for reform in the Taiwan education system, undoubtedly provides a means for this system to realize the flipped classroom concept.

5.1.2 *Promoting Chinese-Language Courses Worldwide*

MOOCs have initiated a trend of education reform by offering an effective means of self-regulated learning. In this study, we investigated whether Taiwan can utilize this reform to improve education quality and whether the Taiwan education system has already been affected by this reform require investigation. We also sought to determine whether we can create a new education pattern as part of this trend and, if so, how we can promote current courses in education. These questions are of particular concern to Taiwan educators. Therefore, the Department of Information and Technology Education, under the MOE inaugurated its first MOOC project in 2013, and followed this in 2014 and 2015 with a series of additional MOOC projects for schools from the elementary schools to university level.

The leading MOOC platforms are Coursera, edX and Udacity. These three platforms have cooperated with top universities worldwide to ensure the quality of online courses and course content. Noting this trend, the Department of Information and Technology Education of the MOE began launching MOOC projects in 2013. The MOE collaborated with top Taiwan universities and university alliances such as National Taiwan University (NTU), University System of Taiwan, and Taiwan University of Education, to provide Chinese-language MOOC courses to provide people with the chance to join top university courses and to realize the ideal of Education for All. Hence, it may be appropriate to refer to 2013 as the first year of Taiwan MOOCs.

As part of efforts to obtain courses in multiple languages and of high quality, Coursera cooperated with NTU to provide Chinese MOOC courses in February 2013. More than 10,000 people worldwide registered for the course Probability, taught by NTU Professor Ping-Cheng Yeh. The course successfully promoted Taiwan's higher education courses among Coursera users. In addition, 43,000 learners registered in August 2013 for the course Chinese Ancient History and People: Emperor Qin Shihuang, taught by Assistant Professor Shih-Hao Lu from the NTU Department of History. According to statistics released by Coursera, the four most popular Chinese courses in 2014-Shi-ji, Probability, Chinese Ancient History and People: Emperor Qin Shihuang and Dream of the Red Chamber were all produced by NTU. Furthermore, Career Literacy and Dream of the Red Chamber EP2, also from NTU were among the eight most popular Chinese courses in 2015. These data show that the Chinese-language courses made in Taiwan are appreciated by Chinese speakers worldwide. This is first step in Taiwan MOOCs gaining global prominence.

5.1.3 Building Taiwan's Digital Learning Industry

MOOCs first came to prominence in the United States in 2012 and subsequently spread globally. Because of the two-way interactive learning model and the realization of the flipped classroom concept, MOOCs have become part of mainstream education in the twenty-first century. Industry, in addition to the education sector, has also affected the development of MOOCs in Taiwan. Widely known MOOC platforms developed in full or in part by private companies and organizations include (a) Junyi Academy, developed by TrendChip Education Foundation for elementary and high schools; (b) Taipei City CooC Cloud, developed by Wistron Corporation and Taipei City government for elementary and high schools; and (c) DeltaMOOCx, developed by Delta Electronics, Inc. for high schools and colleges.

Because of the lack of education resources in rural areas and the difficulties of implementing the remedial teaching, TrendChip Education Foundation established Junyi Academy, a MOOC K-12 platform that provides free high quality learning resources. Moreover, the Taipei City government cooperated with Wistron Corporation to develop the Taipei City CooC Cloud K-12 MOOC platform. Finally, for reducing the gap between learning and doing, Delta Electronics, Inc. created DeltaMOOCx courses to enable high schools and colleges to aid their students in developing proficient skills and becoming well prepared before beginning their careers.

The goal of education is to develop the talent person that is needed by the industries. To contribute to the education, the industries provide MOOC platform, such as Junyi Academy, Taipei CooC cloud, DeltaMOOCx, etc., for students at all level to use for free. The industry devoted to promote MOOC courses in the hope of giving a new power to the K-12 education and developing the talented people that are needed by the industry.

5.2 MOOCs Movement in Taiwan

5.2.1 MOE Funded National MOOCs Initiatives

Following the education reform spurred by MOOCs in the United States, the Department of Information and Technology Education under the MOE began initiating MOOC projects (*mokeshi* in Chinese) in 2013. Former Department of Information and Technology Education director Stephen J.H. Yang defined mo-ke-shi as follows: *mo* means to take a grinding stone as a foundation, and to be quenched; *ke* means to take a course as a basis, and to teach students according to their aptitude; *shi* means to respect teachers, and that practice shares prosperity with learning. After beginning to provide Chinese-language MOOCs in 2013, the MOE in 2014 started to promote different types of MOOC projects for all education levels such as the New Generation of Digital Learning Project: MOOC Subproject, the application of the Mobile MOOC service project, K-12 MOOC Innovative Teaching Project and Taipei City CooC Cloud project. The MOE hopes to realize the flipped classroom concept by introducing MOOCs and further facilitating the trend of lifelong learning in Taiwan. The MOOC projects promoted in Taiwan are detailed as follows.

The MOE established the 4-year New Generation of Digital Learning Project: MOOC Subproject in 2014 to help colleges and universities develop classical MOOC courses. The ministry subsidized 99 university MOOC courses in 2014 and 54 university in 2015. These courses are from a diverse range of disciplines including information and electrical engineering, the arts, engineering, biology, physics, math, and philosophy.

Mobile MOOCs, which combine mobile learning with traditional MOOCs, are viable in Taiwan because of its advanced 4G broadband infrastructure. To promote the innovative application of mobile technology in learning, the MOE initiated a 3-year mobile MOOC project in 2015. This project subsidizes 60 courses and encourages participating universities to develop high-quality 4G course content for these courses. Therefore, people can learn by using mobile MOOCs while commuting to develop a habit of engaging in ubiquitous and lifelong self-regulated learning.

To extend MOOCs to K-12 education, the MOE initiated the 2-year K-12 MOOC Innovative Teaching Project to encourage elementary and high school teachers to use K-12 free MOOC platforms (e.g., Junyi Academy and Taipei City CooC Cloud) to design innovative teaching models and learning activities. This project subsidized 33 schools to develop K-12 MOOC courses in 2015. At the local level, the Taipei City government cooperated with Wistron Corporation to develop the Taipei City CooC Cloud K-12 MOOC platform in 2013 to introduce MOOCs to elementary and high schools in Taipei City.

5.2.2 MOOCs for Higher Education

In response to the MOOCs launched by the MOE in 2013, universities in Taiwan have worked to develop higher education MOOCs. National Chiao Tung University (NCTU), National Tsing Hua University (NTHU), and NTU are the leading schools in the development of university MOOCs. In 2013, NTU became the first university to provide a Chinese-language course through Coursera. Furthermore, the MOOCs developed by NTU were among the most popular Chinese-language courses in 2014 and 2015. These observations suggest that the MOOCs provided by Taiwan universities are of high quality. In 2012, NTHU collaborated with Netxtream to develop the MOOC platform ShareCourse, which is oriented toward higher education MOOCs in Taiwan. In addition, NCTU cooperated with Shanghai Jiaotong University, Xi'an Jiaotong University, Southwest Jiaotong University, and Beijing Jiaotong University to develop the eWant platform for Chinese speakers. Based on the spirits of open and share, Chinese Open Education Consortium (http://copeneduc.org) developed an MOOC platform, Open Edu (https://www.openedu.tw) to facilitate higher education MOOC Chinese courses.

Coursera, one of the first three MOOC platforms in the world, collaborated with NTU to provide Chinese-language MOOC courses in February 2013. NTU first made these courses available through Coursera in August 2013, becoming the first university to provide Chinese-language course through Coursera. As of February 2016, NTU had released 28 MOOC courses through Coursera, and these had received positive reception. These courses are from diverse fields, with names such as Probability, Machine Learning Cornerstone, Dream of the Red Chamber, Engineering Graphics, Optical Foundation, Utilization of Greek Philosophy, and Shiji. Among these courses, those for which the highest numbers of learners registered were Probability, taught by Professor Yeh from NTU, and Chinese Ancient History and People: Emperor Qin Shihuang, which was taught by Assistant Professor Lu of the NTU Department of History and for which more than 10,000 people worldwide registered. Among these registered students were learners from mainland China, Singapore, Hong Kong, Macau, and Canada. Probability was the first course offered by Coursera to combine a regular MOOC course and an online game learning system. The game learning system, PaGamO, was developed by Professor Yeh and his students.

Because of the potential of digital learning in Taiwan, the NTHU Center of Innovative Incubator established a company, Netxtream, in August 2008 to develop an online learning platform through industry-university cooperation. NTHU cooperated with Netxtream and the MOOC platform, ShareCourse, was released in

September 2012. The functions and features provided by ShareCourse include online synchronizing discussion rooms, interactive practice, peer review, item pool for teachers, online tests, and the tracking of students' learning process. These components can aid teachers to plan and implement interactive learning activities. The University System of Taiwan, formed by NTHU, National Yang-Ming University, NCTU, and NCU, first made MOOC courses available through ShareCourse in February 2013. In February 2016, 262 Chinese MOOC courses were offered through ShareCourse. Moreover, ShareCourse has 64 partner schools, including 57 universities and 7 institutions. More than 65,000 learners have registered for the courses in ShareCourse.

NCTU collaborated with Shanghai Jiaotong University, Xi'an Jiaotong University, Southwest Jiaotong University, and Beijing Jiaotong University to develop the eWant MOOC platform, the first courses for which were released in October 2013. In February 2016, 225 Chinese MOOC courses were offered on the eWant platform by 59 partner schools, including 6 schools in mainland China (Shanghai Jiaotong University, Xi'an Jiaotong University, Southwest Jiaotong University, Beijing Jiaotong University, Harbin Institute of Technology, and Tsinghua University), and 53 universities in Taiwan. In February 2016, more than 97,000 learners have registered for the courses on eWant. Among the MOOC courses available through eWant, Micro-film Creation, taught by Hong Yu Chang, and Art of War and Business Management, taught by Hsiao-Cheng Yu from NCTU were offered as general courses to students enrolled at Shanghai Jiaotong University, University of Science and Technology of China, and the Harbin Institute of Technology. This marked the first time that Taiwan MOOCs were offered as credit in mainland China.

The Open edX platform is developed by edX which is established by Harvard University and MIT in 2012, and is a free and open source course management system. The first public of Traditional Chinese version of Open edX (https://www.openedu.tw) is developed by Chinese Open Education Consortium in 2015, and is named Open Edu. In February 2016, 39 Chinese MOOC courses were offered through Open Edu. Moreover, there are 37 partner schools, including 27 universities and 10 institutions. More than 11,900 learners have registered for the Chinese MOOC courses in Open Edu.

5.2.3 MOOCs for K-12 Education

After promoting higher education MOOCs, the MOE began promoting the K-12 MOOC Innovative Teaching Project in 2015, hoping to realize the flipped classroom concept and foster self-regulated learning in students by promoting K-12 MOOCs. The most widely used free K-12 MOOC platforms are Junyi Academy, Taipei City CooC Cloud, and DeltaMOOCx.

In rural areas of Taiwan, ineffective remedial teaching and a lack of education resources hinder K-12 education. The MOE has spent a lot of money on remedial teaching projects but has no positive outcomes to show for it. After observing the higher education learning reform spurred by MOOCs, TrendChip Education Foundation founder Shinjou Fang believed that MOOCs could also solve the problems of K-12 education. Therefore, the foundation combined cloud technology with high-quality education content and, by using Creative Commons, made the teaching materials used by Khan Academy available. The organization extended these efforts by developing the Junyi Academy MOOC platform (http://www.junyiacademy.org) for K-12 students to use for free.

The Taipei City government extended MOOCs to elementary and high schools in the city. In September 2013, the city government collaborated with Wistron Corporation to develop the Taipei City CooC Cloud K-12 MOOC platform. The development of the platform comprises two stages: the high school cloud and elementary school cloud. The high school cloud was developed from 2013 to 2015, whereas the elementary school cloud is planned for development from 2016 to 2018.

With the intention to reduce the gap between learning and doing, Delta Electronics founder Bruce Cheng became involved in MOOCs in 2014. To develop the professional skills required in the age of Industry 4.0, Delta Electronics developed DeltaMOOCx (http://deltamoocx.net/) for high school and colleges. Furthermore, the company cooperated with the K-12 Education Administration, National Academy for Educational Research, National Taipei University of Technology, National Taiwan University of Science and Technology, and National Yunlin University of Science and Technology to develop college and high school MOOC courses. Delta Electronics is responsible for the funding and management of the platform, whereas the colleges and institutions are responsible for course design. Videos for the courses are recorded by Netxtream and Elta TV. The most registered DeltaMOOCx course among colleges is Automatic Program, whereas the most popular courses among high schools are math, science, biology, chemistry, earth science, and electronics. The courses in DeltaMOOCx (http://deltamoocx.net/) began offering courses on March 2013. In 2015, the platform had been partnered with by 30 high schools.

In addition to the locally developed K-12 MOOC Innovative Teaching Project is Taipei City CooC Cloud, developed by the Taipei City government and Wistron Corporation, as well as Junyi Academy and DeltaMOOCx, which are also free for students at all level to use. The presence of these platforms reflects the healthy development of MOOCs by both academia and industry in Taiwan.

5.2.4 MOOCs for Lifelong Learning

With the arrival of the knowledge economy, lifelong learning has become a core competency and a key factor for the competitiveness of a country. Therefore, the government views lifelong learning as a crucial education strategy in Taiwan. The government began introducing the concept of lifelong learning through MOOCs in 2013.

According to data released by Coursera, more than 70 % of registered members have master degree. However, the statistical data also show that the scope of MOOCs is extending from formal education to informal education, suggesting that MOOCs will become a mainstream component of lifelong learning. Therefore, the MOE combined the concept of lifelong learning and MOOCs to develop a lifelong learning MOOC platform.

In Taiwan, the government is not alone in promoting lifelong learning MOOCs; industry and academia collaborate on such MOOCs, indicating the importance placed on MOOCs regarding lifelong learning education. Taiwan Learning Initiative For Everyone (Taiwan LIFE, http://taiwanlife.org) is the leading force in incorporating MOOCs into lifelong learning education. NTU, National Open University (NOU), and Mitac Information Technology cooperated to develop an open education platform, Taiwan LIFE, which was inaugurated on November 3, 2013. NOU provided the MOOC certification, making it the most highly developed MOOC platform in the field of lifelong learning.

To demonstrate the quality of lifelong education, the developers of Taiwan LIFE sought MOOC certification. This is not unique among MOOC platforms. For example, NCTU and NOU cooperated to achieve MOOC credit certification for eWant in 2014. The eWant also became the first MOOC platform to receive exam certification. In 2015, NTHU worked with NOU to establish MOOC credit certification for ShareCourse. NTHU Department of Computer Science Professor Nen-Fu Huang taught the first ShareCourse course that had received MOOC credit certification.

Up to date, Taiwan LIFE has 35 partner schools, and provides 125 MOOC courses. The eWant and Taiwan LIFE held the first certification exam in November, 2014. The certification exam has been held for four times until now. 36 MOOC courses joined the exam and 300 students took participate in the exam. The age of the examinees is from 18 to 70. Until now, there have been 246 people who passed the MOOCs certification exam. Therefore, the influence of MOOCs on lifelong learning education has been substantial.

In Taiwan, the trend of MOOC adoption has affected both formal education and lifelong learning. Taiwan LIFE pioneered a model of combining MOOCs and lifelong learning. Subsequently, NCTU and NTHU did likewise and received a positive response to these efforts to create means of lifelong learning.

5.3 Experiences of the MOOCs Movement in Taiwan

5.3.1 Changing Roles of Learners, Teachers and Schools

The growing MOOC movement in Taiwan has changed the roles of learners, teachers, and schools and the means of interaction. Pedagogical concepts such as flipped classroom can be realized using MOOCs. Accordingly, MOOC adoption has increased rapidly in Taiwan educational institutions since 2013. Subsequently, the roles of teachers, learners, schools, and interaction between teachers and learners have changed. With MOOCs, learners are no longer limited to students in a classroom; rather, they can be self-regulated learners outside the classroom. In MOOCs, teachers are responsible for designing the learning process to guide student learning. Therefore, in MOOCs, the role of the teacher changes from a course provider to a coach. In MOOCs, schools become a metaphor, thereby changing the value of schools regarding their administrative staff, name brand, and campus. The means of interaction also change in MOOCs, because technology such as social media is the main communication tool.

Most universities in Taiwan have adopted Chinese MOOC courses on eWant, ShareCourse, and Open Edu platforms. In February 2016, more than 100 universities have become partner schools with eWant, ShareCourse and Open Edu platforms, and more than 170,000 learners have registered for these platforms. These platforms have provided more than 500 Chinese courses. The topic and field of these Chinese MOOC courses are various and they can be the supplementary materials of university courses. From the large number of university partners and registers of eWant, ShareCourse, and Open Edu, students in Taiwan can improve and expand their learning field through Chinese MOOC courses.

MOOC learners are primarily people who want to engage in self-learning through the Internet. By using online resources, learners can learn nearly anything from any location; hence, MOOC learners no longer need to be students. Learners' age and educational background vary greatly. In addition, learners using a MOOC course can learn at their own pace, which strengthens the habit of self-learning. Moreover, learners wishing to achieve mastery learning in MOOCs may use the same materials repeatedly to become familiar with them. This confirms to the view of a previous study that the MOOC learning model is based on mastery learning (Glance et al. 2013).

Regarding guiding student learning, the role of a teacher in a MOOC shifts from a course provider to a coach. In the traditional teacher-centered learning model, teachers are often too busy to deliver lectures. MOOCs use the learner-centered learning model; thus, the teacher becomes a coach and an assistant who guides student learning. To do this, teachers must focus more on designing learner-centered learning activities. This new paradigm enables students to learn at their own pace and encourages them to learn through collaboration (Spoelstra et al. 2015; Kop 2011; Hew and Cheung 2014).

In MOOCs, schools become a metaphor. With the rapid growth of Internet technology, physical schools and classrooms have become virtual. Many physical universities already have online counterparts. As such, schools-particularly those that engage in MOOC learning-are gradually becoming a metaphor. Therefore, schools must rethink how they value their administrative staff, name brand, and campus. Specifically, the administration should reconsider how it maintains the integrity of the institution and how it can improve student learning outcomes through MOOCs; in addition, it should consider how to improve the academic of the school. Regarding name branding in the age of MOOCs, schools will probably gain recognition because for well known or highly regarded courses or teachers. Receiving acclaim or fame through such a course or teacher could change how a school is viewed and thereby benefit the school. Campuses will still exist because MOOCs cannot replace regular education; in other words, digital learning and the digital age will not replace real-world learning in a physical setting.

The digital foundation of MOOC learners necessitates that the means of interaction in MOOCs is technology such as social media rather than traditional communication methods. Because of the online and open learning environment, the number of learners from various countries connected in a MOOC course is often high (in many cases over 10,000). MOOC learners can be current students or not, and may live in the country in which the MOOC is based or be overseas. The students have various backgrounds, and the communication tools must be changed accordingly. This is why interaction changes in MOOCs. Traditionally, teachers engage in face-to-face communication with students. With the rise of internet technology, the learning environment for students shift to communication tools such as social media networks (e.g., Twitter and Facebook). Furthermore, the assessment methods also change from paper-and-pencil exams to auto grading, peer review, and peer grading. Through digital communication, numerous MOOC learners can communicate, collaborate, and learn more effectively (Shen and Kuo 2015).

The current wave of digital innovation has brought free and open learning platforms. Although MOOCs have a substantial influence on education in general by realizing innovation learning approaches such as the flipped classroom, they cannot replace traditional education received at a physical location. The main goal of MOOCs is to improve the existing education system, rather than to replace it.

5.3.2 The Success Factors for MOOCs in Taiwan

To identify the success factors for MOOCs in Taiwan, we investigated course design and the organizations that promote MOOCs. These organizations comprise both educational institutions and private sector groups. Because the educational and industrial sectors cooperate to promote MOOCs, the MOOC experience substantially influences education at all levels. Successful MOOC courses were found to contain dynamic course design, quality presentation, attractive post-production, and timely interaction, and to make students feel as though they were participating in a traditional course.

Course design consists of course objectives, weekly progress assessments, the segmentation of learning units, and evaluation. To achieve the course objective in MOOCs, teachers plan weekly progress assessments. The weekly learning course contains numerous learning units. For teach units to have high teaching quality, their learning content must have high-quality presentation and attractive post-production. Such presentation is supported by clear lecturing, simulations, animation, and film clips. Attractive post-production integrates images, captions, sound, film editing, and special effects. Students can demonstrate progress weekly and achieve the goal of mastery learning by participating in timely interactions such as those required in online learning activities and exercises. Learning content that imparts a sense of realism can make students feel as though they are participating in a traditional class in a physical school. To provide a means of self-assessment in MOOCs, formative assessments should be provided between every learning unit.

In Taiwan, educational institutions and industry have promoted MOOCs that have well-designed courses, substantially influencing education in the process. The effects of MOOCs extend from a learner's school life to career. According to the preceding discussion, we propose that MOOCs will become mainstream in education and lifelong learning.

5.3.3 Influence and Future Work of MOOCs in Taiwan

The main goal of MOOCs is to improve the existing education systems by realizing innovative teaching approaches. Means of reforming education and realizing the spirit and concept of education, such as innovative teaching such as the flipped classroom, have begun to gain widespread attention among educators in Taiwan. MOOCs rose to prominence in Taiwan in 2013, and the learning process used in traditional education has begun to evolve along with the adoption of MOOCs. This is because MOOCs not only realizes innovative teaching approaches but also develops learners' self-learning ability. In response to MOOCs, educators and teachers are changing their approaches to focus more on developing the learning process according to innovative teaching approaches. In Taiwan, these pedagogical theories have been practiced through MOOCs from K-12 and higher education. Further improvement of the Taiwan education system is expected as the effects of MOOCs intensify.

In Taiwan, MOOCs pose a new means of self-regulated learning and have greatly affected education and industry. In education, learners can learn to develop their self-learning ability. When this ability is trained from an early age (e.g., in elementary or high school), learners can learn more effectively later in life (e.g., in high schools or university). Therefore, the MOE has promoted various types of MOOC projects at all education levels since 2014. To teach the skills required by technology professions, Taiwan's industry has cooperated with the education sector to develop free MOOCs. Thus, MOOCs developed through education–industry cooperation enhance education quality.

The next milestone for MOOC technology is the utilization of big data analytics to examine previous learning data and use the resulting insight to provide learners with feedback. In MOOC platforms with this feature, the course platform will unobtrusively record user learning data including input data, every mouse click, video player control use, and submissions data (O'Reilly and Veeramachaneni 2015). These data will then be analyzed and compared to determine the progress of individual learners. Such practical applications indicate the many potential uses of MOOC learning analytics (Diver and Martinez 2015; Wilson and Gruzd 2014; Young 2015).

The Taiwan education system, from kindergarten to university, can be improved by using MOOCs to realize innovative teaching approaches. Since 2013, MOOCs in Taiwan have been used to enhance education quality through the cooperation between education and industry. The rich learning data accompanying the widespread adoption of MOOCs make learning analytics the next milestone for MOOC platforms.

5.4 Conclusions

The rapid growth of MOOCs in Taiwan has resulted from three factors: the total digital learning environment; high-quality online course content; and the government, schools, and industries jointly promoting MOOCs. A successful MOOC course requires a dynamic course design, high-quality presentation, attractive postproduction, and timely interaction, and must make students feel as though they are participating in a traditional course. For promoting MOOCs, cooperation among government, schools, and industry is the main force; in addition, MOOC courses can gain exposure by having a complete digital learning environment and high-quality course content. The government, through the MOE, must inject funds to aid schools in developing MOOCs. Universities should organize conferences to share their experiences in developing and promoting MOOCs. Furthermore, industry and universities must collaborate to develop diverse MOOC platforms and course content.

The MOE has initiated a series of projects to develop MOOCs in Taiwan since 2013. Among these projects is the New Generation of Digital Learning Project: MOOC Subproject, K-12 MOOC Innovative Teaching Project, and Mobile MOOC service project. Project participants range from elementary school to university students. The MOE has developed mobile MOOCs to provide a means of ubiquitous learning. The MOOC trend has significantly influenced the form of education in both elementary and high schools as well as universities. Chinese-language MOOC courses developed in Taiwan number approximately 500, and approximately 100 schools have contributed to creating MOOCs.

Industry in Taiwan has also contributed to develop MOOCs, with the most notable contributions coming from Delta Electronics, Inc., Wistron Corporation, and the TrendChip Education Foundation. Delta Electronics, Inc. developed DeltaMOOCx for high schools and colleges. For elementary and high schools, Wistron Corporation and the Taipei City government collaborated to develop Taipei City CooC Cloud, and TrendChip Education Foundation developed Junyi Academy. Industry has sought to promote MOOCs to enhance K-12 education and cultivate student skills required by specific industrial sectors.

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Chapter 6
Yet Another Perspectives About Designing and Implementing a MOOC

Sie Wai Chew, I-Ling Cheng and Nian-Shing Chen

6.1 Introduction

Our world is rapidly changing and growing. One of the most prominent aspects would be the exponential growth of the Internet giving rise to a new form of education. "Since the scope of the change exceeds personal and interpersonal learning activities to include larger scale organizational and societal change, additional theories are needed to explain change, to plan interventions and to develop policies" (Bell 2011). Massive Open Online Courses (MOOCs) are one of the latest movement of open education that emerged from open educational resources (OER) and e-learning. MOOCs are designed to provide open education and free access to vast participants through the Internet. There are MOOCs that are entirely asynchronous and only use non-video technologies. However, most of the MOOCs are well equipped with prerecorded video lecture, interactive learning activities, and providing MOOCs learning platform.

MOOCs are similar to blended learning that allows interaction between learners and instructors using asynchronous learning and synchronous learning, maximizing interconnectivity and providing better supporting of learning and engage on learners' full attention (Chen et al. 2005, 2014; Hastie et al. 2010). MOOCs play an

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important role in providing higher education for everyone across the globe with no limitation on the number of students, providing location independence and courses could be taken any time (Riddle 2012). Learners can participate and complete the course at their own pace, in a way that works for their own schedule. It enables the sharing of academic resources among institutions and universities, making learning more efficient and diversified. Along with the changes in learning practice, MOOCs support and fulfill the demands of self-directed learning, allowing learners to determine their learning needs, formulating their own learning goals, and applying appropriate personal learning strategy (Knowles 1975). Thus, the preparation of MOOCs requires additional computing and videography skills (Head 2013) with a different course structure and layout in comparison with the conventional courses.

This chapter aims to contribute on an introduction and exploration on the methods available in planning MOOCs and interactive video lectures. First, covering the construction process of video lectures including the format of video lectures, recording video lectures, editing and segmenting these video lectures, and inserting interactive activities in them. Second, this chapter describes on the production approaches of video lectures including the types of video lectures versus learners' learning goal, along with ways to incorporate other instructors of the same field to form a team in running MOOCs and leveraging on the concept of team teaching. Furthermore, a discussion on leveraging on-campus learners to be involved in the production of the video lectures that are used in MOOCs and the usage of OER in designing learning activities. Finally, an experience sharing on issues and challenges faced in operating MOOCs along with the proposals of potential solutions, including the assessment of learners' performance, administration of MOOCs, and credibility of MOOC certificates are presented to conclude the chapter.

6.2 Construction Process of Video Lectures

During the planning stage, instructors are recommended to brainstorm on the content of the course by having a brief structure of the course in mind. The common practice of MOOCs is to segment the course into a few sections as shown in Fig. 6.1, it is usually referred to as weekly lectures. In each section, there will be several lessons or modules, similar to topics covered by the instructor during each lecture session. Some MOOCs split the course structure further into smaller parts within each lesson or module to have shorter video lectures in each lesson or module. This would provide learners with a better navigation on flow of the course. Schmidt and McCormick (2013) had structured their MOOCs taught in Coursera platform in a similar manner. This section discusses on the common ways of constructing video lectures in MOOCs along with different types of video lectures, recording video lectures, segmenting video lectures, and inserting interactive activity in them as follows.

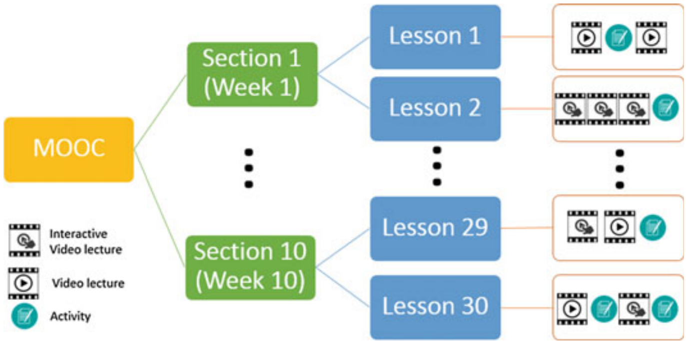

Fig. 6.1 A common MOOC course content structure

6.2.1 Types of Video Lectures

There are various methods in designing and formatting video lectures depending on the instructor's style and the nature of the course. Schmidt and McCormick (2013) had divided them into six groups as follows: (1) instructor lecturing by "voice over" throughout with or without presentation slides, (2) instructor lecturing directly to the camera while filming in office setting, (3) video captured from a live classroom lecture, (4) instructor recording lecture in a studio, (5) instructor demonstrating a concept or command-line prompt using spreadsheet or document, (6) instructor writing and drawing freehand on a digital tablet using a software program (Khan Academy videos).

Different formats of video lectures have their own effectiveness on the learning process for learners. Instructors should decide on the most appropriate format for the video lectures depending on the course content, teaching style, and ensure that it satisfies individual learning needs and learning styles (Chen and Wu 2015). More importantly, the formatting of the video lectures affects the engagement and attention of learners as they are meant to facilitate learners in learning the material effectively.

6.2.2 Recording Video Lectures

Breslow et al. (2013) found that learners spent most of their time on video lectures on MOOCs, making video lectures as one of the most important component in MOOCs. Hence, producing effective video lectures for learners are one of the biggest challenges faced by educators or instructors in designing MOOCs for the learners. It requires instructors to equip themselves with new skills and apply new concepts and structures for the course as it differs from conventional courses; starting from the recording of the video lectures, to the editing and segmenting of the video lectures. A better strategy in designing the course is to ensure learner's engagement with the presented video lectures and absorbing the information shared (Osborn 2010). There are three common practices for producing video lectures as described below.

6.2.2.1 Live Recordings of Classroom Lectures

Recording live classroom lectures are one of the most commonly used method in producing video lectures. It is often that these video lectures are recordings of the conventional physical classroom lectures in universities or they could be talks and seminars with a live audience, as Chen and Wu (2015) put it as lecture capture (or the talking-head lecture).

These live recordings are direct and easy for educators, as they would go on with their conventional classroom lectures as usual, with an additional camera added in the classroom to record the whole process. These video lectures are used in MOOCs to provide learners with the atmosphere of being in the classroom itself. These video lectures could benefit students who had attended the lecture, as they could be replayed by students for a recap of the lecture; this could assist students in revising the material and providing additional references for their studies.

For example, TEDTalk videos are recorded on site during the conference by professional production teams with several cameras placed in different angles. These videos could benefit the audience attending the conference for later references and recap. Moreover, by making these videos available online, these ideas are shared worldwide to the public. Another example will be the MIT open courseware whereby lecturers of the university have live recordings of the classroom lectures and they shared these videos in MOOCs after editing. By watching these MOOC video lectures, learners are given the additional opportunity to experience how lectures are conducted in MIT in a classroom atmosphere.

The interactions between the lecturers and students in live recordings are one of the essences of this method. It allows MOOC learners to relive the classroom atmosphere. The tricky part of classroom lectures live recordings is also this interaction between the lecturer and the students, which is highly dependent on the right moment and ambience of the classroom. Lecturers might not be able to have consistent engagement with the students in the classroom if the students are passive and are with low participation toward the activities given by the lecturer during the session. This will result in producing a rather dull lecture video for MOOCs.

In addition to that, the pace and lecture spacing of classroom lecture varies with a time constrain of the lecture's duration, which is typically two hours. Classroom activities or topic discussion with students might take up too much time, causing the lecturer to sprint through the remaining of the lecture. Furthermore, it is common that during lecture, lecturers tend to pause for thoughts and for impromptu experience sharing. This might cause the structure of the lecture video to be rather imbalanced for MOOCs with the lecture starting with a good pace but ending with a hasty note.

6.2.2.2 Recording Studio

There are universities and institutions well equipped with recording studios which are meant for the production of video lectures for lecturers (Cheng et al. in print). These studios are fully equipped with professional lightings and sound systems along with top-notch video cameras for the recordings. These video lectures were designed, formatted, and scripted for the usage of MOOCs beforehand before the recording process. Hence, learners will find these video lectures more engaging and straightforward for learning. The productions of these video lectures are better in quality with impressive presentation, as they are proficiently written and efficiently structured. This will provide learners better visual engagement with the video lectures and concentration on materials.

Instructors using this method may find that they will lose their teaching style in the recordings along with the lack of ownership of the video, as these videos are usually directed by the technical and production team. The scripts of these video lectures are written accordingly to increase the understanding and engagement of learners where lecturers are to follow the script during the recording.

Moreover, some lecturers find it unusual to give their lecture without having students in front of them. In other words, they will be speaking to the camera the whole time during the recording, making them feel uncomfortable and uneasy. Without students in front of the lecturer, they could not receive instant feedback on whether the students are following with the course or if they understand what is going on. Lecturers will be facing the camera all the time and they have to maintain their excitement on the topic and be enthusiastic while they are delivering the lecture. This is quite difficult for some lecturers as they are not used to these sort of scenario.

Besides that, appointments have to be made for the usage of the studio for the recoding of the video lecture and this depends on the schedule and the availability of the studio and the technical team. Lecturers are not able to complete these recordings at their own leisure time. More importantly, the cost of the studio recording are exceptionally high, not mentioning the production equipment, the video cameras, the maintenance fees involved, professional technical, and production teams are hired as they are required to operate and supervise the whole production process.

6.2.2.3 Instructors' Individual Recording

A more widely accepted method would be having the instructors recording the video lectures themselves using desktop screen recording tools. Instructors are required to design and structure the course beforehand during preplanning phase of the recordings. They will have more ownership and freedom in producing the videos as they could decide on the methods and styles used, having full control of the recording and editing process. Retakes of the videos for further improvement of the video content are enabled which differs from live classroom recordings. Moreover, instructors could proceed with these recording at their own leisure time.

From the learners' prospective, these video lectures are more personalized and casual; it is as though the instructor is having a one to one session with the learners. Learners are more engaged with these video lectures produced with a more personal impression (Guo et al. 2014b) and more conversational. Nevertheless, similar with studio recording, not all lecturers are used to conducting a lecture in front of the camera without actual students upfront.

6.2.3 Segmenting Video Lectures

After the recording of the video lectures, the usual practice is uploading the recorded video directly after completion. It is common to find live classroom video lectures with the entire two hours clip used in MOOCs. Osborn (2010) and Schmidt and McCormick (2013) found that each video lecture should not be longer than 15–20 min, instructors are recommended to elaborate four or five key points in each segments of these video lectures. Guo et al. (2014a) found that learners are more engaged with video lectures segmented shorter than 6 min.

Therefore, another important part of producing video lecture for MOOCs is the editing and segmenting of these video lectures and enriching them with in-video interactive activities. There are numerous software used for the video lectures' recording and editing process including Camtasia, Screenflow, and Final Cut. Also, there are various approaches in segmenting these video lectures. The following shows two common and simple methods: (1) part-by-part video segmenting and (2) the usage of timestamps in the video lectures.

6.2.3.1 Part-by-Part Video Segmenting

Part-by-part video segmenting means that the lengthy recording is cut or segmented into smaller portions in accordance to the topic discussed in the videos (see Fig. 6.2). By segmenting the videos in this manner, it will serve as a table of content of the course, giving learners a whole layout of the course. This will also assist instructors to evaluate the structure of the course and determine whether there are areas of the topic which are not covered in the recordings. With a structural frame of the course, it would be easier for learners to have an overview of the course and pace themselves to complete the course.

6.2.3.2 Usage of Timestamp

Using timestamp, the video recordings are not cut separately into smaller clips. Instead, the whole recording will be uploaded with the additional timestamps

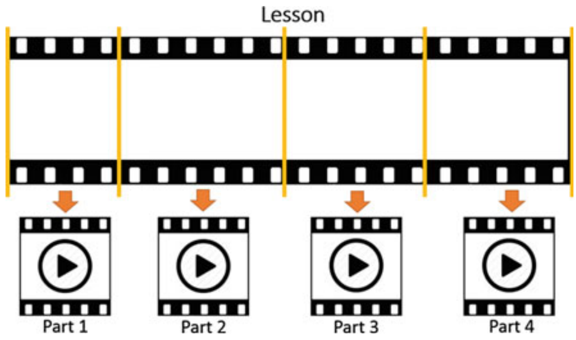

Fig. 6.2 Part-by-part video segmenting

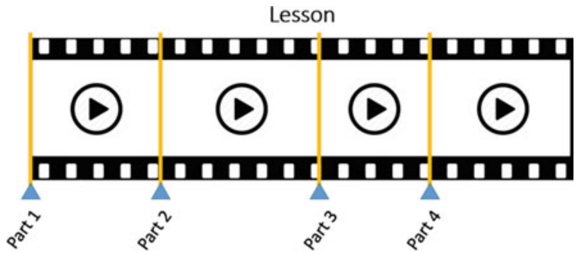

Fig. 6.3 Using timestamp on video lectures

embedded within the video, indicated with labels or captions of the video partition (see Fig. 6.3). YouTube has this function which is easily accessible by listing the timestamps in the description of the video.

6.2.4 Inserting Interactive Activity

Interactive activities are essential as they differ from MOOCs regular lecture videos. These activities assist instructors in understanding learners' learning process by providing instructors' feedbacks and information on parts of the lecture which appear to be difficult for learners to understand and instructors could further improve on the presentation methods or material used. During the editing process, some interaction activities such as answering clicker questions are added in between the videos to increase the engagement of learners during the learning process (Danielson et al. 2014). ED Puzzle (http://www.edpuzzle.com) is one of the useful tools for this function whereby instructors are allowed to embed short quizzes in the video lectures to sustain learners' engagement and track their understanding of the materials. The types of interactive activities and formats are proposed as follows:

- Types of interactive activities

There are various types of interactive activities that could be used in MOOCs like (1) quizzes or follow-up problems, (2) short answer questions, (3) answering thought-provoking questions from the instructor on certain issues, and (4) activities involving interaction with peers. More interestingly, instructors could question learners of their opinion on a certain issue related to the lecture topic before the lecture begins and reveal the learners' answer at the end of the lecture. This is typically useful for course on social science or psychology as it enables learners to witness the change of their prospective before and after the lecture.

- Format on inserting interactive activities

There are two general methods to introduce interactive activities in the course, separated from video lectures and embedded within the video lectures. Both methods are recommended depending on the nature of the course and types of activities.

1. Detached from video lectures

Video lectures and interactive activities are separated individually whereby learners will participate in these activities after completing the lecture video (see Fig. 6.4). This method is useful for MOOCs with shorter video lectures (with length of 6–10 min), after learners completed a subtopic of the lesson through the lecture video, they will participate in these follow-up activities to enhance their learning and understanding of the subtopic. This is common for mathematical and science courses and is popular in courses of Khan's Academy (Khan 2011; Khan Academy 2014).

2. Embedded in between the video lectures

Interactive activities could be embedded within each video lectures (see Fig. 6.5). This is useful for MOOCs with longer video lectures (less than 20 min) where it provides intermediary activities in between subtopic discussion of the video lecture (Osborn 2010). It is encouraged that these activities could be inserted after every 6–9 min of the video lecture to ensure that the learners understand the material and sustain their engagement (Guo et al. 2014a; Guo 2014).

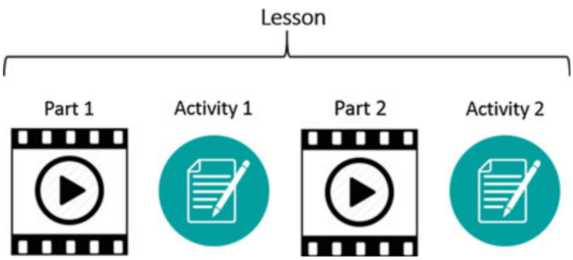

Fig. 6.4 Video and interactive activities separated individually

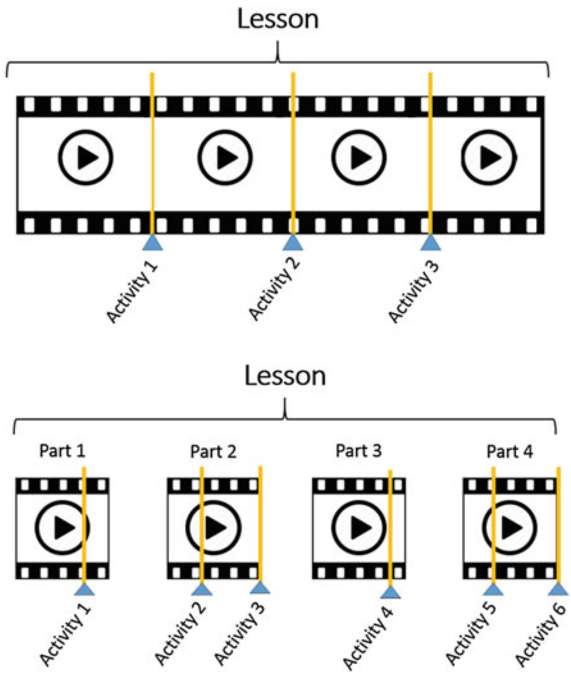

Fig. 6.5 Interactive activities embedded within the video lectures

This is commonly used by social science course as it enables instructors to relate the lesson topic with activities. Schmidt and McCormick (2013) practiced this by having multiple-choice popped up quiz every five minutes of the lecture video to review whether learners understood the material covered.

Before these video lectures are uploaded on the platform, instructors are to review these videos repeatedly to ensure that every detail is in order. This includes the transitional of the slides, the synchronization of the video with the slides and audio, the position of the interactive activities, etc. It is highly recommended to have pauses in between subtopics and slides, as it will ease the process of future editing and updating of material of these video lectures.

6.3 Production Approach of Video Lectures

Different from the aforementioned perspective, we proposed four ways to improve further the quality of prerecorded video lecture for MOOCs: (1) types of video lecture versus learning goal in designing MOOCs as microcourses, (2) leveraging team teaching to incorporate other instructors to implement team teaching, (3) leveraging on-campus students by involving on-campus students in the production of prerecorded video lectures for MOOCs, and (4) leveraging on existing OER in designing learning activities.

6.3.1 Types of Video Lectures Versus Different Learning Goals

The three learning domains are cognitive, affective, and psychomotor (Wilson 2015). Most traditional lectures attempt to fuse these three domains into the course but often end up focusing more on cognitive learning, which is the knowledge base of the course.

Nowadays, learners want to retrieve knowledge on a certain topic instantly where they are readily available online with just a click away. By introducing the concept of microcourses into the designing of MOOCs, this would provide learners with the flexibility where they are given the option to take microcourses covering different types of learning goals. Microcourses are courses that are more focused on a particular topic with short learning units. Learners no longer need to commit to a certain time of a week in order to attend classes physically. Microcourse can be used to balance the three learning domains. The proposed structure of microcourse is to contain these three learning domains as follows:

- Cognitive domain

Cognitive domain is incorporated into MOOCs through prerecorded video lectures where instructors share their knowledge of the course with learners, arising analytical and critical thinking in learners on the subject. We suggest that 10 % of the learning activities of this domain should be hands on, covered by weekly assessments and interactive activities in the prerecorded video lectures and 90 % of the learning activities of this domain is contributed by prerecorded video lectures.

- Psychomotor domain

Psychomotor domain composes of hand–eye coordination and physical skills. To enable this after acquiring the knowledge of the subject, learners are given demonstrations and real-life examples of the application of the subject. Assignments utilizing these knowledge and forum or discussion boards for MOOCs are used for learners to enhance the knowledge learnt. This will assist learners in valuing and understanding further of the course by applying what was learnt in the lecture into their projects, along with the discussion with other learners. This is a way providing MOOC learners with examples on the application on the knowledge of the course, on-campus students could share their hands-on project with MOOC learners by having the prerecorded videos shared. We also recommended that 30 % of the learning activities of this domain should be hands on, including assignments, discussions and forum. Another 70 % of the learning activities of this domain will be contributed by prerecorded video on real-life demonstration and examples.

- Affective domain

Affective domain consists of the learners' feeling and emotion; this is usually referred to the learners' attitude. This is where the learners shift from the ignorance stage on the subject to making the subject part of their daily life. This is including the learners' participation in forum/group discussion, the sharing and exchange of ideas, enjoying the experience, and appreciating the subject. In MOOCs, we could view this as a project-based learning, where learners are applying their learnt knowledge on the subject into their projects. Learners are requested to conduct their projects involving real-life practice and report or discuss their experience on forum or cyber-face-to-face classroom. Learners will record videos of the preparation and planning process of the project to the operation of the project where they will share this experience with future MOOC learners. We also suggest that 70 % of the learning activities of this domain should be hands on which is covered by learners executing their projects. The remaining 30 % will be contributed by having learners reporting and sharing their experience while running their project.

Different learners have different learning styles and habits. By introducing microcourse in MOOCs, learners are given the learning options on whether do they prefer lecture-based learning, demonstration and illustration of the subject, or hands on experience learning. After the completion of each component, we recommend that learners are awarded with certificate of completion of each component, respectively. With all three certificates of completion, learners may receive credits by the university, recognizing the completion of the course. More importantly, the ownership of the course is transferred from lecturers to learners, where learners are given the option to choose the component of the course which would benefit them the most.

6.3.2 Leveraging Team Teaching

Most existing MOOCs only involve one lecturer/instructor throughout the course. Breslow et al. (2013) had shared that for their MOOCs on edX, "Circuits and Electronics," there were three MIT professors and edX's chief scientist operating the course as instructors, along with the assistance from five teaching assistance and three lab assistants.

By utilizing the Internet as a tool, there are no geographical boundaries, making team teaching for MOOCs highly possible. We are looking into promoting team teaching in MOOCs by collaborating with faculties from other institutions or universities. These prerecorded video lectures could be a product from other instructors' and/or former students' project. By having team teaching with the collaboration of different instructors teaching in a course, it creates and provides learners the flexibility in the course by exposing them to different teaching styles and providing learners with different prospective from lecturers on the same topic. These different versions of video lectures on the same topic would assist learners to cope with their individual learning requirement as each learner has different habits and patterns. Moreover, this enables the sharing of academic resources among lecturers, making MOOCs easier for lecturers and learning more efficient and diversified for the learners. From another prospective, not all instructors are comfortable lecturing in front of a camera. Hence, with team teaching, charismatic instructors could assist on the recording of lecture videos whereas camera shy instructors could assist on learning activities, assignments, etc.

Team teaching was used in the MOOC on “Introduction to e-Learning and its Practice” carried out on ShareCourse in Taiwan. Lecturers from different universities were invited to conduct different parts of the course, covering different materials, and sharing their experience on practical examples on e-learning with the students. Students and learners were exposed to different teaching styles from different lecturers with various experiences sharing from these lecturers. This in turn not only provides diversity in the course and enables sharing of educational resources, but more importantly, it provides learners with a constant freshness in changing of the course’s atmosphere and strengthen learners’ engagement toward the course.

6.3.3 Leveraging On-campus Students

The role of the instructor and learners had changed in MOOCs, especially in the video lectures recorded from classroom lectures. On- and off-campus students play different roles in the production and operation of MOOCs. On-campus students could act as actors in the production of these video lectures directed by the teacher, whereas off-campus student, i.e., MOOC learners would be the audience of the video lecturers. Lecturers play the role of the directors of the video, guiding students in the classroom throughout the course while students in the classroom play the role of actors of the video. It is often that during a lecture, lecturers provide the class with learning activities or lecturers may have quizzes or questions for students. These classroom activities are recorded and produced into video lectures for MOOCs with MOOC learners acting as the audience.

In the course “Introduction to e-Learning and its Practice,” recordings of online lectures using JoinNet were edited and used as video lectures for the course. In these video, the instructor played the role of the moderator in navigating students by tossing questions around, students had have an exchange of opinions on the discussed topic. Students also played the role of actors in these video lectures where MOOC learners could be the audience, learning from these lecture video in a more collective and spontaneous way.

6.3.4 Leveraging Existing OER

Learning activity is one of the essential features of MOOCs. In design and planning of these learning activities, Open Educational Resources (OER) could be used in making the activities more interesting and educational to learners. These contents are readily available in OER for instructors to acquire and adopt in their course. Some of the popular OER are used in designing the activities such as YouTube videos and TEDTalk. Instructors use these OER as reference and to provide more practical examples to further elaborate the material of the course (Cheng et al. in print).

Besides using OERs to provide better illustration to learners, it could also be a solution in solving some cost issues for institutions or universities with low budgets for MOOCs (Matkin 2013). These OERs could be incorporated into MOOCs to reduce the workload of instructors in recording and producing new video lectures for their course.

6.4 Issues/Challenges and Potential Solutions in Operating MOOCs

According to experiences, this section discusses four issues/challenge of operating MOOCs along with the proposals of potential solutions.

6.4.1 Assessment of Learners' Performance

Extensive discussion on preventive methods or ways to detect plagiarism were ongoing (Cooper and Sahami 2013) as cheating is one of the main challenges for MOOCs and any other online courses. Hence, innovative assessment approaches on assessing the learners' performance should be reviewed to improve the credibility and recognition of MOOC certificates.

In Taiwan, some courses on Ewant currently provide final examinations or proctored examinations, which require learners to take them physically at various test centers across the country. Learners who are interested to complete these courses and earn a certificate of completion are given a reliable and reputable option to do so. This is not something new in the market, numerous professional papers (i.e., CISCO, Financial Risk Manager by GARP, and Society of Actuaries (SOA) papers) and academic tests (i.e., IELTS and TOEFL) provide various test centers across the globe for learners to complete their final examination in order for them to be assessed and certified of their skills or abilities.

MOOCs could follow these footsteps by providing the option for learners to have final examinations at test centers. This may not only prevent plagiarism but also increase the reputation and recognition of MOOC certificates. However, one of the challenges with having proctor examinations is the cost involved in sustaining and supporting these test centers and its management. Additional work force is required for managing these examinations and more importantly, assessing the examination. There are other options to explore, for example the usage of ID cards and card reader for verification and laptop fingerprint recognition.

6.4.2 Administration of MOOCs

MOOCs are open and free for learners but they are not entirely free for the instructors and educators. For example, edX offers assistance in developing courses with a cost of US$250,000 per course with an additional fee of US$50,000 each time the course is offered (Kolowich 2013). Of course, instructors can opt to develop their own courses which in this case will involve additional time used in developing the course, typically more than 100 h (Kolowich 2013) and in managing the course when it is ongoing, involving another 8–10 h per week.

One of the proposed solution for this is by involving on-campus students in administrating or preparing the course, including recording of the lectures and editing of the videos. This could provide students with practical industrial competency and expose students to experiences that textbooks could not provide. Another proposed solution is team teaching that the tasks and workload of production of MOOCs would be shared among several instructors.

In addition to that, incorporating with corporate company may assist in the funding of MOOCs. More than often, the course content of MOOCs could be relevant to the knowledge required by corporations. MOOCs could be used to provide trainings or refreshers for employees of these corporations, resulting with a huge reduction on training cost for a company. By designing MOOCs to support corporate and educational use, universities and institutions may be able to solve the problem of the cost of MOOCs.

6.4.3 Credibility of MOOC Certificate

There are employers who do not recognize the certification of MOOCs and this would affect the public's prospective on MOOCs (Cooper and Sahami 2013). Some learners will continue attending MOOCs regardless of the certification, however if this is resolved, it is believed that it will increase the potential and popularity of MOOCs.

MOOCs in Taiwan are providing certificates to learners who had completed the course by the enrolment and completion in the final examination at the test centers across the country. A QR code that directly links to eWant database is provided on the certificate of completion to enable employers to verify the certificate. Furthermore, there will be a list of syllabus taught throughout the course printed on the back of the certificate to provide employers a brief summary regarding the course content.

6.5 Conclusion

MOOCs are a product for educators and instructors to explore and get creative by thinking out of the box, creating new ways for learners to gain knowledge, and making the learning process enjoyable. In order to achieve this, it all begins from the basic element of MOOCs. The planning and production stage of MOOCs are crucial in producing a successful course for the learners with the emphasis on the importance of the video lectures and learning activities. They play important roles in ensuring that learners understood the material and more importantly to sustain their engagement on the topic.

Besides the core items of MOOCs, instructors could get creative on the ways they could run the course, gauging on the learners' interest to encourage them to keep moving forward. Implementing microcourse in MOOCs provides learners with the flexibility and passing them the learning ownership to choose according to their needs. On the other hand, educators and instructors no longer need to work alone as with the vast growth of the Internet and MOOCs, team teaching is always possible.

There are many more other aspects of MOOCs that are not discussed above, including the management of forums and discussion boards of MOOCs, designing assignments and assessment for MOOCs. Further research on effective methods for assignment submission and evaluation could be done. A future research on the evaluation form for instructors and learners before they participate in MOOCs could be considered. This evaluation form plays the role of a checklist that assists instructors and learners to determine whether they are ready and self-equipped for MOOCs. It is believed that currently this is not available and not practiced. With this checklist, instructors and learners will understand what skills, practice, and knowledge they are lacking in order for them to be ready for MOOCs.

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Chapter 7
A Critical Look at MOOCs

J. Michael Spector

7.1 Introduction

According to recent sources (see, for example, http://ecolearning.eu/ectsmooc/) there are 4000 or more MOOCs (Massive Open Online Courses) being offered in 2015. In 2013, the number of MOOCs offered worldwide was about 700, so the increase is substantial (see http://moocs.com/ and http://www.openeducationeuropa.eu/en/node/145506). The research on MOOCs, however, is not extensive, and there is only very limited evidence of significant impact on learning. The following remarks found on the welcome page of the MOOC Research Hub at Athabasca University funded by the Bill and Melinda Gates Foundation (see http://www.moocresearch.com/) is a reasonable point of departure for a critical examination of MOOCs:

> The dramatic increase in online education, particularly Massive Open Online Courses (MOOCs), presents researchers, academics, administrators, learners, and policy makers with a range of questions as to the effectiveness of this format of teaching and learning. To date, the impact of MOOCs has been largely disseminated through press releases and university reports. The peer-reviewed research on MOOCs has been minimal. The proliferation of MOOCs in higher education requires a concerted and urgent research agenda.

Questions that come to mind include the following: (a) What are MOOCs intended to accomplish? (b) Why have MOOCs gained such attention and grown so rapidly in recent years? (c) What is the impact of MOOCs on access to learning resources by underserved populations? (d) What is the impact of MOOCs on learning? (e) Are MOOCs changing the nature of distance learning? (f) Are MOOCs transforming the nature of education? (g) How might MOOCs evolve in

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the next 5 years? Other questions could be raised, but addressing these questions is the focus of this chapter. As with many educational issues, the story is not simple nor are the lessons to be learned entirely clear. A brief examination of the short history of MOOCs along with a review of relevant instructional and learning theories and research will provide a context for subsequent remarks.

7.1.1 Historical Overview of MOOCs

It is widely acknowledged that the first (or at least one of the earliest) MOOC was offered in 2008 in association with a course called "Connectivism and Connective Knowledge" at the University of Manitoba in Canada (Downes 2008; Martindale 2015). The instructional approached used in that course was based on prior work in a number of areas, including (a) *distributed cognition*—the notion that knowledge is socially distributed as well as being socially constructed (Lave and Wenger 1991; Salomon 1993); (b) *social constructivism*—a naturalistic theory of knowledge that posits that knowledge is developed in collaboration with others (Palinscar 1998; Vygotsky 1978); (c) *connectivism*—a model of learning as a process involving interlinked nodes with connections of varying strength depending on prior activation, similar to the neural structure of the brain (Downes 2005; Siemens 2005); (d) *collaborative learning*—an instructional approach to learning that involves having small groups working together on a learning task (Dillenbourg 1999; Rau and Heyl 1990); and (e) *open educational resources* (*OER*)—freely accessible media and information resources available to anyone for use in an educational context, often with an explicit open license and clearly in the public domain (Johnstone 2005). In short, the foundations for the design and development of MOOCs come from epistemology, psychology, social interaction, and instructional design.

7.1.2 Types of MOOCs

Early MOOCs emphasized the idea of connecting people in a virtual environment around a particular subject or topic. As a result, MOOCs that emphasizes connecting people and creating a network of participants are called cMOOCs; a MOOC that emphasizes learning with an expert through short video clips and online resources in a tutorial context is called an xMOOC (Martindale 2015; Spector 2014b). MOOCs have grown rapidly, especially with regard to the xMOOC variety, through providers such as Coursera (https://www.coursera.org/), edX (https://www.edx.org/), and udacity (see https://www.udacity.com/).

While this categorization of MOOCs into two types has some initial appeal, the boundaries between cMOOCs and xMOOCs are becoming less and less clear. On the one hand, xMOOCs are placing increasing emphasis on the exchange of ideas and perspectives among a community of participants, and cMOOCs are becoming less like open-ended doctoral seminars with massive discussion groups as instructional designers help organize resources, networks, and activities. While growth has occurred more in association with xMOOCs, the innovative connectivist activities of early cMOOCs are now influencing the design of xMOOCs.

Moreover, one might argue that it is how a MOOC of either type is integrated into an instructional program or learning sequence that is important. For example, an xMOOC might be used in a formal learning environment as an outside assignment prior to having those registered for the course come to class to discuss the xMOOC assignment or work problems related to the xMOOC assignment, as in a flipped classroom arrangement (Sparks 2011). On the other hand, a cMOOC might be included as a requirement in a university course that requires students to participate in a cMOOC and periodically share ideas and insights gained from that participation in the context of a residential university course.

The point here is to avoid insisting that every MOOC be classified as one of these two types and to recognize that MOOCs are likely to evolve with additional types appearing and boundaries between types becoming increasingly blurred. Another way to think about a MOOC is from an evaluation perspective (Spector 2014a). From such a perspective, one focuses on the problem being addressed and its underlying causes, as these typically establish the goals and objectives as well as suggest a solution approach.

7.1.3 The Purposes of MOOCs

On the surface, one might conclude that the purpose of a MOOC is to make a course accessible to anyone who happens to have an interest in the topic(s) of the course. That purpose is based on the word ‘open’ that is part of the MOOC acronym and the fact course resources are available to anyone online—the second ‘O’ in ‘MOOC’. This multifaceted purpose appears immediately based on the acronym and on a popular understanding of MOOC: make a course available to anyone, located almost anywhere, at any time during the offering period of the course. Many online courses share part of this multifaceted purpose, as they are available anywhere there is Internet access at any time during the offering of the course. The difference, then, has to do with that first ‘O’—the openness of the course to anyone. That degree of openness of course leads to the possibility of massive enrollments (i.e., enrollments in the thousands).

Why allow anyone into a course? The answer to this simple question reveals a hidden complexity that affects how one might evaluate a MOOC. First, let us consider what the previously mentioned providers of MOOCs have to say. According to Coursera, the general purpose is to provide universal access to the world’s the best of higher education (see https://www.coursera.org/about/). The purpose of MOOCs offered by edX is to offer the best of higher education to anyone who wants to achieve, thrive, and grow (see https://www.edx.org/about-us). The Kahn Academy makes this bold statement on its Website: “You can learn anything.

For free. For everyone. Forever" (see https://www.khanacademy.org/). Udacity's mission is to bring accessible, affordable, engaging, and highly effective higher education to the world (see https://github.com/udacity).

These four MOOC hosting organizations all include openness in the general purpose of the MOOCs offered—anyone can sign up for a MOOC. One can devise criteria and measurements to evaluate the degree to which the openness purpose has been satisfied, especially when given more details about the particular groups being targeted. For example, if the openness purpose is targeting those located in remote areas with access to residential institution, then one might want to know how many MOOC participants are from those areas. If the target is those without the funds or prerequisites for a particular, then one might want to know what percentage of MOOC participants are from those who cannot afford a regular course or who lack the required perquisites for a course.

If MOOC advocates argue that the purpose is purely humanitarian, in the sense of providing educational resources to anyone who wants them, then it is still possible to gauge the success of such a MOOC. The analogy in this case might be that of a public library which opens it doors and collections to anyone in the community. Public libraries can be evaluated based on the number, frequency, and type of visitor. Specific collections within a public library can be similarly evaluated. It seems possible to devise similar metrics to evaluate a MOOC that claims as its primary purpose simply opening access to anyone. In fact, such data are published and used as indicators of the success of a MOOC. For example, HarvardX (Harvard MOOCs offered through edX) reported enrolling 400,000 in six HarvardX courses in the 2012–2013 academic year (see http://harvardx.harvard.edu/files/harvardx/files/hx_annual_2012_13.pdf). Stanford University's Artificial Intelligence MOOC attracted 70,000 participants (Mason 2011).

Focusing just on the openness purpose, one might say that many MOOCs have been successful. However, that success might be tempered by the number of participants who stayed involved from the beginning to the end of the MOOC. If so, then a huge percentage of those who signed up failed to stay involved to the end of the MOOC. Moreover, there are not data that indicate that the large number who did sign up were part of a population that the MOOC wanted to target (e.g., those in remote locations, those without course prerequisites, those without the funds to pay regular tuition, etc.).

However, the mission statements mentioned previously strongly suggest that there is a second purpose of many MOOCs—namely to offer the best education available to anyone. There is a quality purpose in addition to the openness purpose. The quality purpose is somewhat ambiguous. It could be interpreted as simply offering the best courses previously developed for residential or registered students to anyone who wishes to have a look. While that interpretation implies a certain degree of immodesty, it might be overlooked since institutions such as Harvard, MIT, and Stanford are offering MOOCs. It is not impossible to imagine that a professor at a regional state institution has developed a more coherent and effective course than one being offered at a leading institution. In fact, it is very likely that this is in the case in some instances.

Let us overlook the braggadocio for the moment and look at a second interpretation of quality and effectiveness. It could be the case that an institution such as Harvard, MIT, or Stanford is claiming that is offering a MOOC is claiming that it will be highly effective for all those who participate. While only those who pay full tuition receive a grade, there are a growing number of MOOCs that offer a certificate of completion at a nominal price that carry the implication that the participant has been provided a quality education and attained some level of understanding or competence. Is such a claim supported by evidence? Apparently not.

To claim that a course has been effective, there should be evidence of assessments that strongly suggest that a high percentage of students achieved the course objectives and attained the targeted level of knowledge and skills. Without formative and summative assessments of MOOC participants that can be shown to demonstrate that those individuals achieved desired outcomes, there is no basis on which to claim that the MOOC was effective in terms of learning outcomes for those participants. A completion certificate for a MOOC participant is equivalent to being given a thank you note for attendance when exiting a movie theater at the end of a movie. Those students at Stanford who registered and paid for the AI course very probably gained a great deal of knowledge and competence; there is no evidence that the small percentage of the 70,000 MOOC participants achieved similar gains in knowledge and competence.

In summary, if MOOCs are simply evaluated on the basis of reaching out to a large number of persons, then they might be judged a success. However, if they are evaluated in terms of achieving learning outcomes, then there is virtually no basis to judge those MOOCs as successful.

7.1.4 The Impact of MOOCs

There are three strands in the concept of openness in a MOOC: no prerequisites, no [or very low] cost, and wide accessibility. The further implication of openness is that the learning resources within the MOOC available under an open licensing agreement, used with permission of the copyright owner, or not copyright protected. The concept of *massive* is a result of openness with enrollments in a MOOC are generally in the thousands. Most of the participants in a MOOC do not pay tuition; those who do pay tuition gain additional benefits not provided to most of the participants (e.g., feedback and assessments). Those who manage to complete a MOOC (often much less than 10 % of those who register) may receive a certificate of completion or something similar, but not tuition credit at the offering institution. Due to the massive number of participants, the online learning environment is primarily asynchronous, which allows participants to engage with course materials whenever they choose to do so within the time constraints of the course.

The impulse to offer MOOCs is consistent with one of the purposes just mentioned—make learning resources available to the widest possible community at little or no cost. Given the numbers of participants reported for various MOOCs, one can conclude that there has been some impact of MOOCs in light of the purpose to make learning resources widely available. However, not all communities or societies share the goal of making learning resources available to everyone. Some societies wish to remain isolated from the developed world and especially from western culture and perspectives. Moreover, some developed countries may wish to retain a relatively uneducated class so as to ensure a low-cost work force or to maintain influence over a certain segment of the population in other ways. Still, it is fair to conclude that the impact of MOOCs in terms of making learning resources available to many has been somewhat successful.

However, the impact of MOOCs on learning has not been established, nor is there likely to be a significant impact on learning until MOOCs evolve into courses that include formative feedback, well-structured learning activities, and serious formative and summative assessments. In a recent article by Spector et al. (2014), a course is conceptualized as a collection of instructional objects within an instructional hierarchy (see Fig. 7.1).

It is perhaps useful to conceptualize courses within a hierarchy of components as depicted in Fig. 7.1 (Spector et al. 2014). With regard to open resources, anything that one can find or put on the Internet counts as an information object. At the bottom of this hierarchy are the basic building blocks of knowledge—information, which can come in a variety of forms ranging from data to media objects. However, not all information objects are reliable. Some are misleading; some misrepresent and distort facts; some are simply erroneous, even when the source is generally regarded as reliable. Consequently, some kind of validation process seems appropriate to confirm that the information represented is accurate and reliable. Having reliable information objects—knowledge objects—is highly desirable in an educational context.

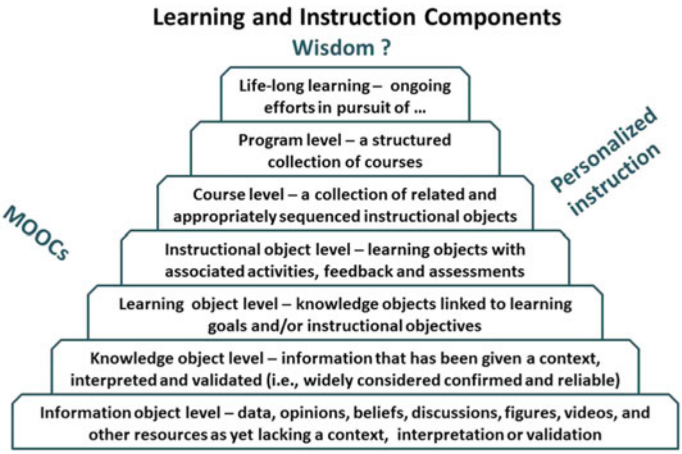


Fig. 7.1 Components hierarchy (Adopted from Spector et al. 2014)

A general goal of education is to help learners develop the knowledge, skills, and attitudes to become effective problem solvers, independent critical thinkers, lifelong learners, and responsible citizens (Dewey 1938; Spector et al. 2014). Experience plays a central and critical role in that development. To promote learning, then, there is a need to match knowledge objects (validated information) with a learning goal or objective and then to design learning activities to help learners gain the required experience. Knowledge objects connected to a learning goal can be considered a learning object, and learning objects that have associated learning activities, including formative feedback and assessments, can be considered instructional objects.

Many MOOCs are clearly collections of learning objects linked to various learning goals. Because many MOOCs have been created by recognized experts, the knowledge objects involved are typically reliable. For example, a MOOC in the subject area of artificial intelligence might contain a unit on the topic of Gödel's incompleteness theorem—the notion that in a formal logical system sufficient to represent the natural numbers there will occur problems or propositions that cannot be resolved or decided within that system (Hofstadter 1979). It is insufficient to have learners simply memorize such a definition, however, formal or informal it might be stated. The knowledge needs to be linked to a learning goal and supported with relevant activities and formative feedback to help learners understand that theorem. Suppose the context is a programming course and the goal concerns avoiding programs that do not terminate. How might that goal be supported with an activity? Borrowing from Hofstadter (1979), one could present learners with a challenge—namely, find a solution to the following problem with or without the assistance of a computer:

Given: An artificial language that contains only three letters—M, I, and U.

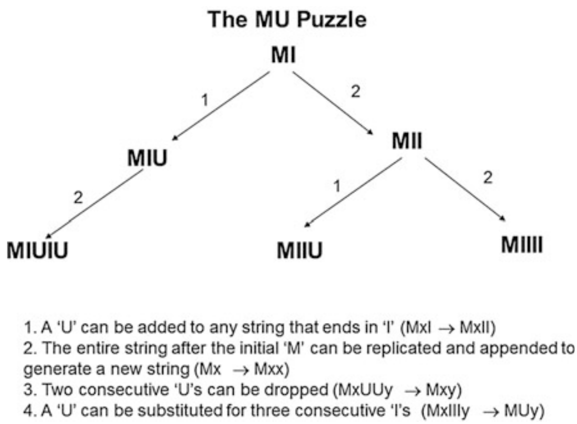
An initial string—namely MI
Four rules for generating new strings in this language:

1. If a string ends in I, a U can be added: MxI →MxIU.
2. The entire string after the initial M can be replicated: Mx → Mxx.
3. Three consecutive Is can be replaced by one U: MxIIIy → MxUy.
4. Two consecutive Us can be dropped altogether: MxUUy—Mxy
   where *x* and *y* are variables representing any sequence of Is and Us including the null sequence.

Derive: MU

One can initiate this learning activity by offering an incentive, such as 100 bonus points for anyone who completes the derivation in the next hour. It helps to provide a visual representation of such a derivation (see Fig. 7.2). It is important not to reveal the underlying problem with regard to this particular problem—namely, that if one created a simple program for a computer including the initial string, the four rules and the task of deriving MU, such a program would never stop. It is commonly called the Turing Halting Problem, and it is a result of Gödel's Incompleteness Theorem. As it happens, trying to solve this puzzle and failing can have significant learning potential.

Fig. 7.2 An initial derivation tree for MU



Creating a collection of learning objects is not as simple as one might think. First, one must be sure that the knowledge objects are reliable. Are the four rules correctly stated? Next, one must have a clear idea of what a learner might be able to do with the knowledge involved—there is a need for a goal. In this case, there are two desired learning outcomes: (a) recognizing that not all clearly stated problems are solvable, and (b) devising a means to have a software program avoid infinite and needlessly repeating loops. As students fail to derive MU, that failure can become a moment of learning, that appropriate formative feedback is provided. Asking students to create other such problems to illustrate incompleteness and the halting problem is consistent with Dewey's (1938) notion of experiential learning and with Downes's (2008) notion of a MOOC experience, as is trying and failing to solve the MU puzzle.

7.1.5 What MOOCs Typically Lack

It is good that many MOOCs are associated with leading experts, as the knowledge presented as the basis for learning is likely to be reliable. However, there are deficiencies in MOOCs that should be noted. One deficiency involves the limited role that instructional designers have played in developing MOOCs. This deficiency is beginning to be addressed by the large providers of MOOCs. Planning and implementing an online course is more challenging than providing a series of lectures (Spector 2012, 2013; Spector et al. 2013, 2014). If MOOCs are conceived of as courses (as are xMOOCd), then instructional designers have relevant experience to offer but are not often included in the design and development of MOOCs (Larson and Lockee 2014; Martindale 2015; Merrill 2013).

A second missing component is that of timely and informative feedback to MOOC participants. While many MOOCs do include learning activities, there is very little timely and informative feedback to participants, other than simple feedback on declarative knowledge items (e.g., multiple choice quizzes that can be automatically graded with prescribed feedback with regard to the correct answer). Formative assessment, when included, is very superficial (e.g., knowing that the incompleteness theorem refers to undecidable problems involving number theory) rather than at a deeper level of applying that knowledge to solve a challenging problem (e.g., recognizing and avoiding infinite loops in program code execution).

A third missing component involves evidence of having attained the intended learning outcomes of the course. Summative assessment for MOOC participants comes in the form of a certificate showing that the participant lasted until the end of the MOOC rather than a grade indicating the level of knowledge and competence attained.

In summary, MOOCs lack some of the components required of instructional objects (learning objects supported with relevant and intentionally designed activities with both formative and summative assessments) (Spector 2013, 2014a, b, 2016). As a consequence, MOOCs should not be considered ordinary courses; some MOOCs (notably cMOOCs) function like large communities of academic interest; others (notably xMOOCs) do not support learners adequately or in a manner similar to support offered in for-credit courses.

7.2 The Future of MOOCs

According to *A Roadmap for Education Technology* (Woolf 2010), one of the most promising areas is personalized learning. Many attempts to create personalized learning have occurred, ranging from programmed instruction to intelligent tutoring systems. Those attempts have yielded some positive outcomes in spite of their many limitations. Programmed instructional texts have been used in some corporate contexts as well as in military training to enable workers to advance in their chosen career paths. Programmed texts typically support declarative knowledge and simple procedures; they have given way to computer-based tutorials that often include a completion certificate to indicate that the learner understands the basic concepts and simple procedures covered in the tutorial. Intelligent tutoring systems worked well in well-defined subject area for which there were single correct solutions to problems, a small number of frequently occurring student errors, and automated ways to measure student progress.

MOOCs can make a significant contribution in the context of a tightly focused short course on a topic that is very well-defined with mostly declarative knowledge (facts and concepts) and simple rules and procedures. For example, MOOCs (similar to xMOOCs but for a particular unit of instruction that might span one to 3 weeks rather than a full semester length course) could be focused on specific mathematical knowledge and ability (similar to the lessons one finds at the Kahn Academy), and offered at no cost to prospective students. The same could be done with regard to reading ability (e.g., reading, interpreting, and paraphrasing short sequences) to help students improve their reading skills. In such cases (many others could be described), shorter and more focused MOOCs could have a measureable impact on learning, especially for those who need remediation in specific areas.

Learning has been characterized as involving stable and persistent changes in what a person or group of people know and are able to do (Merrill 2013; Spector 2016). To claim to have an impact on learning, one must be able to measure or assess progress of learning, in terms of formative feedback (helping learners make progress) as well as in terms of summative assessment (reporting the gains attained as a result of a course). For a MOOC to have an impact on learning, it seems necessary to limit the scope to short sequences of instruction for which meaningful activities can be created and automated feedback provided (Ross et al. 2014). This is what Spector (2014b) called a *Mini-MOOC*—namely, a MOOC that includes instructional objects (learning objects with relevant activities, formative feedback mechanisms, and summative assessment) and is limited in scope to a definable and measureable set of competencies. A Mini-MOOC is consistent with competency badges used in various contexts (e.g., the Boy Scouts of America) and promoted by Baker (2007) and others. Topics that might be suitable for Mini-MOOCs include such things as (a) using the library and the Internet to find reliable and validated resources, (b) developing argumentation and reasoning skills, (c) refreshing mathematical skills, (d) improving language skills, and many more. A Mini-MOOC should have a well-defined and limited scope and be aimed at the development of specific skills that can be tested using automated means available through the Internet. In short, xMOOCs could evolve in the direction of Mini-MOOCs and badges and include both formal and informal. Such Mini-MOOCs could be used in the context of a flipped classroom environment or as stand-along tutorials.

On the other hand, cMOOCs could evolve in the direction of communities of interest (CoIs) that could be used in connection with both formal and informal learning contexts while being open to any and all interested in the topic. All that is needed for that to happen is a reliable server and modest moderation and support. Such an evolutionary path is consist with the OER (Open Education Resources) movement (see https://www.oercommons.org/). A more focused example is the National Diabetes Education Program sponsored by the National Institutes of Health in the USA (see http://ndep.nih.gov/). Those examples are basically open source repositories. An example that allowed for user contributions were the 16 clearing houses formerly sponsored by the US Government as part of the Education Resources Information Center (ERIC; see http://eric.ed.gov/); unfortunately, as government funding became more limited, the clearing houses were eliminated in 2004 and the ability of educators to share and exchange ideas about learning resources was eliminated. Those 16 ERIC clearing houses were consistent with the how cMOOCs can evolve. A current example of such a community of interest is *ShareMyLesson.Com* sponsored by the American Federation of Teachers (see http://www.aft.org/) and TES (see https://www.tes.co.uk/).

It is quite likely that MOOCs will evolve in the directions suggested here as well as in other directions. As that evolution occurs, the initial hyperbole and fanfare that has accompanied the recent growth of MOOCs will fade while actual impact begins to grow.

7.3 Concluding Remarks

While MOOCs now have limitations (e.g., they are more like communities than courses, or they lack critical components required of courses), there is recognizable interest in MOOCs. That interest is in part due to the large numbers of people now participating in MOOCs. It is also due in part to the perhaps inappropriate interest of some institutions of higher education to be included along with Harvard, MIT, and Stanford as offering a new form of instruction. While the latter interest may not be reasonable or legitimate, the interests of the many thousands of persons signing up for MOOCs should be taken seriously. There are indeed many people who wish to have access to education resources who now do not have easy or affordable access. That is an interest worth supporting.

To address the deficiency noted with regard to not providing timely and informative feedback, MOOCs could benefit from learning analytics and move into the world of personalized learning, as suggested in Fig. 7.1. To fully realize the potential of personalized learning in the digital era (Woolf 2010), it is necessary overcome several challenging problems. Some challenges pertain to the use of large sets of data and involve: (a) the rights of learners; (b) the responsibilities of those who mine large datasets and provide results to others; and (c) the implementation of recommendation engines that take into account dynamic student profiles as well as prior learner performance with regard to various instructional objects (Graf and Kinshuk 2009; Kinshuk and Lin 2004).

The rights and responsibilities challenges involve policy development at the institutional, state and national level, although such policies are rarely aligned with practice. The recommendation engine for personalized instruction is more complex than recommendation engines constructed to support online shopping enterprises. While there is some similarity in using individual profiles and histories, the varieties of learning experiences are many and varied. The complexities of learning generally exceed those involved in finding a shirt or book based on past Internet purchases.

Like many innovations in educational technology, there is a period of fascination and a great deal of public interest in the possibilities being promoted along with a new technology. Researchers and developers often share that enthusiasm, and promise dramatic improvements in learning and instruction if the new technology is adopted. Advocacy all too often takes the place of evidence and a graceful path to technology integration. All too often, a new technology is used to simply replace an existing mode of instruction or technology. Teachers are not properly trained and prepared; new systems are not properly supported and maintained; impact data are not systematically collected and analyzed. The resulting impact of a new technology hardly ever lives up the unreasonable expectations advocated when the technology was first introduced.

This has happened with MOOCs. Too many MOOCs are used in a replacement mode. Audio–video media clips (usually involving a recording of a famous scholar) and presentation slides are placed on the Internet to simulate the face-to-face experience of being in a famous person’s class. It is not the reputation or the fame of the instructor that is likely to have a significant impact on learning. Rather, it is the experience gained in working on challenging problems along with timely, informative and supportive formative feedback. That support can come from automated systems if they are properly scoped and structured. This has yet to happen with MOOCs, but as MOOCs evolve there is likely to be less hyperbole and more research on the learning that occurs in various MOOCs.

Acknowledgments This paper is a follow-on to one published in *Educational Technology Resesearch & Development* (Spector 2014b). While the basic substance is similar, there is more emphasis here on how and why MOOCs should evolve to include components found in the for-credit courses offered at the same institution or, as an alternative, simply become large communities of interest.

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Chapter 8
How to Evaluate the Sharing Effects of Open Educational Resource Projects: An Openness Maturity Analysis Framework

Ronghuai Huang, Yongbin Hu and Xiaolin Liu

8.1 Introduction

For a long time, the unbalance of social development leads to a big gap between schools of different regions in educational investment, educational quality, teacher's ability, and educational resources (Zhai 2007). Around the world, especially in the developing countries, the unbalance of education is a common phenomenon (Thomas et al. 2001). Majority of the world governments have issued their education development plans to deal with this predicament.

Educational resource is a type of human social resources, and it is one of the important elements in the education system. Gu (1990) has pointed out that educational resource (ER) is the resource in educational system which helps to achieve educational objectives. Fan (2003) noted that educational resources include teacher resources, course resources, and school environment resources.

In the recent decades, the advent of information and communication technology (ICT) drives research to strive for integrating ICT into school education. Open educational resources (OERs), also known as digital educational resources, receive

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widespread attention in the academic community. OERs are easy to copy, transfer, and use in different regions, cities, and schools. For this reason, the application of OERs is highly valued by teachers, policymakers, and stakeholders. Many countries or regions issued their education development plan to narrow their educational gap. Undoubtedly, almost all the countries regard OERs as the most important part in their plans.

For example, the Chinese government released *National medium and long term education reform and development program* (*2010–2020*) in 2010. This program mentions that an open and flexible educational resources platform is built to promote the sharing of quality OERs (Ministry of Education of P.R.C. 2010). The U.S. Department of Education released *National Education Technology Plan: Transforming American Education Powered by Technology* in 2010 (U.S. Department of Education 2010). This plan mentions that the development and use of open OERs is an effective way to promote innovative and creative opportunities for all learners. Other countries, such as Poland (Kamil Śliwowski 2013), Dutch (Van Acker et al. 2013) also released national educational resource projects or initiatives to develop OERs.

From the literature review we can see clearly that, OERs have received extensive attention and majority of world countries or regions have issued their OERs plans. By further review, we can find that the efficiency and effectiveness of OERs project in practice are very low (Clements et al. 2014; Dongming et al. 2013). For the root cause of the problem, there is no consensus in academia community. Cechinel et al. (2011), Tate and Hoshek (2009) believed that the quality of OERs is the most important factor, but (Clements et al. 2014) argued that the lake of open assurance system is the root reason. There has been a number of studies that view OERs as a system, covering structure, driving forces of OERs system (Dongming et al. 2013; Zhang 2011). It is generally believed that OERs are related to several factors, such as supplier, user, using mode, transmission mode, etc. However, few researches have been done on the effects of OERs projects.

In this chapter, a framework of openness maturity of OERs projects is introduced. The chapter is organized as follows. The next section outlines the development of OERs. The third section presents the driving force and its transmission mode of OERs. The fourth section analyzes the opening characteristics of OERs. The fifth section presents the framework of OER projects. The sixth section concludes this chapter.

8.2 Open Educational Resources Projects Worldwide

Open courseware movement is the most important event in the field of educational resources. This section outlines the definition, development, and typical projects of OERs.

8.2.1 The Development of Open Educational Resources

It is generally recognized that OERs are derived from Massachusetts Institute of Technology (MIT) open courseware (OCW) movement. In October 2002, MIT, one of the most prestigious universities in the world, launched the MIT OCW Initiative, effectively starting to tear down the walls that kept the masses from accessing the quality educational resources available only to a small group before (Lane 2013). Since then, the open initiative reached far beyond MIT and OCW movement, with over 200 institutions having joined to form the OCW Consortium.

In 2002, OERs were firstly coined at UNESCO's 2002 Forum on OCW and designates, which are defined as "teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others" (Johnstone 2005). The Organization for Economic Co-operation and Development (OECD) defines OERs as: "digitized materials offered freely and openly for educators, students, and self-learners to use and reuse for teaching, learning, and research. OERs includes learning content, software tools to develop, use, and distribute content, and implementation resources such as open licenses" (Hylén and Schuller 2007).

In 2007, with support of 1200 universities and colleges, and 1200 K-12 schools, Apple Inc. launched iTunes U programme with the purpose of providing digital learning resources for worldwide teachers and students. This programme covers literature, science, health and medicine, education, business, and other subjects. In 2012, with Coursera, Udacity, and edX springing up, the emergence of Massive Open Online Courses (MOOCs) attracts the attention on open education (Saadatmand and Kumpulainen 2014). As a new type of online resources, MOOCs not only provide course material, such as lecture videos, reading materials, exercises, but also provide individualized learning service with big data and deep teacher–student interaction (Scholz 2013). In 2013, Peking University and Tsinghua University launched their own MOOCs programme, which means that OERs have marked a new stage in China.

8.2.2 Typical Open Educational Resources Projects in the World

From a global perspective, the governments around the world have been generally aware of the value of OERs, and a number of OER projects have been launched in response to the national digital education policies, among which are some well-known and influential ones. *Survey on Government Open Education Resources Policies*, a report which was published by Commonwealth of Learning (COL) and UNESCO, shows that (1) 57 % countries believed that OER could be open and have flexible learning opportunities; (2) 41 % countries have issued OER policy; (3) an estimated 37 % of those digital materials in the public domain are available as OER across the regions (Hoosen 2012).

In fact, there are three types of OER sharing mode so far. The first mode is called government-led mode which is a mode that government plays a key role in investing, managing, and operation. The typical project is AER project in American, eduSource project in Canada, EDNA project in Australia, NPTEL project in India, etc. The second mode is called institution-led mode which is a mode that academic organizations or non-profit organizations play a leading role. Typical project is OCW project in MIT, eThemes in University of Missouri Columbia, etc. The third model is called profit-organization-led mode which is a mode that commercial companies launch their projects to produce quality educational resources. The typical project is pre-school education project of K12 Inc., iTunes U of Apple Inc., teaching training project of Person Inc.

8.3 Driving Mode of Resources Construction and Promotion Approaches of Open Educational Resources Transmission

OERs are developed as course descriptions, syllabuses, teaching plans, key and difficulties guidance, assignment, reference materials, and instructional videos. Besides, it also exists as learning materials, case databases, demo/virtual/simulation training systems, assignments, and online self-test and examination systems. Different shapes of OERs can be used not only in classroom teaching but also in teacher training, teaching research, and others (McGreal et al. 2012). However, the shapes and scenarios of utilization of OERs are slightly different in different fields, such as K-12 education, vocational education, higher education, and adult education.

In general, the sharing of OERs involves two sides, one is supplier, and the other is user. Similarly, the sharing process includes two successive processes, one is resource development, and the other is resource transmission. In order to meet the need of teachers and students, it is essential to preset application scenarios, such as classroom teaching, after-class learning, class preparing, shadow education, etc., and then confirm the sharps of OERs. In practice, there are not enough OERs to support the considerable application scenarios. It is urgent to develop more OERs with definite scenarios for daily teaching. Therefore, for resource development, the driving force is derived from the interaction of the shapes and application scenarios of OERs.

For OERs transmission, it includes promotion approaches of the supplier and access approaches of the user. In order to expand the influence and market efficiency of products, suppliers develop and promote their OERs with various approaches. Meanwhile, the users enrich their access approaches to gain more quality and appropriate OERs to meet the educational teaching.

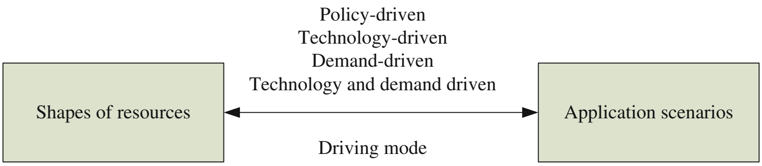

Fig. 8.1 Driving mode of resource development

8.3.1 Driving Mode of OERs Development

The term "driving force" comes from the discipline of system dynamics. The original meaning of "driving force" refers to the power of driving system progress and development. This term is widely used in the fields of social science these days, which is frequently used for the analysis of behaviors in the system. Driving mode is description of the relationship between shapes of resources and application scenarios, which is summarized as policy-driven mode, technology-driven mode, demand-driven mode, and technology and demand-driven mode, as is shown in Fig. 8.1.

Policy-driven mode is a mode which is driven by educational policy issued by national or provincial education departments, such as National Elite Courses Project and Quality Resources Sharing Project in China. Technology-driven mode is a mode which means new technology plays a key role in resources development, such as big data or augmented reality. In general, every technology disruptive innovation will lead to changes in resource development. Demand-driven is a mode driven by teaching demand of teachers and learning needs of students. Technology and demand-driven mode means that resources sharing is driven by the interaction of new technology and teaching demand. Currently, technology and demand-driven mode is a rather ideal driving mode in this respect.

8.3.2 Promotion Approaches of OERs Transmission

Generally, marketing is an important part in commercial activities. However, marketing is rarely used in education, especially in developing countries. In the Internet age, information exchange and collaboration between people is getting more and more attention, which makes the value creation activities and market leading power by the enterprise to the consumer shift (Haotian and Jingyu 2013). For example, the emergence of Apple's application store has changed the traditional software sales model. Another example, Chinese Xiaomi company's "hunger marketing" changes the mode of mobile phone sales. In regards with OERs, the promotion approaches of OERs Transmission refer to the transmission of resources from suppliers to users. To sum up, this approach includes passive promotion, mass

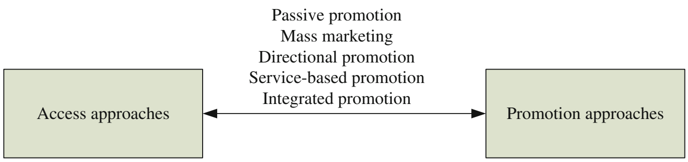

Fig. 8.2 Promotion approaches of OERs transmission

marketing, directional promotion, service-based promotion, and integrated promotion, as is shown in Fig. 8.2.

Passive promotion means there is no deliberate promotion and marketing in OERs transmission. Mass marketing is a kind of resources promotion which is targeted to all potential users with the purpose of gaining large number of users. Directional promotion is a kind of resources promotion which is targeted to specific users in specific industries, professionals, and fields. Service-based promotion refers to providing specified resources and service to specific users. Integrated promotion is a complicated promotion, which means providing various resources and services with various ways.

8.4 Openness Characteristic of Open Educational Resources

As one kind of digital resources, OERs are easy to be produced, copied, and transmitted, which means openness is the fundamental characteristics of OERs. Hodgkinson-Williams and Gray (2009) have proposed the Measuring of Openness of OER, including social openness, technical openness, permit openness, and fund openness. Measuring of Openness of OER is raised from the constitution element of OER projects. In terms of the characteristics of resources and the relationship between users, it can be summarized into four indicators including usability, reachability, scalability, and stickiness. The relationship is shown in Fig. 8.3.

8.4.1 Usability

"Usability," originally appeared in the field of human–computer interaction, is now widely used in software design, website design, and product design. ISOP241-11 defines usability as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (Wikipedia 2014). While Nielsen Norman Group (2014) believed that, usability should include learnability, interactive efficiency, memorability, error frequency and seriousness, and customer satisfaction (Nielsen Norman Group 2014).

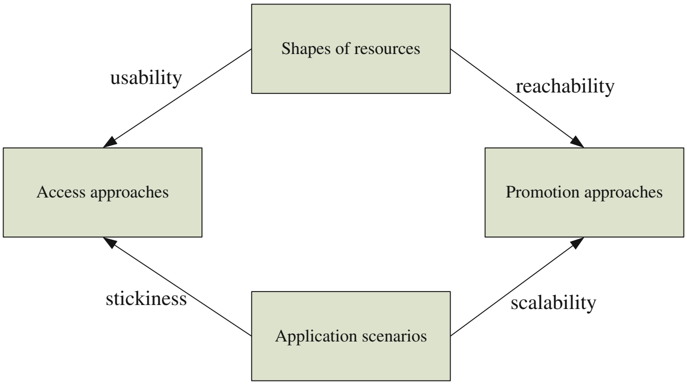

Fig. 8.3 Four indicators used to analyze the openness maturity of OERs

In OERs sharing field, usability, used for the relationship between shapes of resources and access approaches, refers to the ease of use and learning of educational resources.

8.4.2 *Reachability*

Reachability, originated from graph theory of mathematics and computer science, is widely used in the field of urban traffic planning, describing the relative close and separate of a certain scene and its surrounding other scenes to reflect the complexity of this scene to meet the requirements of some activities for people (Bhat et al. 2002). Walter Hansen defined reachability in his article named *How Accessibility Shapes Land Use* as describing a certain scene with potential of opportunities for interaction (Hansen 1959). In OERs sharing field, reachability, used for representing the relationship between shapes of resources and promotion approaches, refers to the complexity of educational resources for users. If the reachability of resources is better, more users can acquire resources from suppliers smoothly.

8.4.3 *Scalability*

Scalability, widely used in social life, generally refers to relatively large and more extensions. In public services, scalability refers to the extensive range of users for public services and each citizen may have the right to government service (Ping and Qinghua 2013). For library and information, the extensive of commonly referred library beneficiary is that learners are free from the limitation of classroom, school, and region, each and every trainee can become as being educated without limitation. In the field of OERs sharing, scalability, used for representing the relationship between application scenarios and promotion approaches, indicates that educational resources can be adapted to the ability of increasing learning demands.

8.4.4 Stickiness

Stickiness, first appeared in the field of products and e-commerce, generally refers to the dependent frequency of users on both sides. Stickiness is an important index for user's loyalty, which is related to user experience. Some marketing personnel with successful experience know how to cultivate the stickiness of users for products. As for website design, stickiness in a broad sense refers to the dependency, loyalty, and usage of users for website. The simple interpretation of stickiness is how to make new customers become regular customers. In the field of OERs sharing, stickiness, used for the relationship between way of access and application scenarios, refers to the appealing and attraction of OERs and learning services can keep stable, lasting and close relationship with users. This relationship is to enable users to use these resources and services continuously rather than resources and services of other competitors.

8.5 Framework for Analyzing the Openness Maturity of Open Educational Resources

The openness characteristic of OERs is closely related to the shapes of resources, promotion approaches, application scenarios, and access approaches. Usability is representative of the relationship between shapes of resources and access approaches; reachability is representative of the relationship between shapes of resources and promotion approaches, Scalability is representative of the relationship between application scenarios and promotion approaches; stickiness is representative of the relationship between access approaches and application scenarios. Thus, the framework for analyzing the openness maturity of OERs is formed, as is shown in Fig. 8.4.

8.5.1 Shapes of Resources

Shapes of resources refer to OERs files forms. Due to the complexity of OERs, this can be defined from four aspects including media type, packaging mode, content granularity, and knowledge structure.

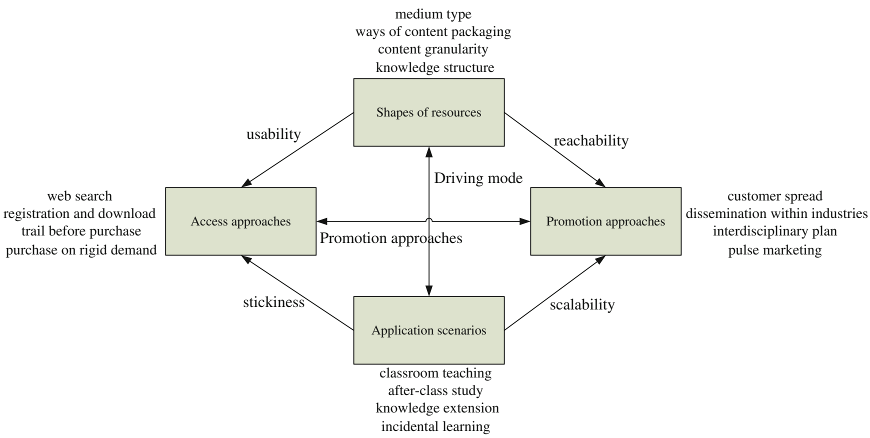

Fig. 8.4 Framework for analyzing the openness maturity of OERs

Medium type refers to the file types of educational resources, including video, text, audio, teaching tool/software, web teaching courseware, presentation-type courseware, and mixed courseware. Packaging mode is a kind of procedure, which makes a package of learning contents and data into one file, content granularity refers to the relative size and roughness of information unit in learning contents, which is the basic unit of resources contents, including course, modular/chapter/unit and knowledge point. Knowledge structure means the basic framework for the sequence and organization of knowledge, generally including complete and clear, partial/fragment, fragment and clear, and various types.

8.5.2 *Application Scenarios*

Application scenarios indicate the possible scenarios of OERs in practice, which can be summarized as classroom teaching, after-class study, knowledge extension, and incidental learning.

Classroom teaching refers to OERs that are used to support classroom teaching and learning. After-class study means OER is used for teaching preparation, teaching research, and professional development or the application scenarios for learners to strengthen their learned knowledge or in-depth study. Knowledge extension indicates a kind of application scenarios that learners who support educational resources explore educational resources centering on a certain specific topic or theme to expand the knowledge and deepen their understanding. Incidental learning refers to a kind of scenario for educational resources in irregular or recurring learning.

8.5.3 Access Approaches

Access approach refers to the ways of users to gain resources from suppliers, which can be summarized into four different ways, including web search, registration, and downloading, trail before purchase, purchase on rigid demand.

Web search is a way to acquire relevant resources from public platforms, such search engine and free database. Registration and download refers to registering and login on the designated website or platform, and then acquiring the limited educational resources. Trail before purchase indicates that users make a trial within a certain extent of competence prior to whether purchase the educational resources or not, and then determine whether to purchase or not. Purchase on rigid demand refers users to purchase the resources based on their own needs.

8.5.4 Promotion Approaches

Promotion approaches are the ways that OERs transfer from supplier to users, which can be summarized into many ways, including customer spread, dissemination within industries, interdisciplinary plan, pulse marketing, etc.

Customer spread refers to the transmission of resources by users themselves. Dissemination within industries means the transmission of resources within industries and professions. Interdisciplinary plan indicates the transmission of resources in different fields. Pulse marketing refers to OERs Transmission through promotion and marketing.

8.6 Conclusions

It is generally believed that balancing education and promoting educational equity is essential to every country. To this end, a great number of OER projects have been carried out around the world. This chapter presents maturity of OERs framework, which is beneficial for the researcher and policymaker to analyze the effects of these projects. However, this framework is concluded by practical experience and theoretical deduction, its rationality and reliability have not been verified yet. Future work of this research will verify the validity of the framework by international and domestic cases, which will help to explore the predicaments in OER projects implementation and give strategies to enhance its efficiency.

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Chapter 9
Intercreativity and Interculturality in the Virtual Learning Environments of the ECO MOOC Project

Sara Osuna-Acedo, Divina Frau-Meigs, Lucía Camarero-Cano, Adeline Bossu, Raquel Pedrosa and Darco Jansen

9.1 Introduction: ECO Project—The CIP Dimension

Learning today is a high-priority commodity, as it is the driving force that enables the advancement of individuals and society and the development of the economy, politics and culture. Access to good education guarantees citizens a better quality of life and the ability to engage more productively in all areas of knowledge.

The launch of the Web 2.0 has highlighted the need to invest in education technology. Now, thanks to Information and Communication Technologies (ICTs) and Open Educational Resources (OERs), the teaching–learning process can be made available to all individuals at very low cost. This has led to the emergence of a new type of large-scale learning known as massive open online courses, or MOOCs, which are poised to revolutionize the current education system. MOOCs based on OERs are set to become the main means of delivering a successful open education that breaks down barriers and opens up the possibility of education for

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the whole of society. However, MOOCs in the higher education system today still form part of informal education, and greater efforts are required in this area.

ECO Project was born as a consortium of 23 partners from different European Countries. ECO is a project integrated in the "Competitiveness and Innovation Framework Programme" (CIP), Theme 2: "Digital content, open data and creativity", Obj. 2.3.a: "Piloting and showcasing excellence in ICT for learning for all". In 2014, ECO Project was formally approved by the European Commission under CJP—call CIP-ICT-PSP-2013-7, project id: 621127. The goal was to take a step forward and to design virtual learning environments through MOOCs.

The Project aims to enable all Internet users interested in online or educational entities to proceed with their continuing training using state-of-the-art technologies and, subsequently, to be able to incorporate them to their teaching methods. Since the birth of MOOCs in 2008, two main pedagogical approaches were mainly used: cMOOCs, with a connectivist approach (Siemens 2005), and xMOOCs, which applies the traditional teaching model based on behaviourism.

Specifically, the ECO project proposes a new model, sMOOCs (social MOOCs), to foster participation in order to attain the necessary digital skills demanded by today's society. Students as participants are the protagonists of their own learning, building their knowledge through collaboration on virtual platforms and in different social networks, and from the exchange of information and feedback from all the other participants.

To attain digital skills and multiliteracies, qualified teachers are needed and one of the main objectives of the ECO project, which is in charge of implementing this new mode of sMOOCs, includes training e-teachers. A report coordinated by Sainz (2015) and published by the Telefónica Foundation in 2015 warns that "the lack of digital competence of many teachers is a significant barrier to the adoption of these new educational tools, which require a considerable adaptation effort" (p. 78).

As explained in the ECO_D4.3 (2015):

> ECO sMOOCs are "social", since they provide a learning experience marked by social interactions and participation, and "seamless", since ideally they should be accessible from different platforms and through mobile devices and integrate with participants' real life experiences through contextualisation of content via mobile apps and gamifications. (Fueyo et al. p. 8)

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Two of the key concepts driving sMOOCs are intercreativity and interculturality. Intercreativity refers to the collaborative creation of new elements, making use of digital tools. Interculturality denotes the relationship and exchange of information between people from different cultures. All this takes place within technosocial communities that is, through either analogue or digital social networks, viewed as an indissoluble whole. As explained by Camarero-Cano (2015):

> One way or another, we live in a society in which analogue and digital social networks are interconnected, forming traditional (analogue) and virtual (digital) communities whose indissoluble convergence is what we call technosocial communities (p. 188).

To create the conditions for intercreativity and interculturality, the cornerstone of the sMOOCs organized by the ECO project, which extends learning over time and space, is a pedagogical design based on constructivist and connectivist theories. The development of an intercreative and intercultural teaching–learning environment is instrumental in the creation of a "common brain" that is, of a collective intelligence in constant coordination, capable of uniting individualities, working towards the common good and enabling advancement at both the personal and social levels. Considering the technosocial and socio-cognitive dimensions in sMOOCs requires the integration of various frameworks that take into account the interplay between external context-specific dimensions and internal content-specific dimensions.

9.2 European Policies as Enablers of sMOOCs

MOOCs can be positioned within the broader development of open education, as an extension of OER Movement. The potential of open education was strongly marked by the Cape Town Open Education Declaration (Shuttleworth/OSF 2008). However, although the concept of open education is often mentioned, it is not usually combined with a clear and solid description of what the term means. What "open" means in open education has been the subject of some debate[1] and is increasingly becoming associated with "free". However, open education is primarily a goal associated with removing barriers to education (Bates 2015). The aim is to increase access to and successful participation in education by eliminating all sorts of obstacles and offering multiple ways of learning and sharing knowledge, and to improve accessibility to formal and non-formal education. In this context, MOOCs form part of open education and should be defined as such.[2] Recently, Jansen and Schuwer validated this relation between MOOCs and open education.

In general, Open Educational Practices (OEPs) are related to the removal of all kinds of obstacles in education. For example, successful participation in higher

[1] http://booktype.okfn.org/open-education-handbook-2014/what-is-open-education/.

[2] http://www.openuped.eu/images/docs/Definition_Massive_Open_Online_Courses.pdf.

education can be increased by removing economic barriers. MOOCs contribute both by reducing costs for participants and by providing education for the masses, but they also remove barriers related to entry requirements, location, scheduling, network connectivity, digital literacy, accessibility over time, language, age, culture, legal issues and quality. They focus on learner satisfaction, completion and recognition (Mulder and Jansen 2015).

In addition, on the macro level, OEPs are related to governmental policies that stimulate access to and success in education or society as a whole. Examples include open access policies for publicly funded research or open licensing policies for the outputs produced by subsidized education so that they benefit everyone in society and not only educators.

The European Commission's initiative, "Opening up Education", supports such public policy-making. It was launched in September 2013 as a European move towards innovative learning and teaching through ICTs aimed at modernizing education for the full spectrum of learners in all educational sectors using OERs and MOOCs. ECO, funded by the Competitiveness and Innovation Framework Programme (CIP), can be seen as part of this larger process of democratization of knowledge via the democratization of learning–teaching processes and strategies.

Online and open education has great potential to improve the quality of education by promoting innovation in teaching and learning processes and increasing flexibility and accessibility for students. Openness is an important driver for various social dimensions, but also for promoting the development of skills, enhancing knowledge transfer and increasing the pace of innovation. ICTs enable openness and in addition provide the efficiency and scalability needed in open education.

However, it must be recognized that different barriers exist in each continent, country and region and the incentives required will also vary. This is due not only to language differences, but especially to national and cultural characteristics. Open and online education can overcome these obstacles and provide access to and successful participation in higher education. The main challenge is to provide solutions that scale (both pedagogically and economically) and respect cultural differences and the need for personalized interaction in education. Specifically, interculturality must be combined with intercreativity within the massive dimension of MOOCs to help overcome some of the cultural obstacles that arise in the online exchanges among all types of participants.

9.3 Educational Virtual Environments Facilitating Intercreativity and Interculturality: Characteristics of the Eco sMOOCs

ECO project has a landing page http://project.ecolearning.eu/ where all topics related to the project are presented: the main goals, partners, news, the conferences and meetings ECO is involved in, and related documentation. The pedagogical and communicative approaches of the project lay the emphasis on creating educational participation scenarios in which intercreativity and interculturality are the common threads for learning.

ECO also has another page for enrolling in ECO sMOOCs https://ecolearning.eu/. For each sMOOC, there is a vignette for visual identification, the course dates (specifying if the course is open, closed or always open), and who is promoting it (university or institution).

To enrol, users must register with the ECO community so as to be considered as participants in the ECO project. Once participants have enrolled, the system opens all the courses so that they can be explored and created with the contribution of each user. The course landing page provides a video presentation and information on: duration, estimated effort, languages, certified credits, evaluation criteria, learning goals, recommended requirements, audience, organizers and teachers.

After joining a course, participants can access four windows that facilitate access to content and foster communication: syllabus (information on course content), tasks (activities proposed by the team), newsfeed (comments by other participants) and notifications (information on facilitation issues).

Participants also have access on this page to the course forum, where the facilitation team posts all the messages to promote sharing and the construction of new knowledge. In this forum, users can vote on each post with a "like" or "dislike" and all participants can add comments.

Participants also have a progress window where they can see the total tasks proposed and the number of tasks they have completed. A progress bar shows what percentage of the course has been completed. If they click on the "*i*" icon, participants can see their course mark and what modules have been completed and corrected.

Since the ECO sMOOCs are essentially social, participants have their own pages, with internal features, on the ECO website where they can share:

- Personal information (age, location, description, interests, Facebook, LinkedIn and GooglePlus profiles)
- Posts, to develop their ideas
- Courses, to show the list of courses they are enrolled in
- Badges, to display their list of badges received in all courses.

Administrators have their own section where they can manage the courses, the participants, the contents, the badges and the learning process statistics. The administrators can work in teams to edit content, to monitor data and to communicate with participants while fostering peer-to-peer evaluation. They do so in a manner that is not intrusive and that is characteristic of ECO's technical functionalities, developed in accordance with the connectivist–constructivist pedagogical design with the engineering team.

The course editing functionalities enable teachers to provide information (general information, additional information, course appearance, credits and diploma), to interact with one another in the back office part of the sMOOC, to organize the sessions in modular units (videos, podcasts, presentations, docs, articles and others), to interact with groups of participants and to manage the attribution of badges.

Additionally, the administrators have access to data and learning analytics. They can follow statistics (general course statistics, general student/participant statistics); they can monitor participant progress and they can see the evolution of the participants' and teachers' lists. As for communication, they can create and manage announcements for participants (these announcements will appear in the notification window of the sMOOC), they can also send email messages to the participants and organize all sorts of live events so as to foster engagement within the ECO community.

This basic structure of the ECO environment provides a whole repertoire of e-strategies (navigation, mixing, pooling, gamification, etc.). The ECO platform also offers microblogging tools, file sharing tools and videoconferencing tools. It is filled in with all the information uploaded by the teaching team, the facilitators and the participants. Together, they form part of the ECO community, where each participant turns into a communicative node able to propose a transmedia narrative leading to the collaborative construction of knowledge.

9.4 sMOOCs and Intercreativity

ECO sMOOCs are an example of a teaching–learning process that promotes intercreativity and interculturality. Two of their most important characteristics are accessibility and ubiquity since these courses enable access for people with special needs or at risk of exclusion, and training can be delivered anywhere, anytime and through any device. These ECO features and affordances are coherent with the UNESCO policy guidelines for mobile learning (2013):

> Because people carry mobile devices with them most of the time, learning can happen at times and in places that were not previously conducive to education. Mobile learning applications commonly allow people to select between lessons that require only a few minutes to complete and lessons that demand sustained concentration over a period of hours. This flexibility allows people to study during a long break or while taking a short bus ride. (p. 14)

Such flexibility and ubiquity are not without challenges for the learner as he/she can feel isolated or at a distance. Therefore, implementing sMOOCs requires specific conditions that foster a participatory culture, buttressed on media convergence (Jenkins 2008). Henry Jenkins has speculated that "rather than talking about media producers and consumers as occupying separate roles, we might now see them as participants who interact with each other according to a new set of rules" (2008, p. 15).

In turn, Aparici and Osuna-Acedo (2013) lay the emphasis on connection beyond connectivity:

> The participatory culture is that which has no barriers for citizen expression, which supports creativity and sharing individual and collective creations. Individuals believe in the importance of their own work and feel a connection between what others say and their own contributions. (p. 138)

These external context-specific affordances provide new opportunities that can be harnessed to lead to the development of internal intercreative teaching–learning in sMOOCs.

9.4.1 Intercreativity: Definition and Features

The term intercreativity was coined by Berners-Lee in (1997) to refer to the capability people have of creating original and productive elements collaboratively, in a virtual environment and based on digital tools. The author explained it by saying: “I want the Web to be much more creative than it is at the moment. I have even had to coin a new word—intercreativity—which means building things together on the Web” (1997, Interactive Creativity section, paragraph 1).

The concept of intercreativity was created by joining the terms ‘interactivity’ and ‘creativity’. Interactivity implies that there is interaction between people–machines–people. As described by Osuna-Acedo and Busón (2007), the ideal is to achieve the highest possible level of interactivity, in which citizens are active users and take the initiative. In turn, Martínez and Cabezuelo (2010) pointed out that the function of interactivity is to incentivise collaboration and sharing of information quickly, seamlessly and conveniently among all participants.

Intercreativity, therefore, means that all people can be “webactors” (Pisani and Piotet 2009): they actively create content and solve problems collaboratively, improving the existing situation. Berners-Lee (2000) said that:

> We ought to be able not only to find any kind of document on the Web, but also to create any kind of document, easily. We should be able not only to interact with other people, but to create with other people. Intercreativity is the process of making things or solving problems together. (p. 156)

Mostmans et al. (2012) hold that intercreativity “emphasises the possibilities of creating together and being creative together” (p. 105). According to Meikle (2002), intercreativity entails creating new contents collaboratively, as well as using digital technologies with autonomy and freedom. Camarero-Cano (2014) explains that:

> The idea delves into the creation process, that is, from the moment an idea is born, throughout its development and until it ends. In short, it is a social process of creative exchange and a pathway to build knowledge together. (p. 2)

Hence, the culture of participation and media convergence, the architecture of participation (O’Reilly 2004) and co-creation–co-authorship are essential to making the development of intercreativity possible.

Jenkins (2009) proposed the following characteristics of participatory culture:

1. Relatively low barriers to artistic expression and civic engagement,
2. Strong support for creating and sharing creations with others,
3. Some type of informal mentorship whereby what is known by the most experienced is passed along to novices,
4. Members who believe that their contributions matter, and
5. Members who feel some degree of social connection with one another (at the least, they care what other people think about what they have created). (pp. 5–6).

O'Reilly (2004) explained that the nature of systems is designed for user contribution, and insisted on the idea that the more the people form part of a network, the better the product created. This confirms the importance of co-creation to drive intercreativity, as it refers to nonlinear and active creation by all participants, which implies that all members who are a part of the creation process are, at the same time, its co-authors.

Another of the essential characteristics is transmedia connectivity, that is, a communication process which uses various intertwined communication channels. This concept is derived from transmedia storytelling (Jenkins 2008), which defines narrative coordination through various virtual platforms. A striking element of this communication process is the "feed-feed model" (Aparici and Silva 2012):

> Rather than a process for reinforcing messages, it should be understood as an act of construction and connection between all interactors where there are no divisions of any kind; they all have the same status and rank, regardless of the type of declaration made. (p. 3)

The ECO technical and social functionalities allow for transmedia and convergence: videos and other analogue solutions are mingled with digital social networks on the same platform and within the same course. They also facilitate participatory culture with low barriers of entry, easy registration, formal and informal mentorship, the possibility to communicate within heterogeneous groups, not necessarily under the oversight of the administrator team. Additionally, participants have the possibility to feedback and to feed-feed as well as to evaluate their work amongst peers.

9.4.2 Intercreative Approaches in sMOOCs and Collective Intelligence

The development of an intercreative teaching–learning environment in sMOOCs makes it possible to create a common brain, leveraging the rise of collective intelligence (Lévy 1994), smart mobs (Rheingold 2002) and the wisdom of crowds (Surowiecki 2004). As asserted by Lévy (1994), collective intelligence:

> …is a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills. […] the basis and goal of collective intelligence is mutual recognition and enrichment of individuals rather than the cult of fetishized or hypostatized communities. (p. 19)

There are different areas in which collective intelligence can be applied. Marco (2010) suggests nine domains that take into account technical and social engineering.

- Decision Support: the more there are people involved in decision-making, the more the ideas and solutions will emerge. It will be possible to verify the information from different perspectives, so that it will be easier to detect and prevent errors.
- Open Innovation: knowledge, opinions and experts' field experience are integrated with input provided by potential users. Thus, feedback will efficiently improve the products received.
- Crowdsourcing: the work gets outsourced, being the citizens the ones who take charge of finding solutions collaboratively.
- Social Collaboration: social software facilitates collaborative work, such as using tags to categorize data. This makes information search-and-find faster and more efficient.
- Control: closed, hierarchical structures are set aside in order to give way to open, nonlinear and outsourced structures.
- Diversity versus in-depth expertise: there must be a balance between diversity and expertise in order to generate original ideas and tailored solutions.
- Engagement: motivation, appreciation and recognition are a must, in order to get active and committed participation.
- Policing: the more people are involved, the more likely negative behaviours are detected. This establishes some kind of control, to take care of unacceptable situations.
- Intellectual Property: it is essential to clarify the terms and conditions of intellectual property in terms of ideas, solutions and work done, to avoid misunderstandings.

Such domains resonate with ECO's pedagogical design and technical functionalities in support intercreativity: openness is sustained, with Intellectual Property issues resolved via Creative Commons licensing; engagement and policing are maintained with the help of the facilitating teams and mentoring to support collaboration; crowdsourcing is enabled by peer-to-peer interaction and peer-to-peer evaluation that support innovative solutions and provide feedback and feed-feed.

Using all these elements incorporated within the sMOOCs pedagogical and technological design, ECO aims at ensuring empowerment of the participants so they can fully participate in the intercreative actions being carried out. The roles of teachers and students are transformed, making it possible for "everyone to learn with/from everyone". Initiatives, contributions, observations, criticisms and so on are open and expressed by all the participants without any type of censorship or undue policing and control.

In terms of effective implementation, ECO proposes several actions to guarantee the attainment of the project's objectives: (1) The administrators teams are provided with a "checklist" that enables them to follow ECO's pedagogical design in a transparent and collaborative manner; (2) A quality committee has been set up to monitor the implementation of intercreative practices, as designed in the pedagogical model; (3) Participants are given a voice to express their opinion in this regard in a satisfaction questionnaire which they can complete anonymously. The questionnaire results are then used to improve the sMOOCs over the following iterations (three in total over 2 years).

The quality committee comprises three people who coordinate the actions for ensuring compliance with all the requisites established in the area of intercreativity. These include activities for internal assessment between the different ECO sMOOCs. Each sMOOC team assesses two other courses according to a series of variables and criteria previously established by the committee.

The participants' satisfaction questionnaire collects their opinion on several aspects related to intercreativity, such as:

– Design of collaborative tasks
– Promotion of participant involvement
– Promotion of participation with other participants
– Promotion of participant creativity
– Social interaction and support from other students
– Feedback and comments on other participants' work.

The results of the first iteration tend to show an overall high degree of satisfaction that confirms the positive feelings elicited by participatory social sMOOCS (see Fig. 9.1: Satisfaction questionnaire). The results confirm that courses delivered within an intercreative teaching–learning environment that promotes collaborative work and co-creation by all participants are largely appreciated by participants.

Those responses obtained in ratings "very good", "good", "fair", "completely", "to a large extent", "excellent", "good" and "satisfactory" are considered as positive responses. Accordingly, the aspects better ranked in descending order are: the design of collaborative tasks (82 %), social interaction in general and the received support by other students (80 %), promotes student creativity (78 %), promotes learner involvement in the course (76 %), the feedback and comments given by others to your works (76 %) and promotes interaction with other learners in the course (65 %). In consequence, the pure components of intercreativity (interactivity and creativity) are within the level of satisfaction of the participants in the ECO sMOOCs qualified between 80 and 78 %, respectively, leaving the remaining percentage to aspects that support the concept.

Although the data generally are quite satisfactory, it is necessary to point out that there is an amount of participants, between 4 and 12 %, who "do not know" how to

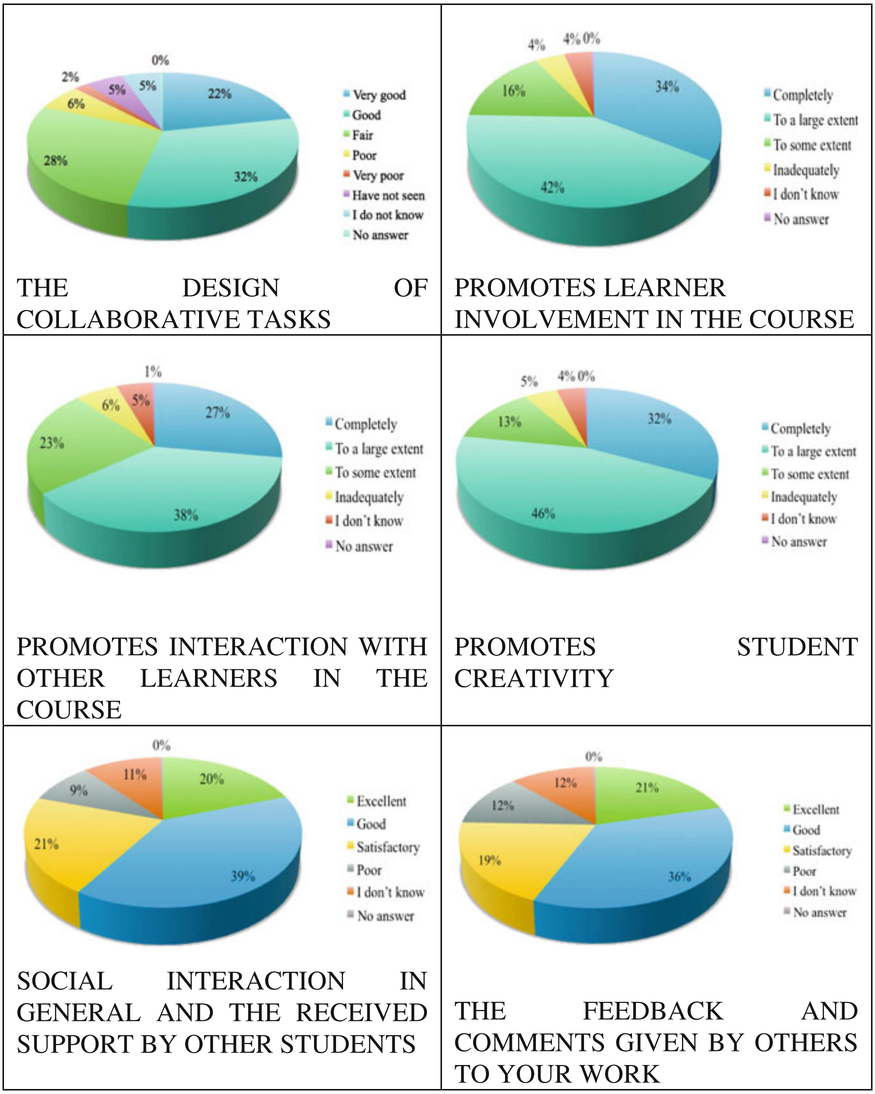

Fig. 9.1 Satisfaction questionnaire for ECO project participants in the first edition of its sMOOC (*Source* Fueyo et al. 2014)

reply to aspects regarding the interaction among the learners and the promotion of collaboration and creativity. These are some elements that show that cognitive and cultural barriers still exist to intercreativity. The second and third iteration results still showed some resistance at that level and point to the need to address them in the future.

Fig. 9.2 Shared experiences in the sMOOC "Alfabetizacion Digital para Personas en riesgo de Exclusion Social"

When considering the output from some sMOOCs, intercreativity appears as capable of addressing burning issues and contributing to social change. For instance, in the sMOOC "Alfabetizacion Digital para Personas en Riesgo de Exclusion Social", offered by Oviedo University, Pinterest is a tool used to share experiences and to fight exclusion (see Fig. 9.2: Shared experiences).[3]

In this sMOOC, one intercreative activity consists in having participants look for digital literacy specialists within a collective in risk of exclusion. This creates a real case study focus on a common set via a participative videoconference on YouTube where any person can ask their own questions throughout the sMOOC's Twitter or Facebook accounts. The experience reaches the end when a videoconference summary gets published in the internal sMOOC bulletin.[4]

In the sMOOC "Comunicación y aprendizaje móvil", offered by UNED, an intercreative activity is performed via Twitter using #ECO_CAM_1A. All the participants build a transmedia narrative, which allows them to discuss and reach a consensus about all the course's contents.[5]

Another example can be found in the sMOOC DIY MIL (on competences for media and information literacy), administered by the French team of Sorbonne

[3] www.unioviedo.es/ecolearning/presentacionmooc.

[4] https://www.youtube.com/watch?v=2ZF2lPGvq44.

[5] https://hub8.ecolearning.eu/course/comunicacion-y-aprendizaje-movil/.

Nouvelle University. Several participants built collective projects to address the issue of radicalization by social networks following the terrorist attacks in Paris on 13 November 2015.[6] One of them, Mrs Farinella created a project called "Info ou intox sur le web, comment faire la différence dès le primaire?" to turn primary school children into "info-detectors". It was then showcased in a conference organized by the Ministry of Education "Réagir face aux theories du complot" (Paris, February 2016, http://www.ac-grenoble.fr/ien.cluses/spip.php?article583).

In a similar move to recognize the social value of such innovative pedagogies, the Spanish Minister of Education, Culture and Sport, Sir Iñigo Méndez de Vigo and Montojo, complimented publically the ECO project, especially because sMOOCs enticed educators to become e-teachers, among other objectives (Madrid, October 2015).[7]

Beyond satisfaction questionnaires, such examples illustrate the intercreative capacities of participants, their willingness to share and to improve society around them, making them into active citizens via digital affordances. The project pushes this collective intelligence even further as in its last phase (year 3), ECO offers participants the option to design their own courses within the OPENMOOC platform. This means that they get to reach the e-teacher category alongside other participants. This implies collaborative work and a social construction of knowledge assumed by all, the ultimate test in intercreativity as it were.

9.5 Interculturality as a Support and Lever to Intercreativity

In ECO, collective intelligence is also intelligence distributed across countries and cultures. ECO is based on the hypothesis that in sMOOCs, interculturality meets intercreativity. Being creative in partnership with people outside one's culture and area of expertise builds community and understanding across cultures. It may also bring transformative changes when cultures come into contact.

9.5.1 Defining a Complex Process

Interculturality can be defined as the process of exchanges between cultures in contact (Devereux 1972; King 1997; Demorgon 1996; Ladmiral and Lipiansky 1991). This contact implies a construction of culture as "nested" levels of interactions: national cultures in contact per se (e.g. language, politics), then institutions (e.g. school systems, teaching styles, educational designs) and finally professional cultures (e.g. engineers, managers, designers, teacher/users) (Demorgon 1999,

[6]https://hub5.ecolearning.eu/course/diy-do-it-yourself.

[7]http://portal.uned.es/portal/page?_pageid=93,52324354&_dad=portal&_schema=PORTAL).

2003). These interactions are complex and include cross-, inter-, intra- and transcultural characteristics (Morin 1987; Frau-Meigs 2006).

In this context, cognition, emotions and socialization contribute to new communities of practice and interpretation (Fish 1980) that emerge during the process of interculturality. According to Merlin (2001), cultures are “cognitive networks” that ensure the transmission of values, attitudes and institutions as nested constructs. They are part of the socialization process (Simmel 1999), and more specifically, of the social learning that takes place through use, practice and the management of emotions under the observation of others. Emotions are related to empathy, which allows all actors to understand others’ emotions and to justify choices on the basis of cultural and professional values (Damasio 1994; Decety and Ickes 2009; LeDoux 1996; Livet 2002).

When considering Marco’s (2010) domains for intercreativity, some of them overlap with interculturality as a socialization process that takes in emotions, values and attitudes. Among the most important: “Decision Support” as the more intercultural people are, the more likely they are to solve problems unexpectedly; Loss of “Control” as the mix of professional and national cultures can modify hierarchical structures and facilitate outsourcing and crowdsourcing; “Diversity versus in-depth expertise” as the more diverse a community, the more likely it is to generate original ideas; “Policing” since the intercultural situation tends to transform stereotypes and generate positive behaviours as people learn about each others’ cultures and clarify positions and misunderstandings.

It is the encounter between these different layers and domains that produces the intercultural situation. All professional actors interact with each other, bringing with them their national, institutional and professional cultures. The intercultural setting aims to foster transcultural communication (horizontal, shared, across nations and institutions and practices). It also intends to facilitate decision, loss of control, and foster diversity and (self-) policing, while the awareness of others becomes an asset in the participatory process. In ECO project, this transcultural encounter aims at a shared European MOOC culture that goes further beyond the usual goals of other existing MOOC platforms. This lead to the original idea of creating a reflexive MOOC, the sMOOC *Step by Step*, in order to have an observable intercultural and intercreative situation that can be used as a template for other sMOOCs.

9.5.2 Interculturality Applied to a Practical Experience: The sMOOC “Step by Step”

The design of the *sMOOC Step by Step* tests the process of interculturality in relation to intercreativity: it brings together six national cultures, twelve institutions and three major professional cultures (manager, user, computer engineer), for a total of around 30 permanent staff. These professionals have several profiles, including teachers, pedagogical engineers, facilitators, learners and community managers.

Additionally, several disciplines come into play, such as management, education, communication and computer engineering.

This amount of interaction fosters a climate of intense exchanges that feed intercreativity. The actors share a repertoire of online e-strategies such as gamification, content aggregation, sampling, multimedia creation and diffusion (text-image-sound), sharing of resources, networking, transmedia navigation and communication and peer-to-peer coordination (Jenkins 2009; Frau-Meigs 2011).

The overall design has been devised by a single team representing all ten of ECO facilitator teams or "hubs". The French and Spanish coordinators supervised the entire process and ensured continuity and quality (see Fig. 9.3 sMOOC *Step by Step*: interculturality within the teaching team). The sessions and units were created with the best practices from every hub being shared and modified (after iteration 1 of all the other sMOOCs in the project), which added intercreativity to interculturality.

The seven sessions in the sMOOC have each been created by two hubs working closely together and mixing languages and cultures (German/Spanish, French/Spanish, Italian/French, Portuguese/Spanish, French/Portuguese, English/French and English/Spanish). Since English is the lingua franca across hubs and teams, the English partner was entrusted with the task of supervising the quality of the English used in the sessions. This was very important as each country translated from the English into its own language (see Table 9.1 "Intercultural teams: Hubs by sessions").

In terms of interculturality, the cognitive interplay of emotions, actions and decisions has elicited collective representations and has brought together the

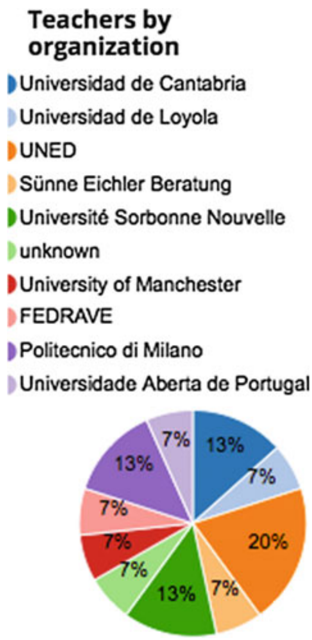

Fig. 9.3 sMOOC *Step by Step*: interculturality within the teaching team (institutional and professional cultures)

Table 9.1 Step-by-step intercultural teams: Hubs by sessions by tasks

	Institution / Session	UniCAN	UoMan	SE	Ferdave	Sorbonne	Loyola	UNED	UAB	POLIMI
Supervision	All									
Global pedagogical design	All									
Pedagogical design / session	1									
	2									
	3									
	4									
	5									
	6									
	7									
English quality control	All									
Translation and facilitation in each language	English									
	Spanish									
	French									
	German									
	Portuguese									
	Italian									

NB The grey zones are zones of interaction between national teams

community of practice of the sMOOC *Step by* Step. The repertoire of e-strategies provided by the technological functionalities also made it possible to enlarge the community of practice and extend it to participants, especially over time and space with the three iterations. This process has given rise to situations of co-training and cooperation, in some cases, and to situations of resistance in others (Morley 1983).

9.5.3 Cooperation and Resistance

In terms of co-training and cooperation, the bicultural teams came up with a constructive compromise. Through cognition and empathy, the online space moved towards a transcultural laboratory experience with intense “focus” activity. Focus is a cognitive notion that accounts for both the control and policing dimensions of intercreative interculturality. The teams intervened in each other’s tasks: “interventional focus” defines the fact that the action of others impacts decisions by participants back in their own language. Loss of control and diversity is manifested in “accidental or serendipitous focus” when the actions of others in previous and parallel sMOOCs have an impact on *Step by Step*. Peer-to-peer coordination in particular was used often and led to constructive concentration.

Co-training and cooperation were facilitated by leveraging all the devices of transmedia connectivity in order to share resources and coordinate actions (e.g. the ECO project platform, microblogging tools, file sharing tools, videoconferencing tools). The traditional borders of cultural time and space were recombined: spaces for leisure were used for work (e.g. WhatsApp for professional exchanges; the e-learning platform Alf for project management), working time was not aligned on office opening hours but on project needs (e.g. Sunday messages sent on the platform).

Interculturality was achieved by the transfer of practices and good experiences in English first, giving sMOOC *Step by Step* a uniform feel, and then providing a context-based adaptation. This was particularly visible in the activities (tasks, quizzes, peer-to-peer evaluation) and in facilitation of the sMOOC (live events, forum, groups, internal and external social networks), contributing to the “interventional focus”. Actors from outside the ECO project even joined into help and contribute with their experience (for example, the Sapiens MOOC team from Sorbonne Paris Cité; one expert from the MOOC “Introduction à la cartographie des *processus* métiers”). Conversely, contributors from the *Step by Step* project helped in other sMOOCs outside ECO (for example, the sMOOC ECFOLI, MOOC OEI), contributing to the “serendipitous focus”.

Interculturality was also enhanced by sharing new techniques. This was evolutional and iterative and shows that time creates trust and confidence and improves participants’ adaptation in the intercultural context. Innovation occurred across cultures when good ideas from one country were adopted by others. This was particularly evident in the use of teasers and promotional videos, and led countries that were less image-driven to adopt various forms of visual representations and even change the way they worked (taking stop motion animations from the MOOC DIY EMI and using it for the *Step by Step* teaser, etc.).

In terms of situations where resistance was encountered, the teams experienced a number of limitations. In some cases, the efforts made to reach a compromise hampered criticism and policing: being extra careful and tolerant meant that some proposals were accepted even though there was a sense of diminished quality. In fact, diversity was sometimes favoured over quality, especially since the perception of quality varies across cultures and cannot be objectively enforced by one partner over the others. The focus activity was not without risk and required some management to tackle lack of comprehension (criteria for evaluation, weighting grades, quizzes); notional proximity could also be misleading (units, nuggets, levels, paths, instructions). Diverse management cultures from different countries also created some discomfort and unease until issues were clarified and verbalized. Consequently, regular weekly meetings were held and leaders of some tasks allocated more time to tutoring, mentoring and moderating (see Fig. 9.4: *Step by Step* Teachers and Facilitators team).

Some countries appear to lack a culture of participation and there is a tendency to fear interventional observation. Some teams tended to wait for instructions and requests for resources and material, whereas others took the initiative without waiting to be asked. This indicates that there may be a need for intercultural participation training. As for interventional observation, there is a fear of judgment

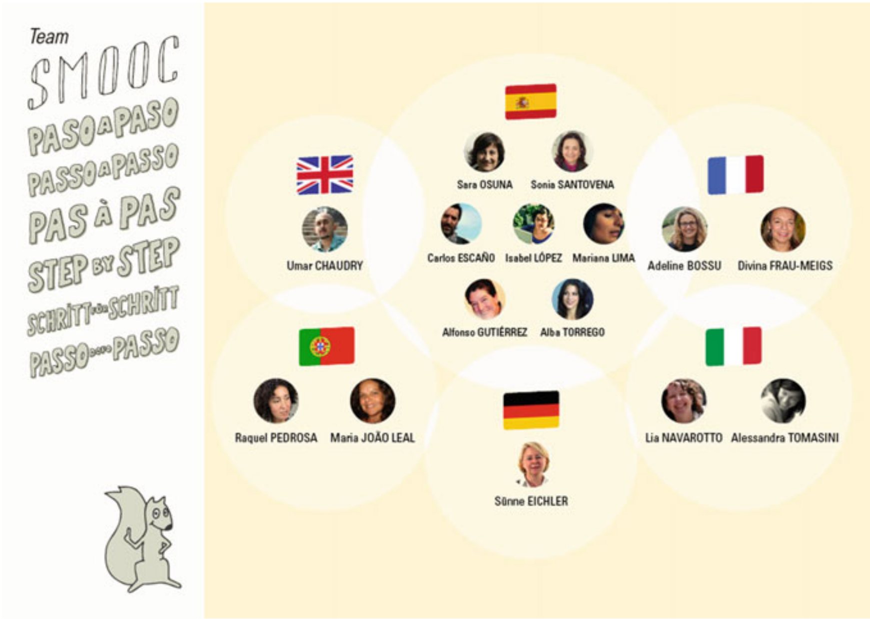

Fig. 9.4 sMOOC *Step by Step teachers and* facilitators team (one meeting/week)

and committing mistakes in spite of the trial-and-error culture of MOOCs. In addition, the substantial presence of partners from Spain rendered the creative and participatory process somewhat asymmetric, not because of ill will, but due to sheer numbers. This was mitigated by alliances across platforms and teams and by increased communication efforts from all. Nonetheless, linguistic proximity diminished the integration potential of some partners from other linguistic spheres, indicating the need for intercultural management.

9.5.4 Towards Open Interculturality

Overall interculturality was an added value as evidenced by the exchanges in the forums (see Figs. 9.5 and 9.6: *Step by Step* Intercultural Forum examples), the wealth of collaborative artefacts (see Fig. 9.7: Padlet Session 1 and Fig. 9.8: collaborative glossary) valorising the deliverables[8] and the results in the satisfaction questionnaires (see Figs. 9.9, 9.10 and 9.11: *Step by Step* satisfaction questionnaire).

[8]See examples for the padlet available at http://fr.padlet.com/wall/s44b1zun5tju); for the glossary examples are available at https://annuel.framapad.org/p/Glossaire.

Fig. 9.5 Intercultural forum: mix of languages, exchange of advice between various categories of participants

The forum provided opportunities for decision support; it fostered crowd-sourcing and social collaboration; it balanced diversity with in-depth expertise; it mixed and remixed resources and languages in an open and intercreative manner.

These collaborative "spaces" and tasks allowed creativity and production by participants themselves. They provided recognition of their differences and complementarities to build a unique and original artefact. This product will also become a reference and resource for their knowledge and projects and will be offered to the new participant e-teachers willing to design their own courses during the last phase of ECO project.

The satisfaction questionnaire shows that the intercultural exchanges have not been an issue in terms of creativity. On the contrary the participants are overwhelming satisfied with the sMOOC *Step by Step* and the way it affords interaction and buttresses creativity.[9]

The intercultural process led to the creation of a new culture, a new vocabulary, new methods of production and new ways to create resources and deal with learners. Sharing a common culture led to tolerance for foreign behaviours, values and designs, in a form of (self-)policing. The sMOOC *Step by Step* actually acted as

[9]Since the first session, a new sMOOC has been created in ECO «working in multidisciplinary teams» offered by POLIMI, www.ecolearning.eu.

Fig. 9.6 Intercultural forum: circulation between resources and languages

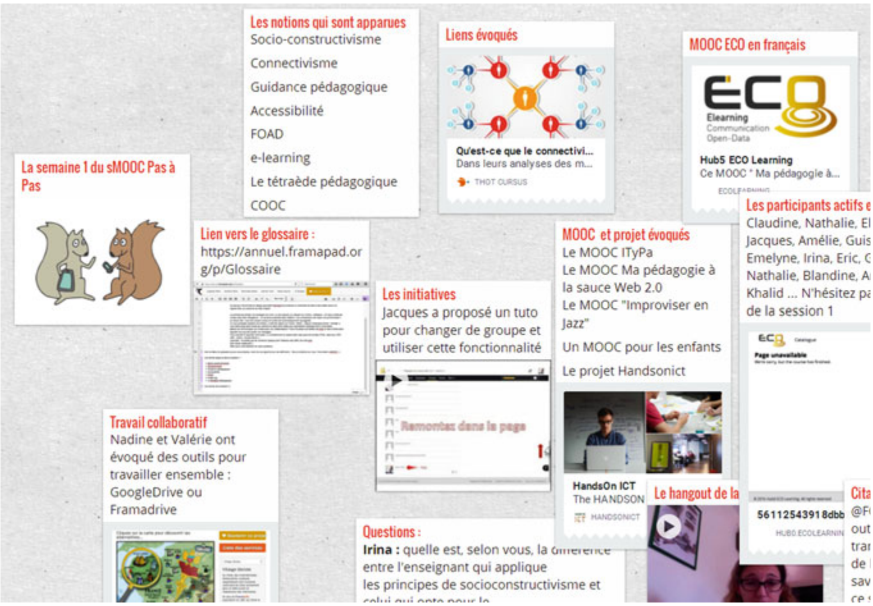

Fig. 9.7 sMOOC *Step by Step* (iteration 2): Padlet co-created with the proposals of participants (http://fr.padlet.com/wall/s44b1zun5tju)

a new space, as a kind of fab lab or an online makerspace: it focused attention on intercultural competences such as collaboration, training oneself as one trains others (feedback and feedforward) and reflexivity. The added value of this new space contributed to making the other languages visible and accessible, favouring inter-comprehension (Capucho 2008). Additionally, this experience in intercreativity enabled participants to be creative back in their own culture, modifying other MOOCs in their hubs, introducing new resources and new media, etc.

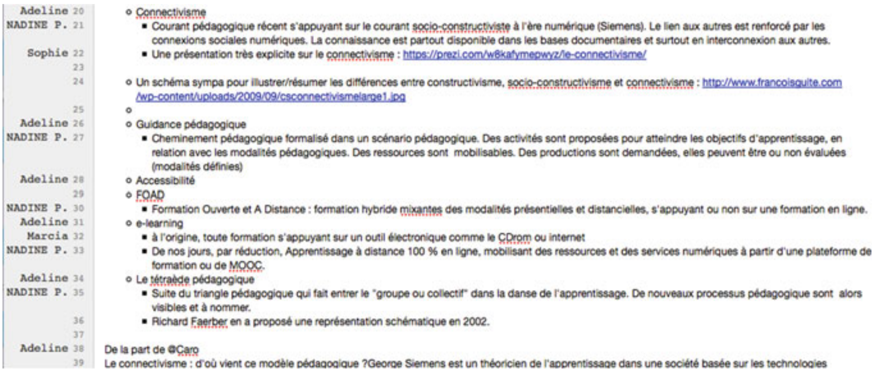

Fig. 9.8 sMOOC *Step by Step* (iteration 2): The French version of the collaborative glossary (https://annuel.framapad.org/p/Glossaire)

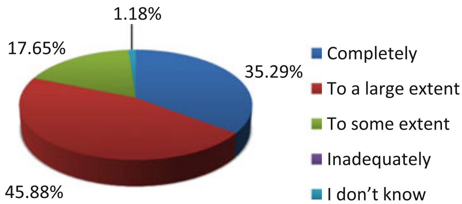

Fig. 9.9 Data collected from Osuna-Acedo (2014–2017): In your opinion, to what extent the course you have chosen promotes participant creativity?

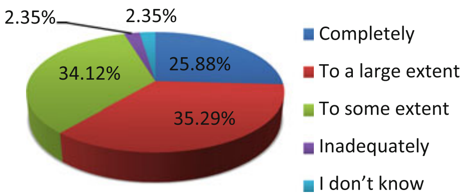

Fig. 9.10 Data collected from Osuna-Acedo (2014–2017): In your opinion, to what extent the course you have chosen promotes interaction with other participants in the course?

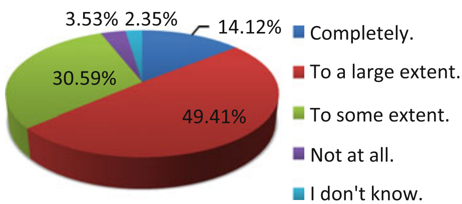

Fig. 9.11 Data collected from Osuna-Acedo (2014–2017): In your opinion, does the course encourage valuable communication and interaction among participants?

The sMOOC *Step by Step* highlights the potential of "open" interculturality; it develops capacities for taking action collectively, and it prepares for "open" minds and "open" behaviours, in situations that are also "open" (i.e. iterative and cross-cultural). This is valid for trainers/teachers as well as for participants (see

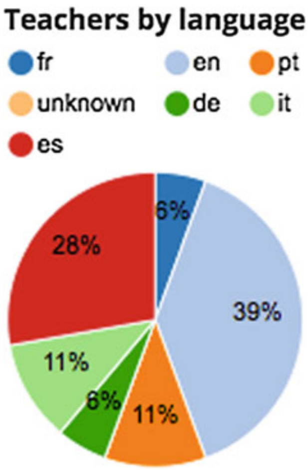

Fig. 9.12 Data collected from Osuna-Acedo (2014–2017): Teachers by language

Figs. 9.12 and 9.13: teachers and participants by language). As such, open interculturality is associated with online well-being and identity formation. With sMOOCs, an additional "lifelong interculturality" dimension can be added that increases access and accessibility, ubiquity and mobility. Moreover, interculturality applied to a practical and context-based experience is connected to intercultural dialogue and diversity.

This open interculturality is cognitive because of the context of exposure and social learning created by the sMOOC. The cognitive dimension implies monitoring the entire environment and being ready to interact (interventional or accidental focus); being conscious of the situation of others and internalizing this (empathy); being able to change roles and to find playful solutions (tolerance to error); being distant in relation to oneself with new roles, unknown situations (decentering

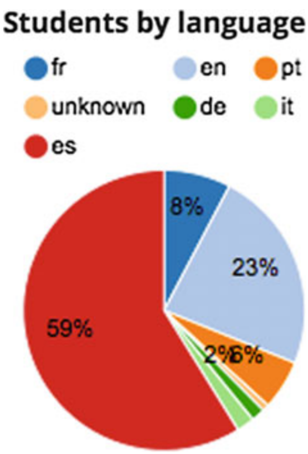

Fig. 9.13 Data collected from Osuna-Acedo (2014–2017): Participants by language

process); being capable of tolerating differences in others' values (tolerance to ambiguity); and being aware of one's own observation activity (presence to self and identity construction) (Frau-Meigs 2011).

9.6 Conclusions

This research and this experiment around the sMOOC *Step by Step* and the other 16 pilot sMOOCs of the ECO project confirms the hypothesis that intercreativity and interculturality are key factors in removing barriers to education.

The main findings for intercreativity confirm that giving priority to creativity and interactivity in the sMOOC model enables course participants to assemble knowledge in technosocial communities, in which communications are horizontal and multidirectional in a non-hierarchical transmedia context.

The main findings for interculturality confirm that sMOOCs are affordances for situations of co-training and cooperation across nested cultures. Contrary to other online experiences that have attracted passive observers and lurkers, they show an intense "focus" activity that leads either to intervention or to serendipitous diffusion of resources and learning.

sMOOCs function as makerspaces or laboratories that favour socialization and acculturation to new ways of copresence and co-education: they induce the sharing of tool kits, transmedia connectivity, repertoires of e-strategies and intercultural dialogues.

The sMOOC *Step by Step* proved to be a performance in open interculturality with strong cognitive processes at work: interventional or serendipitious focus, empathy, tolerance to error, decentering, tolerance to ambiguity, presence to self and identity construction. An important issue here is to avoid excessive uniformity in the sMOOCs. Each country should have the capacity to adapt their courses to their specific situation through a range of resources, activities and social networks. Learning should explore other spheres by making use of all available tools, and through the interaction of all the individuals involved.

This exploration is key and quite dependent on ensuring cultural diversity via interculturality in the European Unions. As expressed by Frau-Meigs and Kiyindou (2014), "The digital technology is an opportunity for cultural diversity in terms of democratization, creativity and sociability, but it is also a potential risk in terms of economic affordances for the countries who do not control the conditions of access and the financial profits, which de facto re-enforces digital fault lines along existing geo-cultural divides".

The European ECO project is a pioneer in offering open and online education oriented towards a new pedagogy based on sMOOCs. The courses are designed within virtual learning environments to foster intercreativity and interculturality among the participants. The educational process is possible, thanks to the participation, collaboration and exchange of information by all the users, transforming them into active agents and knowledge producers. This new pedagogical model enables the creation and development of a collective intelligence, which is characteristic of technosocial communities, and produces knowledge from the co-creation of all the participants.

The advancement of societies is possible through the education of individuals in a participatory manner. It is therefore both a priority and a duty for governments to invest more in open education and offer quality pedagogy adapted to current needs that also extract the maximum possible performance from individuals and from the available resources.

National education systems cannot afford to ignore this networked phenomenon, and must take a step forward to incorporate it into their pedagogical models. The teaching–learning process must be geared towards open and online education that satisfies the current demands of society, while breaking away from the transmissive models anchored in the last century. Interculturality becomes an asset in the European Community at large, as globalization increases the need to understand cultures in contact and gives additional value to intercomprehension. Intercreativity and interculturality are two key factors to integrate for the successful education of citizens, in a scalable and sustainable way.

Acknowledgments We would like to thank the European Commission for believing in our project, and all our partners in the ECO project for their teamwork in seeking to build another way of educating, and other ways of building knowledge consistent with the demands of today's society.

Special thanks go to all the participants in the ECO project, who form a learning community in which different cultures and languages coexist, and who are engaged in this important collective work of intercreative teaching and learning practices. The ECO project is empowering many people who are becoming co-authors of the culture of their time through the educommunicative environments in which they interact.

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Master in Social Networks and Entrepreneurship

Master in International Journalism

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Chapter 10
Towards Fostering Quality in Open Online Education Through OER and MOOC Practices

Ebba Ossiannilsson, Zehra Altınay and Fahriye Altınay

10.1 Introduction

The development of massive open online courses (MOOCs) has been debated extensively in recent years. In 2012, the rise of MOOCs used to be described as a tsunami or a melting glacier (European Commission 2014; Haggard et al. 2013). However, MOOCs has been in use since 2008 when Downes and Siemens launched their cMOOC, which was based on connectivism (Creelman et al. 2014). MOOCs are a practical medium for the rapid diffusion of content, skills, and information. Hence, MOOCs have become well known in the management of international cooperation in higher education, including the mobility of students and academic staff. Open educational resources (OER) were established already in 2002, when MIT launched some of their course materials open free, and UNNESCO then followed up these initiatives, as OERs promote the values of equity, quality, and diversity in higher education. This chapter will discuss the combined benefits of OERs and MOOCs for online education, and the chapter offers a roadmap to institutions for establishing policies on quality and how quality can be assured using OERs and MOOCs as evaluation tools. The main quality indicators are shown in Fig. 10.1.

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Fig. 10.1 Quality indicators for OERs and MOOCs

As shown in Fig. 10.1, accessibility, flexibility, interactivity, personalization, transparency, open and shared content, media, pedagogical enhancement, reflection, and social learning are the key indicators of high quality in the use of OERs and MOOCs. Thus, this chapter provides insights into effective institutional policymaking and planning that ensures the quality OER and MOOC practices and fosters the use of technology in education. Also discussed is the implementation of OERs and MOOCs to ensure international cooperation in higher education, student and staff mobility, mobile learning, and the strategic management of internationalization.

10.2 Background

10.2.1 Quality in Open Learning and Education

Higher education will face many challenges in the future. The most challenging mission will be to innovate in the face of the changes that will arise worldwide because of shifting demographics, increased globalization, the rapid development of technology and digitization, and the trend to the philosophy of open education. Because of the increasing trend towards lifelong learning in a complex environment, there are demands to transform the educational sector and to rethink learning and education. To develop the potential of learners within such transformation, learning and education need to meet the following demands for life skills:

- Collaboration
- Communication
- Empathy
- Reflection
- Resilience
- Problem solving
- Global citizenship
- Critical thinking
- Creativity

This transformation has been described as an evolving shift and is seen as a revolution in education. In this respect, Weller (2014) called it a “battle,” arguing that first, there are real conflicts, second, the dispute is over wealth because real values are at stake, and third because history is written by the victorious. Weller pointed out that the winning values should be the high quality of open access, OERs, MOOCs, and open scholarship. Weller (2014), and Cormier (2016) as well as Ossiannilsson (2016) argued that open education is represented by the rhizome paradigm. The rhizome resists chronological organizational structures. In this model, culture, like the surface of a body of water, spreads towards available spaces or trickles downwards towards new spaces through fissures and gaps, eroding what is in its way.

Thus, the battle has emerged because most educational institutions are organized and structured vertically in departments and disciplines, and they tend to be entrenched in traditional linear education in degree programs. This hierarchical structure contradicts the goals of today’s learners, who seek education throughout their lives. The main challenge for higher education is to promote innovation in learning and to modernize pedagogy to accommodate self-paced learning. In addition, there are challenges in the implementation of strategies designed to open education and to modernize public administration of education. Another type of education should be developed to promote innovation in learning. Moreover, there is a pressing need to consider not only new platforms of learning, such as the social media of LinkedIn, Facebook, and Twitter, but also smarter ways of learning. The real change, according to Sangra (2015), is in the nature of knowledge. Today, knowledge is created through participation in flexible, collaborative networks in dynamic and even unstable environments.

The discussion of methods of delivering education through the Internet includes the notion of education in the context of increased digitization. With the advent of MOOCs, online learning and education have become hotly debated and challenging issues. Accordingly, rethinking learning and teaching to align pedagogy with management and administration has become urgent. Weller (2011) discussed the ways in which the adoption of new technology is changing scholarly practice, how it will continue to do so, and the questions that both actual and possible innovations raise for all academics. In their study on educational equity, Willems and Bossu (2012) insisted that access, participation, and outcomes are key components in evaluating quality. Lane (2012) observed that OERs widen the engagement with supporting learning. Therefore, worldwide education has become essential to the notion of quality in the context of higher education (Richter and McPherson 2012). In this respect, real change and transformation are promoted by the diffusion of knowledge and the adoption of technology. OERs and MOOCs can be used to support learning by ensuring access to and equity in education.

Several models of quality and online educational practice have been discussed and explored in the literature. The International Council for Open and Distance Education (ICDE) (Ossiannilsson et al. 2015) conducted a research study on quality models of online teaching and learning around the globe. More than 40 of the best-known models were reviewed, their quality was defined, and recommendations were offered to stakeholders. The quality standards for online education generally include institutional support in the form of vision, planning, and infrastructure, course development, course delivery, instruction, course structure, and student and faculty support. According to Rosewell and Janson (2014) flexibility, accessibility, interactivity, and personalization are also important for success in online learning. Ossiannilsson (2016) and Ossiannilsson et al. (2015) emphasized quality indicators, as was outlined in Fig. 10.1, as crucial because they enable learners to control and orchestrate their own learning processes.

Regarding quality in OERs, the most well-known quality model is the TIPS model, which was developed by the Commonwealth Educational Media Centre for Asia (Kawachi 2013). This model uses 38 criteria in four categories, the initials of which are TIPS, in that order. Hence, the first category is the teaching and learning process (T); the second is information and material content (I); the third is presentation product and format (P); and the fourth is system, technical, and technology (S). Camilleri et al. (2014) argued that in OERs, quality assurance requires pedagogical enhancement, pedagogical stakeholders, and pedagogical resources, which is shown in Fig. 10.2.

Fig. 10.2 Features of quality assurance in OERs

The European Association of Distance Teaching Universities (EADTU) developed the OpenupEd model to assess the quality of MOOCs. OpenupEd aims for the dramatic redefinition of education for the benefit of both learners and the wider society while reflecting core European values, such as equity, quality, and diversity. OpenupEd promises to bring some distinctive features to the MOOC landscape. To ensure that OpenupEd promotes this vision, its courses should demonstrate eight key features: openness to learners, digital openness, a learner-centered approach, independent learning, media-supported interaction, recognition options, quality focus, and a spectrum of diversity. Because the benchmarks included in OpenupEd are designed to reflect these features, they can be used to gather evidence that a MOOC, or a program of MOOCs, supports the aims of OpenupEd. Moreover, supporting these features helps to ensure that OpenupEd MOOCs reflect the values of equity, quality, and diversity (Roswell and Janson 2014).

Each feature in the TIPS and OpenupEd quality models has been debated regarding its importance in a holistic and contextualized approach. If the guidelines are taken into account, both models also emphasize the important roles that OERs and MOOCs can play in enhancing the quality of open online learning and in the quality assurance of higher education in general. The transition towards openness and innovation also requires changes at the levels of individual academics, institutions, and sectors. However, the real change is in the nature of knowledge, attitudes, and mindset (Martin 2015). This transition requires quality in leadership, management, and development, which is discussed in the next section.

10.2.2 Institutional Policies and Planning for Quality

According to research by the D-Transform EU-project (2015), which aims to be a compass for the use of information and communications technology (ICT) to transform the higher education system, transitions involve at least three institutional levels. The first level involves encouraging individual academics to become champions, the second is promotion and implementation at institutional level, and the third level involves the sector-wide promotion and implementation of national strategies and initiatives. However, learners form the foundation from which arises the demand for the accommodation of their needs and requirements to favor increased openness that suits their complex life situations.

In this transition, the role of leadership is crucial, as are the attitudes towards open practice and how quality is considered and measured. In this respect, course design and the development and enhancement of quality are managed within the frame of information technology, increased digitization, and openness. The quality of the education system relies on its ability to provide flexible courses and programs through collaboration, personalization, and self-paced learning. In the open education movement, ICT is used to raise questions about the quality of the higher education system. With new technologies that have the potential to provide higher levels of personalization, collaboration, access, immediate use, connections, communication, presence, and support, learning can fit the needs of the global e-society. In this respect, knowledge is exchanged worldwide to remove the barriers in the education system and upgrade learning skills. Because social learning through networks and communication plays an increasing role in professional knowledge, higher education systems must strive to promote quality in management and the pedagogy to foster self-determined learning. Therefore, the ongoing design and redesign of self-directed learning are essential to ensure that the student's voice is heard in ensuring quality (Castaño-Muñoz et al. 2013). Recent studies found that open and distance learning and the facilitation of information technology created social inclusion in higher education, which fostered diversity and equality (Bossu et al. 2012; Phelan 2012). The significant role of openness and innovation in quality higher education is emphasized in the relevant literature.

10.3 From OERS to MOOCS

Although online education in the form of distance education has been available for many years, current formats include hybrid modes that are applied using methods such as the flipped classroom. Universities traditionally limit their enrolments to a relatively small numbers of learners, they charge tuition fees, and most often award university credits for students' achievements'. However, distance-learning courses offer flexibility for learners who cannot attend campus-based degree programs. With OERs and MOOCs, the full potential of online learning can finally be attained. In this section, both OERs and MOOCs are reviewed, and the issues surrounding them are described (Uvalic-Trumbic and Sir Daniel 2014).

10.3.1 Open Educational Resources (OER)

The term open educational resources (OER) was adopted at UNESCO's 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries, which was funded by The William and Flora Hewlett Foundation. UNESCO's definition reflects open materials that can be used legally, adapted, and shared in textbooks, lecture notes, projects, video, and so on. Opencontent (2014) described OERs as the five Rs of openness:

- Retain—the right to make, own, and control copies of the content
- Reuse—the right to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, and in a video)
- Revise—the right to adapt, adjust, modify, or alter the content (e.g., translate the content into another language)

- Remix—the right to combine the original or revised content with other open content to create something new (e.g., incorporate the content into a “mashup”)
- Redistribute—the right to share copies of the original content, revisions, or remixes with others (e.g., give a copy of the content to a friend).

The Commonwealth of Learning (COL) (2015) provided the widest definition of OER to include materials that are offered freely and openly for use and adaptation in teaching, learning, development, and research. Although OERs are mainly shareable in digital formats both online and offline, such as DVDs or CD-ROMs, in COL’s definition, OERs as not merely synonymous with online resources, online learning, or e-learning. In COL’s context of development, OERs can also appear in printed formats. COL is strongly committed to the creation, adaptation, and use of OERs because they have the potential to increase the access to education while reducing costs and improving quality. They are, therefore, an important element of COL’s mission of learning for development. The term Open CourseWare (OCW) is used to describe publicly available materials that are offered by a university or college for either part or all of a complete course. The definitions of both terms have evolved since 2002 (COL 2015).

Simunich et al. (2015) emphasized the “findability” of OERs, which is more than simply the value that easy access can have for student-learning outcomes. Findability, as defined by Morville (2005), is the degree to which a particular object is easy to discover or locate, as well as the degree to which a system or environment supports navigation and retrieval. Findability is hence a crucial first step in setting standards for online courses. According to Nikoi and Armellini (2012), OERs should be used to widen access to education through networks in the knowledge society. The free adaptation and distribution of resources would sow the seeds of a new pedagogical context in higher education systems by offering a greater number of people more ways to learn. In this respect, OERs provide value that improves the quality of teaching and learning in higher education. Because OERs evolved into free open online courses, MOOCs are described in the next section.

10.3.2 Massive Open Online Courses (MOOCs)

The real revolution in online courses started in 2011, when academics at Stanford University created MOOCs as we now understand them. These online courses were available to anyone with access to the Internet and an interest in the subject. Figure 10.3 illustrates the MOOC timeline, from its earliest days around 2000, when it made available open content in general, to Open Courseware from MIT and the UK’s Open University Open Learn platform. In 2008, Siemens and Downes introduced the first true MOOCs. Figure 10.3 also shows course delivery platforms, such as FutureLearn, Udacity, Coursera, and edX. The first MOOCs comprised only open resources such as OERs, so there is clear continuity from OERs to

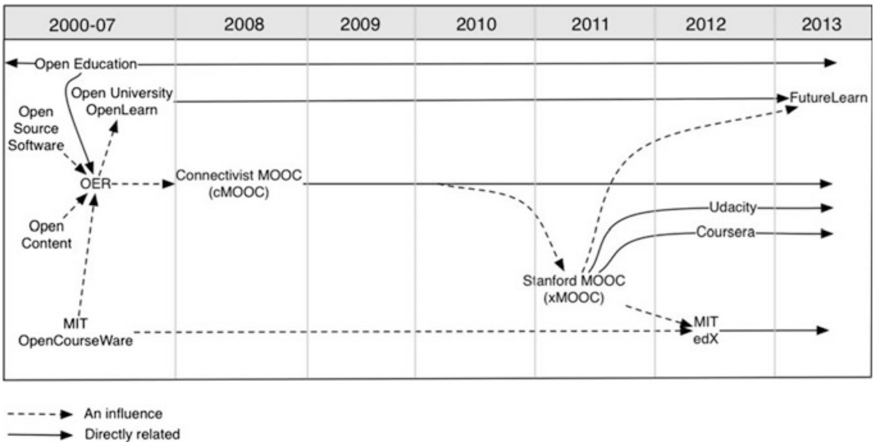

Fig. 10.3 The MOOC timeline. *Source* Commons.wikimedia.org

MOOCs. Both OERs and MOOCs embrace the values of equity, quality, and diversity in education for all (UNESCO 2015).

The earlier cMOOCs by Downes and Siemens, which were based on connectivism (Siemens 2005), were already in use by 2008. MOOCs have allowed people around the world to access free online education that is provided by some of the world's leading universities and to join learning communities of individuals interested in similar subjects. They are a new concept in online education and offer truly boundless opportunities. However, MOOCs have some limitations. Although 2012 might be called "the year of the MOOC," the movement began much earlier (Downes 2013). It is well known that the first MOOCs appeared in the fall of 2008 and that Dave Cormier coined the term during this first course, which was on connectivism. Other courses may also have been influential and they are known as LAK11 (on learning and knowledge analytics), CCK11 (on connectivism) and the course on personal learning environments networks and knowledge (PLENK).

Morris and Lambe (2014) constructed a template that could be used to outline a typical MOOC (Table 10.1). As shown in the left column, the MOOC has a syllabus, course materials, a learning community, and it provides help in the form of technical support and user feedback, mainly peer reviews. The middle column displays announcements from the course educator. The right column includes directions for deadlines, recent quizzes, recent discussions, and supporting documents.

Most MOOCs are linear and provide a timetable of activities for learners to follow. The timetable is useful, but it can also prove too difficult to manage by those studying in the midst of other pressing commitments. According to Morris and Lambe (2014), the journey through the first two weeks of a typical MOOC follows the path outlined in Table 10.2.

In all educational settings, it is crucial to learn about the learners. In MOOCs, this is particularly important, but it is almost impossible to achieve because of the

Table 10.1 Outline of a typical MOOC

User profile, account settings		
Course title, university provider		
Syllabus (course map, schedule, and learning outcomes)	At login, this area may display course announcements from the course educator or teaching assistants. When menu items are selected, this area will display the main course content	Course deadlines
Course materials (e.g., video lectures, quizzes, and interactive activities)		Recent quizzes
Learning community (e.g., discussion forum, blog, and wiki)		Recent discussions
Help, technical support, and user feedback		Supporting content

Source Morris and Lambe (2014)

Table 10.2 A journey through the first two weeks of a typical MOOC

Week 1				
Introduction	Video lecture, suggested reading, etc.	Discussion (e.g., chat and discussion forum)	Quiz	Summary
Week 2				
Review of week 1	Reading or other learning content	Activity (e.g., discussion, interaction, production of content, etc.)	Quiz	

Source Morris and Lambe (2014)

huge number of learners, which can be as high as 50,000. In addition, the students have diverse backgrounds, prior education, socioeconomic status, available time, and so on. Perhaps most importantly and the reason why MOOCs pose such challenges is that learners take MOOCs based on choice (Creelman et al. 2014). The most frequent group and individual learners are pre-university learners, university learners, professional learners, self-directed learners, and leisure learners. However, with the use of learning analytics, learners, academics, and institutions can all learn who they are, what they require, what interests them, and so on. The quality of online courses is based on the interaction of three interfaces: learner-to-learner, learner-to-course material, and learner-to-teacher. Hence, learning analytics has a significant effect on the quality of MOOCs.

There are two kinds of MOOC narratives: they are the insider narratives and the outsider narratives told by people and events. Insider MOOC narratives is described by people who have taught MOOCs, worked on MOOCs, researched MOOCs, championed MOOCs, or worked for the platform providers that enable MOOCs. Outsider MOOC narratives are described by people who may have invested some time exploring an open online course but have not been directly involved in the creation, teaching, or enabling of a MOOC (Kim 2015). Thus, in discussing MOOCs, there are always two audiences to consider. This insight includes the distinction between two main types of MOOCs, the cMOOC and the xMOOC. According to Downes (2013), all four letters are negotiable, so that MOOCs could have numerous variations and nuances that blur the two categories. New abbreviations, such as SOOCs (small open online courses) and NOOCs (national open online courses), have been developed.

A concern that often is raised about the limitations of MOOCs is their low completion rate; often only 10 % of students complete a course. However, Cope and Leeds (2015) claimed that completion rates are not necessarily the best indicator of success, they claim that measures of anticipated success are based on measures of academic course success, when in actuality one is not necessarily a substitute for the other. Moreover, Reich and Ho (2014) found that dropping out of courses was not a breach of expectations but the natural result of the online, open environment. The traditional measures of success, which are based on participation, retention, and completion, tell only one side of the MOOC success story.

10.3.3 Innovation and Quality

The digitization of openness and innovation promotes inclusiveness, which can be achieved through accessibility and affordability. Moreover, human interaction leads to openness and innovation. There is an intensified need to employ more scaffolding and better designs for learning in digitization for openness and innovation. In this respect, focusing on student learning in the practice of MOOCs and OERs presents an opportunity to increase the digitization of openness and innovation. In addition, efficient and regular development of the competence of professional staff is required to increase the quality of open online learning environments. According to Weller (2011), there are increased requirements to enhance digital scholarship in teaching and learning. Openness and innovation can be developed by greater synergy and agility. Synergistic effects can be achieved by combining the factors of human interaction, staff development, and student learning (Dobbin et al. 2013). Because the use of OERs and MOOCs facilitates international cooperation in higher education, all learners can obtain the benefits of high-level research materials from prominent research universities around the globe without having to move or enroll in exchange programs. OERs and MOOCs are innovations that offer new models for pedagogy, and they have promising implications for assuring the quality of higher education.

OERs can yield insights into inclusive learning in higher education, which can be used to make a difference through openness and participation (Hockings et al. 2012). Increasing the participation in learning is a crucial element in assuring the quality of higher education. Furthermore, the use of innovative measures to access resources for constructing knowledge and enhancing learning through openness creates synergy. Quality in higher education can be achieved using the opportunities offered by OER and MOOC in a strategically implemented management approach.

Participation and collaboration are fundamental in assuring the quality of education. Social networking tools enhance learner–learner interaction, and OERs enhance learning through group cohesion and collaboration (Toetenel 2014). This phenomenon brings people and resources together to establish shared learning experiences. In this respect, the construction of knowledge is based on group collaboration in the exchange of ideas and free access through participation. Therefore, OERs and MOOCs should be integrated into higher education in order to enhance its quality, just as social inclusion is achieved through OERs (Conole 2012). In this respect, valuing learning and teaching in higher education, dialogue, and openness provides fundamental support for quality (Olcott 2012). Hence, higher education systems have begun to recognize that OERs and MOOCs are fundamental to ensure that the purpose, policies, and products of higher education are achieved. However, they should also consider that student satisfaction, the delivery of courses, and the open access to resources are parameters of quality in higher education. Through OER practices, it is possible to develop practical solutions that take students' views and expectations into account within the framework of quality indicators.

The increased access to and free use of digital resources has led to a debate about the quality of learning and the practices of learning and educational systems. This attention is evidence of the innovative effects that OERs and MOOCs can bring to higher education systems. The infusion of OERs through the practice of MOOCs in higher education will allow access and participation to be included in the evaluation of quality in learning. At every level of education, casual, formal, and professional, the inclusion of students' views is essential. OER practices in higher education can ensure quality by improving the access and participation of students. In 2000, MIT offered some free course materials to public, and shortly after UNESCO launched the concept OER in a policy forum. In the UK, open courses were offered by the Open Learn. This was at that time an innovative way of using course materials that were free and adaptable. Siemens and Downes' initial cMOOC was based on the connectivity of OERs, social media, and Rich Site Summary (RSS) flow, which allowed learners to create their own courses. In the case of xMOOCs, most courses use OER materials, but not all, and it is not by default as it was in the cMOOCs.

10.4 Conclusion and Recommendations

The discussion of methods of delivering education through the Internet has led to the notion of increased digitization in education. Because of MOOCs, online education has become a challenging issue that has been the subject of much debate. MOOCs offer a means for the reconstruction of learning and teaching by moving pedagogy towards the digital scholarship on teaching and learning (Weller 2011). The quality indicators and benchmarks discussed in this chapter can be used to assess the quality of online education environments and practices. These assessment tools are categorized into three domains of standards that can be used to guide the evaluation of the quality of online education:

- Management in the form of vision, planning, and infrastructure
- The development, instruction, structure, delivery, student assessment, examination security, and technological evaluation of courses; and
- Student and faculty support (Ossiannilsson et al. 2015).

This chapter provided a roadmap for institutions to establish policies about quality and quality assurance by benchmarking the implementation of OERs and MOOCs. The quality assessment of MOOC and OER practices requires evaluation tools that can be used to examine the potential for achieving quality. In today's academic agenda, the key challenge is to develop such tools and ensure that they can be used effectively to measure quality.

The open frameworks of OERs and MOOCs offer higher education institutions the opportunity to provide high-quality learning experiences to learners by emphasizing collaboration in knowledge sharing. By avoiding the need to purchase any textbooks and materials, OERs show both how institutions can provide equal access to education for all learners and maintain flexibility and openness in disseminating knowledge. Accordingly, institutions need to develop policies that increase the awareness and use of OERs and their potential effects on openness and collaboration in order to enhance the quality of higher education. Institutions need to pay attention to accessible and affordable learning processes, and OERs are likely to be a part of possible solutions. Although OERs and MOOCs are implemented to provide equal opportunity and openness in the higher education of learners worldwide, team-based policies and strategic plans require the collaboration of experts. There should be synergy among experts in providing OER and MOOC services in higher education.

At every level of education—casual, vocational, and formal—open educational practices can be part of an innovative strategy to enrich the openness and internalization of teaching, learning, and professional development. Furthermore, collaboration between experts and scholars on open education practices and open education movements can increase the acceptance of the digital age in which education should offer more collaboration and internalization among institutions to set quality benchmarks. Focusing on open education practices through the implementation of OERs and MOOCs not only leads to social inclusion and the participation of learners with specific needs and disabilities in the education process but also supports institutional policies and strategies for assuring quality. Openness and equality in education are fundamental in sustaining quality movements in educational settings and arenas.

The transformation of global open online learning and education has been enhanced by the use of OERs and MOOCs. These formats benefit higher education systems by offering digital advances that help in the implementation and assurance of quality. Developing sustainable OER and MOOC practices can guide higher education systems, provide equity, create social inclusion, and enhance quality and innovation.

In the promotion of innovative pedagogy and models in higher education, OERs and MOOCs can become indicators for institutional policies and management. OERs and MOOCs can be used to create alternative ways of learning and teaching, which ensure the dignity and equity of learners by providing social inclusion, group cohesion, and collaboration. Therefore, access, participation, and institutional involvement are important elements in fostering quality in higher education. Further research could be conducted to elaborate the practical implications of internalization and collaboration between institutions in terms of quality and benchmarking. Finally, future studies could use learning analytics to determine the ways in which learners, academics, and institutions could make the best use digitization and the Internet.

OERs and MOOCs are a vital part of the open educational landscape, and they can serve as facilitators of change in that setting. The future demands that we incorporate OERs, MOOCs, and future innovations into university offerings. Some key challenges in the implementation of OERs and MOOCs include the recognition, validation, and consequences of indicators and certifications of quality. Other challenges include understanding the future consequences of unbundling. Moreover, informal learning will be integrated increasingly into the mainstream process. Perhaps the greatest challenge is that educational institutions and organizations need to take responsibility not only for their regions or countries but also for the future education of the global population. In assuming this responsibility, collaborative and sustainable initiatives are required, such as the integration of OERs and MOOCs into the curricula of higher educational institutions worldwide. Education needs to keep pace with the increasing availability of knowledge everywhere and at any time through the Internet. In other words, institutions must answer the rhetorical question, "What is the point of education, when Google can tell us everything?"

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Chapter 11
How OER Enhances MOOCs—A Perspective from German-Speaking Europe

Martin Ebner, Anja Lorenz, Elke Lackner, Michael Kopp, Swapna Kumar, Sandra Schön and Andreas Wittke

11.1 Introduction

Since George Siemens and Stephen Downes organized the first Massive Open Online Course (MOOC) in 2008, there has been a dramatic increase of such online courses. MOOCs became a worldwide phenomenon following a Stanford University course on Artificial Intelligence that had more than 160,000 learners

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worldwide (Carson and Schmidt 2012). Several famous universities developed infrastructure to host MOOCs and MOOC platforms such as Udacity, edX or Coursera began to offer online courses for thousands of learners for free. MOOCs that were grounded in connectivism were termed cMOOCs and the new generation of MOOCs were termed extended or xMOOCs. MOOCs moved from an open course format to a very structured format. However, the most important development was the change from "open" in the sense of Open Education to "open" in the sense of freely available. While Siemens and Downes wanted to change the accessibility of learning content and proclaimed the use of open educational resources (OER), the commercially oriented offerings that followed were freely accessible but did not necessarily contain OER. The motivation of providing non-OER MOOCs is understandably ownership, uniqueness, and control, factors that might appear short sighted in terms of sustainability when MOOCs are offered over several years at institutions. Moreover, these factors might play a bigger role in the many business models that exist in higher education in countries such as the United States, but in German-speaking Europe (Germany, Austria, and parts of Switzerland, Italy) where public higher education is free of cost or includes very low fees, and copyright restrictions are very tight, there is a major need for OER in open education or even education in general.

To address this need, two MOOC providers in Germany and Austria, called mooin (Germany) and iMooX (Austria), started with a defined OER-requirement on all courses, unlike other well-known MOOC providers. All courses offered by these providers have to be licensed by a Creative Commons license, preferably an open license. Therefore, any educational resource (e.g., video, document, learning object) included in a course offered by mooin and iMooX can be used by anyone outside the MOOC even if the course has ended. Additionally, in May 2015, these two large regional university MOOC platforms that use free licensed content founded the MOOChub for better cooperation. The project MOOChub aims to offer educational content to a broad public and to reduce any barriers concerning accessibility. The project idea is rather simple; any course offered by one provider will also be offered by the other and vice versa. This ensures that courses that are available reach more people (especially those who are learners at only one platform) and also serve as a perfect OER example: Content is linked, reused, and, may also be changed in future.

In this chapter, we first describe the context of OER and MOOCs in German-speaking Europe with a special focus on the strict copyright law. Then, we provide an overview of why OER are essential in online courses and how they facilitate participation, cooperation with partners, creativity, the impact of the courses, and the sustainability of the content. Finally, evaluation results are presented and discussed. The main question we will address is: What is the current state of OER and MOOCs in German-speaking Europe and how does OER influences MOOC impact, participation, cooperation, and creative solutions?

11.2 Copyright and OER in German-Speaking Countries

In Central Europe (especially in Germany, Austria, and Switzerland), a strict copyright law protects the rights of artists, musicians, and authors. However, this also makes it nearly impossible to use such content for educational purposes as something like "fair use" (such as in the United States) is unknown. This is even the case when the educational usage of such resources is intended. For example, If a university lecturer produces content for a lecture and makes it available online and in a digital format to assist the students' learning processes, students are not allowed to copy any of the content into their personal learning resources and share it with anyone else. Each student has to ask for permission as to whether this is allowed or not. In the case of MOOCs this means teachers who participate in such a course are not allowed to use MOOC materials in their own classes or teaching. Thus the content provided by an author can only be used in a "read-only" manner otherwise the copyright is being violated and the violator can be sued, which happens quite often. At the same time, the reality is often different. The daily, illegal but more or less necessary behavior of content usage or copying, leads teachers and students to hide their content from each other. Thus the main difference between the copyright law in the US and Germany is that in the US content can be used for educational purposes following fair use guidelines or, the author has to specify his/her copyright on content or creative works, whereas in Germany and Austria any material is under copyright per se.

OER represents exactly the opposite of this status quo and therefore a solution to overcome these problems. They are not only freely available, but also free to use. Every single resource is delivered with a license that allows usage by teachers as well as by learners in a defined way. "Open" in German-speaking Europe means that (Ebner and Schön 2011):

- it is available for free,
- it is useable for free (can be changed, remixed, printed …),
- it is possible to use and modify the material with freely available open source software and open formats (e.g., OpenOffice), and
- it supports open teaching and learning processes.

Besides the copyright law, Geser (2007) points out further benefits of using OER in education (p. 21):

- OER offers a broader range of subjects and topics to choose from and allow for more flexibility in choosing material for teaching and learning.
- OER leverages the educational value of resources by providing teachers personal feedback, lessons learned and suggestions for improvements.
- OER facilitates learning communities, such as groups of teachers and learners, with easy-to-use tools to set up collaborative learning environments.
- OER promotes user-centered approaches in education and lifelong learning. Users are not only consumers of educational content, but create own materials, develop e-portfolios, and share study results and experiences with peers.

Since the early days of the OER movement, different publications have pointed out why OER is highly relevant for higher education (Caswell et al. 2008; Hylén 2006; Johnstone 2005). For example, the necessity for an own OER strategy was described by Schaffert (2010) and implemented for the first time at Graz University of Technology (Ebner and Stöckler-Penz 2011).

11.3 Non-OER MOOCs in German-Speaking Europe

Even though MOOCs might be seen as an incorporation of openness because the first "O" stands for open, MOOCs are mostly not OER, only their accessibility and pedagogical conceptualization can be labeled as *open* (Hollands and Tirthali 2014; Lehmann 2013; Rodriguez 2013; Schulmeister 2013). Hollands and Tirthali (2014, 27) summarize: "Truly open content is common in cMOOCs but less so in xMOOCs where ownership of content is often contentious and has to be worked out between faculty members, their employers, course platform providers, and would-be adopters of the MOOC content." The authors point out that contracts are not signed between instructors and MOOC platform providers, but institutions and platform providers. That is to say that "the individual instructors are unable to choose whether their content is made open access" (ibid.). Some instructors even fear the loss of control over their materials and that the lines between instructors and learners are blurred (ibid.). On the one hand, ownership, uniqueness, and control are the main arguments in support of providing non-OER MOOCs. On the other hand, financial issues have to be considered. OER has to be designed and developed; hence, working time and effort have to be compensated and it is not the user who pays for it, as Kerres and Preußler (2013) point out. New business models have to be created in order to cope with these financial considerations. Additionally, several initiatives and members of the OER movement demand the obligatory development of OER when they are publicly funded (cf. Bündnis Freie Bildung 2015).

These limitations hold for MOOCs in general. In her report about views of stakeholders on MOOCs and the copyright, Cheverie (2013, 2) summarizes that some stakeholders are concerned by a new situation: "Typically, educational institutions offer [...] courses as face-to-face, online, or hybrid classes to a defined group of students who have registered, been authenticated, and have a specific affiliation with the college or university. In this model, copyright issues are fairly well known, with appropriate policies in place, and copyright law provides guidance." MOOCs are provided by third-party platforms and their audience is a global one far away from the above mentioned "defined group of students who have registered." In German-speaking Europe, the situation is intensified by very tight copyright restrictions that present further barriers for sharing and sustainability. In this context, OER is a major need and requirement for open education or even education at all (Bremer and Robes 2012; Kerres and Preußler 2013).

11.3.1 Challenges for Learners

Copyright concerns that originate from the MOOC movement have been scrutinized by Cheverie (2013, 3) who focuses on the US-American law system and identifies new challenges regarding fair use and MOOCs: "What fell under fair use in a traditional classroom environment, however, might not apply to a MOOC. Similarly, licensing agreements for the use of third-party content in a traditional course need to be revisited for MOOC versions of the same course." For German-speaking countries, the provision of materials on a server is not only challenging, the distribution of copyrighted resources on a server might constitutes a copyright infringement and, hence, entails criminal proceedings (Hansen and Seehagen-Marx 2013). For the learners, these limitations lead to problems regarding ubiquitous accessibility of learning resources and their use in the learning process. They are not allowed to use, reuse, and remix the learning resources. Hence, the handling of longer videos might be copious, as instructors are not allowed to shorten them. Finally, even teaching assistants are not allowed to use the materials and resources provided for their own classroom use as reuse is prohibited, as well.

11.4 iMooX, mooin, and the MOOChub

In this section, we present an overview of open licensed MOOCs in German in the last decade, and then describe two OER MOOC platforms, iMooX and mooin in detail. We conclude with the MOOChub that is a cooperation between iMooX and mooin and aims to facilitate the offering, sharing, and reuse of OER MOOCs. We conducted extensive research on other German-speaking MOOCs but none of these courses runs under an open license.

11.4.1 A Short History of Open Licensed MOOCs in German

Due to the described barriers resulting from the copyright law, even the first MOOCs in Germany and Austria tried to strictly follow the open licensed model. Table 11.1 gives a short overview regarding the history and evolution of those courses.

These first MOOCs experienced great success in terms of registered participants and public responses and can be regarded as pioneers for the two MOOC platforms described in the next sections, because teachers and participants of these first MOOCs are now the providers of iMooX and mooin.

Table 11.1 OER MOOCs from German-speaking countries until 2015

Date and license	Course name, URL	Short description (participation, content)
May–July 2011; CC BY-NC-SA	OPCO11; http://blog.studiumdigitale.uni-frankfurt.de/opco11/	First MOOC in German about the "Future of learning" organized by different stakeholders, with the MOOC of Siemens and Downes 2008 serving as a model
April–July 2012; CC BY-NC-SA	OPCO12; http://opco12.de/	MOOC about "Trends in the area of e-teaching," followed the same format as OPCO11
March–June 2013; CC BY-SA	COER13; http://coer13.de	MOOC about open educational resources to train teachers and interested people about the use of OER in their daily life
February–April 2015; CC BY-NC-ND	Lehrer2020; https://lehrer2020-bw.de	Specially for student and teachers

11.4.2 The First OER MOOC Platform in German-Speaking Europe: imoox.at

The first OER MOOC platform in German-speaking Europe was founded in 2014 by the University of Graz and the Graz University of Technology in Austria. The development of the platform named "iMooX" started as a project that was partially funded by the regional Styrian government. Right from the beginning, all the project partners involved agreed on the fact that all content had to be provided as OER. Thus, the slogan "education for everybody" was created for the platform to stress the importance of offering free access and to allow everyone to reuse the provided material. Providing exclusively OER was the reason for UNESCO to take iMooX under its patronage.

iMooX is designed to offer classic xMOOCs; in general, courses on the platform contain video lectures, quizzes for self-assessments, and a discussion forum. The development of the platform started in 2013, the results from a functional platform as well as three MOOCs were available in March 2014. These three MOOCs had a total of 1300 participants, of which 89 % held a high school diploma that enabled them to study at a university, and 57 % had at least a Bachelors degree. Fifty-four percent were older than 35 years, indicating that more than half of the participants attended the courses either for further education purposes or because they were personally interested in the course topic. Eighty-five percent were satisfied with the functionality and the design of the platform.

iMooX was established for several reasons. First of all, the platform operators intended to provide free online courses for the widest possible audience (which includes those with an academic degree and those without). Second, some of the courses are offered as online lectures especially for students, who can gain credits

Table 11.2 Selected courses from imoox.at

Date and license	Course name and topic	Participation (registered people, contributions in forum, badges)
2014, CC BY-NC	"Learning in and with the Internet"—MOOC about the use of digital media for teaching and learning	Nearly 1000 participants in the first run and more than 1000 participants in the second run
2014, CC BY	"Gratis online Lernen"—Starting to learn in a self-organized way with free internet resources	More than 1100 registered participants in the first run and another 400 in the second run (2015); more than 23,000 reads in the forum
2015, CC BY-ND	"Social aspects of information technology"—MOOC about how information technology influences society	About 900 registered participants and a final certification rate of 49 %
2015, CC BY-SA	"Course about open educational resources"—MOOC about OER	This course was a relaunch of COER13 (see Table 11.1) and attracted about 500 participants. For the first time badges were used, with about 100 issued badges for the final examination
2015, CC BY-(partly SA)	"Making with children"—MOOC about making activities for children	More than 500 registered for this course and it is still growing. For the first quiz more than 100 badges were issued

by passing an extra exam. However, these courses are also open for all other target groups. Last but not least, the platform and its courses support the marketing activities of the universities involved by displaying excellent examples of academic teaching.

In the winter term 2015, 16 courses were available on the platform and more than 7700 users had already registered for iMooX. A wide range of courses was offered, for instance, in the fields of physics, chemistry, computer science, informatics, contemporary history, and social sciences, and on topics such as "free online learning," "e-learning and law," "social media and school," or "creative digital design for children" (see Table 11.2).

In the meantime, iMooX is no longer a project but a more or less regular service available to all departments and their lecturers. Financing the course production is rather difficult, though. Since all learning material is meant to be OER there is no business model with which one can earn money. Therefore, the platform relies on donors, who could be the public sector, NGOs, or even companies. The creation of every single course has to be separately financed, which is extremely cumbersome, mainly because one-fifth of each financing must be used to partially cover the costs of operating the platform itself. Therefore, in the case of iMooX, financing course production is the biggest challenge when it comes to producing MOOCs as OER.

11.4.3 The German MOOC Platform: mooin

The Lübeck University of Applied Sciences (FH Lübeck) in Germany is working on two MOOC projects. The first one, called "FHL-MOOC," is funded out of the "Struktur- und Excellenzfonds" by the Federal State of Schleswig-Holstein for developing 12 MOOCs to address new target groups. The second one is "pMOOC" ("professional MOOC"), funded by the Federal Ministry of Education and Research (BMBF) to explore the MOOC format for lifelong education in the academic sector. Overall, the FH Lübeck plans to offer 40 MOOCs by 2020 on its MOOC platform mooin and each one should run as OER under a free license.

Lübeck is one of the largest Moodle-hosting universities (Moodle is a widely used Open Source Learning Management System) in Germany with more than 64,000 users in more than 25 different Moodle-installations. mooin is based on a Moodle framework with a strong focus on user experience and Web 2.0 technology. For the development of mooin three main aspects were considered

1. Mobile first (Fat Media concept) (Lorenz et al. 2015).
   Based on a responsive web design with one-column media elements, the user experience was optimized for mobile devices. Interactive quizzes are directly integrated in the videos and provide a wide range of quiz formats and thus support a wide range of didactical approaches.
2. Gamification by using Open Badges
   mooin is the first German MOOC platform supporting Mozilla's Open Badge standard (MOBI). The learners can achieve badges for different learning activities. A badge overview for each MOOC presents the history of the last 20 assigned badges. The open list of participants also presents which badges had been assigned to whom.
3. Social Media
   Each mooin-MOOC has its own hashtag. Thus, it has its own URL. Based on the didactical concept and the strategy for social media marketing, each MOOC can use its own social media channels like Facebook, Twitter, or G+. mooin supports embedded elements to connect YouTube playlists, Facebook like-boxes, or tweets.

mooin launched in spring 2015 and started with four new and two old MOOCs. "Hansemooc" and "Grundlagen des Marketing" were offered previously in 2013 and 2014 on different platforms (Moodle and iversity) to gain initial practical experience, e.g., how MOOCs are to be run and how the platforms are working. As of November 2015, mooin had eight MOOCs with 5784 users registered and 8349 course enrollments (44 % of the users have two or more MOOCs courses) as shown in Table 11.3.

mooin started as an open platform. Everybody is welcome to run a MOOC for free, but technical skills are needed to use the backend and the quiz editor (www.capira.de). Furthermore, knowledge in MOOC production, didactics, teaching, and marketing is needed. The KLOOC was the first MOOC produced by a university

Table 11.3 Selected courses from mooin.de

Date and license	Course name and topic	Participation (registered people, contributions in forum, badges, …)
2015 most videos CC BY	"Hansemooc"—historical MOOC about Lübeck and the Hanseatic League	3rd offering with 234 participants (1st and 2nd on Moodle resp. diversity with more than 2,000 participants), 136 badges issued out of 8 individual badges (1st MOOC on mooin for piloting the platform)
2015 most videos CC BY	"VideoMOOC"—fundamentals of video production	2430 participants, 1012 badges issued out of 7 individual badges
2015 CC BY	"Projektmanagement"—1st pMOOC on academic level about fundamentals	1274 participants, 316 badges awards out from 3 badges
2015	"KLOOC"—MOOC about sustainability from TU Kaiserslautern	492 participants, 1,522 badges issued out of 10 individual badges
2015 videos CC BY	"Grundlagen des Marketing"—fundamentals on academic level	Third times running with 334 participants (1st and 2nd not on mooin with over 8000 users), 96 badges issued out of 4 individual badges
2015 CC BY	"Das Digitale Ich"—about the digital identity is a cooperation with two adult education centers	1720 participants, 4902 badges issued out of 16 individual badges
2015	"Corporate Learning"—MOOC with 8 different companies about corporate learning	1630 participants, 635 badges issued out of 10 individual badges
2015 videos CC BY SA	"MOOC25"—MOOC about the 25th anniversary of Germany's reunification	234 participants, 100 badges issued out of 6 individual badges

other than Lübeck and was very successful for the Kaiserslautern University of Technology; more cooperations will follow. Therefore, the mooin team is still working on tutorials and documentation to provide better services for third-party institutions wishing to offer a MOOC using this platform.

After six months, mooin is a main part in the digital strategy of the FH Lübeck and is part of a long-term OER initiative. Lübeck will support the use of different installations of Moodle with videos, pictures, or whole courses under free licenses, because the openness of higher education is one the tasks for education in the twenty-first century in Germany.

11.4.4 The MOOChub

The MOOChub was founded by the MOOC platforms mooin and iMooX in May 2015. Each platform offers its own MOOCs and links to the courses of the other

Fig. 11.1 External Referrer activity between iMooX and mooin from March to November

MOOChub partners, i.e., the HanseMOOC that runs on mooin is presented on iMooX and the Graz-MOOC on iMooX is listed on mooin. Thus, each MOOC platform reaches more potential participants and learners can choose from a wider range of courses. Since May 2015, 1.4 % of all users on mooin clicked on a link on iMooX, thus imoox.at is the third important external reference with 6.5 % for mooin and vice versa as shown in Fig. 11.1.

Beyond the agreement to include links to each others courses, further cooperation between MOOChub partners is planned such as cooperative research, a cooperative badge portal, and experience exchange, e.g., a cooperative MOOC that will be run on both platforms and will use OER content on both sides. Based on the success of iMooX and mooin, OER will play a central role in future courses. The MOOChub will be extended and research will be undertaken. For example, the course on OER will simultaneously run on both platforms next year to see if more people can be reached and if the platforms are supplementing each other.

11.5 Discussion: Enhancing Education with OER MOOCs

In previous sections in this chapter, we provided an overview of copyright laws and OER in German-speaking Europe and described the OER MOOC platforms iMooX and mooin in detail. Here, we provide examples to discuss how both platforms enhance education with online courses through OER. OER enables participation, cooperation with partners, creativity, sustainability of the content, and course impact. OER results in new ways of teaching.

11.5.1 Enabling Participation

From the learner's perspective, it does not matter if course materials are OER or not, at a first glance. Taking a deeper look, OER enables the use and reuse of course content in different ways that change the ways in which learners participate: The materials can be openly shared, and reused in discussions with other learners, even outside the platform. The focus is on having more users use the materials and use them in different ways, not so much on having a high number of registered users.

This allows (re-)publishing of the content on other platforms, for example YouTube for the videos.

Depending on the types of learners in a MOOC, this can also have far-reaching consequences. For example, on completing a two year review of learners in HarvardX and MITX MOOCs, Ho et al. (2015) shared that one-fifth of the learners in MOOCs were teachers or instructors where 39 % were past or present teachers and 21 % currently taught in the topic area of the MOOC they were taking. If a MOOC was to contain OER and be hosted on an OER platform like mooin or iMooX, and teachers and instructors were a significant percentage of the learners taking the MOOC, they would be able to revise, reuse, and adapt the OER for their own learners and their teaching contexts, greatly increasing the impact and reach of the MOOC. An actual example of reuse was when the virtual university of teacher education organized an online course supplementing two MOOCs on OER (COER15 and COER13). As a result, a so-called OER-study-guide was developed as a kind of summary of the whole course. Moreover, it is now available for free online and with an open license and can be used in other contexts not just by the participants who took it but also by others wishing to teach about OER.

11.5.2 Cooperation with Partners

Our experiences with MOOCs in German-speaking Europe have indicated that they are attractive for organizations or partners who try to educate a broader public. Nevertheless, in our discussions we determined that OER was more or less a precondition to start cooperation, otherwise it would be very hard to bring the learning content to different educational institutions and different teachers and trainers. We provide a brief list of different types of cooperations below:

- The iMooX course „Gratis Online Lernen“ (“Free Online Learning”) was done in partnership with *Volkshochschule Österreich* (all adult and community education centers of Austria) as well as the *Volkshochschule Hamburg* (the adult and community education center of Hamburg). Furthermore, different local groups participated in the online course with regular weekly face-to-face trainings. The virtual university of teacher training in Austria held a virtual weekly training for interested teachers. Due to the OER license, there were no problems with the (re)use of course content anywhere and by anyone.
- The *ichMOOC* (“meMOOC”) on digital identity on mooin was a coproduction with the *Volkshochschule Hamburg* and the *Bremer Volkshochschule* (adult and community education centers of Hamburg and Bremen). Centers of adult and community education called “Volkshochschule” are very traditional institutions for in-class adult education but without an infrastructure for MOOC production—often even without an infrastructure for low-level technology enhanced learning. The cooperation not only allows these institutions to produce an online course, but also to reach a much wider audience than before. The course had 1633

participants while it was running and 4400 course badges have been assigned. The course is licensed under CC BY, and all 41 videos are available via YouTube. It was the largest course ever offered by a center for adult and community education (the Volkshochschule) in Germany.

- OER and openness of iMooX courses also lead to the usage of the MOOCs through formal educational programs. For example, the course “Gratis Online Lernen” was used to teach two classes in online learning at the university of teacher education in Linz and was integrated into the continuing education program in Bozen, South Tyrol (Italy). A new MOOC about the Maker Movement is part of a course at the university of technology Köln.
- Because of the 25th anniversary of the German reunification, the Kooperative Berlin chose mooin to publish their MOOC25 that addresses several research topics of this field. Funded by the Federal Foundation for the Reappraisal of the SED Dictatorship, five researchers gave input on commemoration, happiness, memorials, influence of media, and literature concerning the German reunification. It started on October 3, 2015 (German Unity Day) and currently has 230 participants. All content is licensed under CC BY-SA, and all videos are published on YouTube.
- To promote further collaboration, the Lübeck University of Applied Sciences announced the “MOOC of the Year 2016” contest to support the winning MOOC concept with fees and services worth a total of €25,000. One central condition of the Call for MOOC concepts was that the MOOC had to be licensed under CC BY. The winning MOOC that addresses the field of unemployment and unemployment insurance will start in spring/summer 2016.

11.5.3 Impact of the Courses and Creative Solutions

Geser (2007) proposed that OER will lead to creative and new solutions in education. We list a few creative solutions and impact in German-speaking Europe here:

- The iMooX course “Gratis Online Lernen” developed a new didactical approach called inverse blended learning (Ebner et al. 2015). The facilitators created a course handout in addition to the MOOC content and sent this to the local learning groups and trainers. The main idea is that the online course will be enhanced by face-to-face meetings. Inverse blended learning means that an online course is brought back to face-to-face situations.
- The adult and community education centers used the ichMOOC to build up a network of almost 50 so-called MOOCbars in Germany, Austria, Switzerland, and Italy, which were other centers that offered local support for participants of the ichMOOC. Furthermore, three live sessions were exclusively streamed to these MOOCbars and motivated the networking of regional MOOC participants.

The Creative Commons licenses allowed each person in a MOOCbar to use the provided content for further discussions there.

- A further example for the impact of OER MOOCs is that the course “Gratis Online Lernen” got the Austrian State Prize for Adult Education 2015 due to its impact on educating a broad public.

11.5.4 Sustainability of the Content: Remix and Reuse

A huge advantage of OER is the sustainability of course contents as well as the ease of reuse. Users are able to continue to register in courses that are already over to take the courses at their own pace. It is possible to develop new content from MOOC OER content to teach different target groups, as mentioned in this chapter. Another interesting aspect of using OER in MOOCs is the relaunch of courses. For example, the course about OER (COER13) has been completely downloaded and re-uploaded to iMooX. The course was restarted in summer 2015 with some new videos and interviews and attracted more than 500 users. In other words, reusing and remixing allow for the reoffering of courses without supplementary full costs.

Finally, although embedded videos on mooin or iMooX are not recognized by YouTube analytics because of the Capira quiz layers, some information on the sustainability of the videos is available. Two examples: the ichMOOC playlist was run 1421 times and saved by 22 users and the 22 videos of “Grundlagen des Marketing” have 157,000 clicks. All MOOCs on mooin and iMooX are still available, even if the course is already over. Thus, the whole content is available for everyone. All videos are additionally published on YouTube, with the aim of bringing OER to a broad public.

11.6 Conclusion

OER MOOCs are essential in the context of copyright laws in German-speaking Europe. The promotion of MOOCs as learning material or as a basis for in-class teaching in schools, higher education, and training can only be successful if local teachers may use, adapt, and remix the provided content. Further, if MOOCs are to enable self-directed learning, and also support learning and teaching in groups, OER can play a central role. The creation of OER MOOCs also opens up opportunities for new ways of teaching and learning and didactical concepts. Only with an “O” for “Open” in the sense used in “Open Educational Resource” can MOOCs be really open, foster sustainability, and contribute to a more open and better education and world.

11.6.1 The Role of German as a Language

Currently all the courses on mooin or iMooX are in German, because both platforms aim to educate the broad public, where German is the native and/or common language. Furthermore, the local financial supporters and regional governments are strongly interested in enhancing education in the region. These goals are supported by the learners' data. An initial analysis of the platform iMooX revealed that about 20 % of the learners are directly from the region nearest to the location of the initiative, an additional 49 % are from Austria, a further 15 % come from the German-speaking area, and only 16 % from a non-German-speaking area. An analysis of the platform YouTube in the case of iMooX reveals that 52 % of the users come from Austria and 42 % from Germany, Switzerland and Italy, indicating that the videos more or less attract learners from those areas. In other words, MOOCs offered in a particular language mainly address the needs of the region where they are placed. This fact makes it essential that our MOOCs are in the language of our learners.

11.6.2 OER: A Challenging Opportunity

The development and usage of OER is an opportunity, but is also very challenging. Based on our experiences, the main challenges are listed below:

- First of all, OER is a matter of copyright, and the development of open licensed materials most of the time constitutes the (new) development of everything. Additionally, the usage of OER needs to be discussed with contributors and developers, needs their support, and involves changes, e.g., in author contracts.
- Second, OER limits the opportunities of commercialization of course materials. From a business perspective, OER MOOCs require different modes of (co-) financing, e.g., when the MOOC content cannot be simultaneously used in paid courses.
- OER apart, the development of an online course and multimedia content is a challenge for most experts and contributors, even if they are from media or learning related fields or are instructional designers. For example, the trailer of the ichMOOC is the only video of the course that could not be published under an open license, because of the background music that was bought from a commercial platform.

11.7 Summary

In this chapter, we described the need for OER MOOCs in German-speaking Europe and the implementation of exclusively OER MOOCs by the providers iMooX and mooin. We also discussed how the combination of OER and MOOCs has powerful advantages, especially with respect to copyright law in education, cooperation amongst partners, the sustainability of learning content, course visibility and impact, and innovative and creative solutions.

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Chapter 12
Open Learning: 'Communication and Mobile Learning' at Spanish University

Sonia Santoveña Casal and Alejandro Silva

12.1 Introduction

This chapter reports a study of the application of the virtual learning model in a MOOC, 'Communication and mobile learning', within the project 'Elearning, Communication and Open-data: Massive Mobile, Ubiquitous and Open Learning' (ECO) of European Commission. According to Lisbon Strategy and Europe 2020 Strategy's goals to build up a knowledge-based society in the Eurozone and to lower or remove technological barriers in M-learning processes for users with special needs or at risk of exclusion.

The study has been carried out in the 2014–2015 academic year. The MOOC is addressed to teachers, professionals related to social and educational sectors, and all people interested in education. Above all, the MOOC is interesting for teachers who want to develop their job in e-environments.

In these lines we present a study about the effectiveness of 'Communication and mobile learning' MOOC, during the 2014–2015 school year, with 765 students enrolled. The learning model effectiveness will be analyzed by contrasting students' opinions before and after the course. Some aspects have been considered essential to assess the model effectiveness: acquired knowledge and performance, interest and innovation level of the formative proposal and overall satisfaction with the course.

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12.2 Theoretical Framework

12.2.1 'Communication and M-learning' Within ECO Project

'Communication and M-learning' is the title of a MOOC (Massive Online Open Course) designed in Spanish by the Faculty of UNED and University of Zaragoza (Spain) within 'Elearning, Communication and Open-data: Massive Mobile, Ubiquitous and Open Learning' (ECO) of European Commission, according to Lisbon Strategy and Europe 2020.

ECO Project started in February 2014, and is led by UNED involving 23 partners including enterprises and universities from Spain, France, United Kingdom, Germany, Italy, The Netherlands, Argentina, and Colombia.[1] Given the evident geographical gaps, as well as the digital concept of the project, partners are supposed to work online through digital platforms and conferences, although face-to-face meetings are taking place once a semester.

This MOOC, designed by UNED and the University of Zaragoza, is part of a series of online, free and open pilot courses, without limitation of capacity or access requirements. Thus, in late 2015 participants can register up to 20 courses developed by all the project partners. Subjects of study are diverse, with titles such as "E-Learning Project Management", "Experimentation With Mathematics and Geomatics" and "Digital literacy" among others. The courses take place in up to six languages (English, Spanish, French, German, Italian, and Dutch), but have a common educational framework developed and adopted by consensus among the partners.

Objectives

Following the directives of the Digital Agenda for Europe and being that "over 50 % of Europeans use the internet on a daily basis", ECO Project aims at introducing "the solution to enhance digital literacy, skills and inclusion". Within this context, European Commission points out that "the digital revolution brings important opportunities for education and it is time to scale-up the use of IT in learning and teaching to exploit freely available knowledge."

The ultimate and main aim of ECO is to train 4000 certified teachers who will be able to create their own online courses and other educational resources and distribute them through the learning platform that comprises all pilots. In order to achieve this goal, a special MOOC called "Step by step", which is the first one MOOC available in six languages, has been designed.

In addition, European Commission considers that qualifications should open as many doors as possible and academic recognition can lead the way. In fact, ECO partners offer MOOCs with the possibility to obtain a formal certificate (to be paid

[1]More information about partners is available on ECO Project portal: http://project.ecolearning.eu/about-eco/partners/.

for), i.e., official credits that may be taken into account towards obtaining a degree (in units of ECTS).

On the other hand, the project attends to find a solution in order to avoid high dropout rates (very frequent in MOOCs) and to prove the potential of MOOCs for breaking down technological barriers in learning for people with special needs or at risk of exclusion.

Consequently, 'Communication and M-learning' course is designed to stimulate open and flexible learning and to improve learning outcome, assessment and recognition, as well as to tap into the potential of IT and Open Educational Resources for learning.

Teaching principles

ECO Project Courses, and particularly this course, follow the main principles of Massive Online Open Courses, and, specially, of sMOOCs or social MOOCs. They attend to learner-centeredness, interaction, flexibility, digital inclusion, openness, and ubiquitous learning.

Teaching principles are intercreativity and interculturality, based on the sMOOC model of network, ubiquitous and contextualized learning, with a key prominence of mobile devices. All participants' individual skills and competences are not only added up, but also actually enhanced through the richness of individual creativity and each person's multiple intelligences, combined with common goals, resources and achievements.

The learner is put central and enters the sMOOC to meet his personal learning objectives. Platform works like a main square where learners learn by building knowledge by interacting with others in forums, wikis, and social networks, by being active in situated, authentic tasks (Mulder and Janssen 2013).

Constructivism and connectivism prevail here among different learning theories. As well as Siemens (2005) stands up for, 'Communication and M-learning' staff pretend to offer participants a "nebulous" environment that enable them to see connections between fields, ideas, and concepts: "Decision-making is itself a learning process". In this sense, wikis, forums and social networks are offered to students in order to participate, ask questions, discover problems, and, to sum up, get involved. Learning comes from experiencing, creating and inventing, because real learning only occurs "when the student manages his own learning" (Kaplún 1998).

Bearing this in mind, openness is a key factor in this ECO course, not only of no financial cost, but also open accessibility, open licensing policy, freedom of place, pace and time of study, open entry, and open pedagogy (Weller 2013). To support this at a maximum level, ECO partners offer all content in MOOCs with an open licensing policy (reuse—remix—rework—redistribute).

The teacher facilitates the process and doesn't reproduce the "banking" concept of education, in which the scope of action allowed to the students extends only as far as receiving, filing, and storing the deposits (Freire 1968). Teacher does not act as knowledge provider in a one-way knowledge transfer mode. On the contrary, pedagogical framework and activities of ECO MOOCs are designed to promote what has been called relational factor (Gabelas Barroso et al. 2013), encouraging students to be part of the construction process of learning like neurons in a powerful synaptic network, by participating in a working community through active discovery, association and interaction. Moreover, due to the high learner-to-teacher ratio of MOOCs, individual feedback from the instructor has become virtually impossible (Suen 2014).

Furthermore, course ‘Communication and M-learning’ is based on peer-to-peer assessment (P2P). Meanwhile didactic staff designed assessment rubrics for all peer-assessed activities, platform developers provided a software system which links randomly done activities with different examiners (participants). Whether the results are accurate or not, it is considered valuable as an instructional tool in its own right, because peer assessment and peer discussion forums provide formative feedback to students (Suen 2014).

Therefore, ECO sMOOCs rely on a flexible pedagogical framework with a focus on networked and ubiquitous learning as the only means to deal with the number of students enrolling and to deal with the personalized learning objectives of these learners and to allow MOOC designers to design their courses flexibly in a variety of ways to meet pedagogical requirements.

12.2.2 sMOOC ‘Communication and M-learning’

‘Communication and M-learning’ is the title of a MOOC designed in Spanish by the Faculty of UNED and University of Zaragoza (Spain) within ECO project.

MOOC lasts for eight weeks (5 ECTS), which represents a workload of 125 h, an average of 15 h/week. It has not been established in advance a specific delivery schedule of topics, in order to facilitate individualized learning organization. So, a flexible schedule has been set during those these eight weeks.

The MOOC is aimed at teachers, professionals related to social and educational sectors, and all people interested in education. Above all, the MOOC is interesting for teachers who want to develop their profession in e-environments.

The MOOC has been developed in the OpenMOOC platform.

Course goals are the following:

1. Knowing the relational factor relevance when technology is involved in communication processes.
2. Learning to communicate effectively, playfully, creatively, and instructively in learning communities, social networks, and through mobile devices.
3. Learning to design an innovative methodology which makes use of M-learning educative and communicative chances.
4. Knowing M-learning characteristics and principles.
5. Developing practical and theoretical knowledge which endorse daily demands as teachers within ‘Communication and M-learning’.

Although teachers are the course targets, it is open to everybody and does not require any previous knowledge. It has six teaching units:

1. Introduction: Communication
2. Communication: Theoretical framework
3. Technologies to communicate
4. M-learning
5. M-learning applications
6. Asynchronous and synchronous tools.

Generally speaking, the methodology is based on the principles of constructivism and connectivism as well as the potential of open educational resources (OER) to quality and access to education. Collaborative and individual tasks are complementary and activities are integrated into the learning process. Forum and social network debates, Wikipedia or Facebook have been used in order to develop collaborative learning. Nevertheless, we have used individual activities so as to reinforce learning.

It has 8 published units, 26 nuggets and 11 tasks. Each unit comprises videos, podcasts, lectures, bibliography, web biography, and some activities. Documents are available in different format (PDF, audio, video). The didactic material is accessible to students with disabilities. Videos and audios have subtitles and audio-descriptions.

Students who complete the course can apply for a credential or certification. The first one serves to prove having completed it. However, the certification is achieved after an online or in person, always with identity checks, and gives the right to obtain 1 ECTS credit.

Communication with students was conducted through the ongoing discussion forums and social networks (Twitter and Facebook). Seventeen forums were created and 451 messages were sent to the forums.

Besides, several educational activities have been proposed, such as:

- Media education as first contact with Twitter
- Identify a communicative situation in a context of real learning
- Monitoring of a TT phenomenon
- Me and Wikipedia
- Discussion on LinkedIn and SWOT analysis of the benefits and risks of social networks in education
- Brief essay about the importance of interrelations in education
- Analysis of mobile APPs for integration edu-communicative
- Discussion on Facebook
- Participation and discussion on Twitter about M-learning.

A continuous assessment system has been developing during the 8 weeks. It has consisted in using peers (P2P) among different activities, such as design a didactic experience in which they integrate the knowledge acquired during the MOOC. For conducting peer (P2P), students have tutorial with concrete guidelines and rubrics to assess the work done by others students in each of the 12 compulsory activities. Quantitative and qualitative evaluation has been carried out following the rubrics designed for each activity.

12.3 Assessment of the Didactic Experience

During the 2014–2015 school year, efficacy, advantages, and limitations of the social model were analyzed basing on student opinions and learning achievement levels.

12.3.1 General Description of the Didactic Experience

The MOOC first edition took place from October to December 2014. Subsequently, the second iteration of the course was held from April to May 2015. Considering the results of the first assessment of the course, teachers are working in the incorporation of changes in order to make an improvement educative offer.

Below, the results obtained from the assessment of the experience are presented.

12.3.2 Participants

The assessment involved 765 students. The sample was formed by 199 students, although the participation was unequal when answering the questionnaires.

Definitely, the participating sample was composed of 135 students who took the online survey 'Pre-survey: Expectations and previous knowledge', 20 who took the online survey 'Post-survey: Satisfaction, expectations fulfillment and acquisition of knowledge' and, finally, 44 who took the online survey 'User Satisfaction Questionnaire' (see Table 12.1).

In all cases, the sampling error was found by taking into account the different participating samples, on the basis of simple random sampling in the least favored case ($p = q = 0.5$), considering a confidence interval of 95 % (see Table 12.1).

12.3.3 Data Analysis

Data were collected within the framework of the MOOC, requesting participants to fill out some questionnaires as activities. It was carried out during the first iteration (from November 2014 to January 2015) and during the second iteration (from May to June 2015).

Table 12.1 Sample and sampling error

	Online survey			
	Pre-survey	Post-survey	User satisfaction questionnaire	Total
Sample	135	20	44	199
Sampling error	7.8 (0.078)	22 (0.22)	14.6 (0.14)	6 (0.06)

Three questionnaires were presented to the students

1. Pre-survey: Expectations and previous knowledge (attached at Appendix 1)
2. Post-survey: Satisfaction, expectations fulfillment, and acquisition of knowledge (attached at Appendix 2)
3. User Satisfaction Questionnaire (Attached at Appendix 3).

Both pre and post surveys were designed ad hoc for the evaluated MOOC. These surveys aimed to measure expectations, previous knowledge, satisfaction and acquiring knowledge of students. A validation of these surveys was carried out by two University of Zaragoza teachers, one expert on MOOCs and two teachers from the UNED. Following suggestions were satisfied:

– Pre-survey: To improve items 1 and 2 wording and to add item 6 ("How did you get noticed about this course?").
– Post-survey: To improve items 1 and 2 wording and to reformulate item 5 ("Generally speaking, have you got what you did expected with the course?").

Regarding "User Satisfaction Questionnaire", it was designed and developed by a team of ECO Project (*E-learning, Communication and Open-data: Massive Mobile, Ubiquitous and Open Learning*), led by University of Oviedo. Main goal of this survey '(…) is to contribute to the evaluation of the MOOC designed in the ECO project. To do this, it collects specially the assessments of users of these courses. So its focus is in the subjective evaluation, taking this function from a comprehensive design evaluation of this project, for which this part is complementary to the objective evaluation, made this one especially through analysis of traces left by the users of every MOOC' (Fueyo 2015: 12).

User Satisfaction Questionnaire was organized in three types of questions: five questions about sociodemographic topics, two questions about student profile and 24 questions related with MOOC (design, content and others aspects of the courses) (Fueyo 2015).

Realibility and validity

Attending Sharples (2009) generally it is not possible to control factors to an extent that would make a comparative study appropriate, but this same author establishes that evaluation of mobile learning "is not intrinsically different to other forms of learning" regarding researching goals about "knowledge, skill and experience". In spite of this, quality analysis of level and type of participation, among others factors, is an essential task to be done in order to fulfill the objectives of thousands of learners (Perifanou 2014).

Because of that, a reliability rank establishment is necessary. A *Cronbach Alpha* of 0.60–0.70 is considered good and above 0.80 very good (Fernández and Lebrero 2015; Morales 2007a).

On the one hand, in relation with surveys reliability, It is necessary to highlight the impossibility about obtaining "User Satisfaction Questionnaire" reliability rank, because its gross data will not be available until the end of the project (available data are available on Fueyo & co. 2015).

On the other hand, pre-survey produced a *Cronbach alpha* rate of 4.69, while post-survey reliability produced a rate of 0.772. According to Morales (2007a, b), pre-survey low reliability could mean that there is no difference among the subjects' opinion analyzed:

> (…) without differences among individuals, a high reliability coefficient cannot be obtained. Reliability is a positive feature if and when someone is interested in detecting differences which are supposed to exist (Morales 2007a: 14).

Furthermore, following Morales (2007b: 4) it can be assumed reliability is not an instrument feature, but a feature of some results about scores in a given sample'. So, '(…) a same instrument can properly measure or rank the subjects of a specific sample, very precisely; and at the same time it can badly measure, with a large margin of error, the subjects of another sample' (Morales 2007b: 4–5).

Pre-survey low reliability implies students' expectations data would need to be replicated and/or expanded. Considering this studio as a pilot study, reliability could be considered low, but not far from the values indicated by Nunnally (1967). Nunnally points out 0.50 or 0.60 reliability rates would be acceptable in the early stages of the investigation.

This investigation is based on pre-survey results acceptance. Nevertheless, it is considered necessary to replicate in the future this research with a sample of different students.

Content analysis technique was used to analyze the open-ended questions of pre-survey and post-survey. Descriptive statistics were carried out on the closed-ended survey questions.

Quantitative approach provides objective data, while qualitative approach, through the implementation of content analysis (objective and systematic reading of the answers, underlining the main aspects, identification of common and distinguishing aspects and drawing conclusions), has as an objective to achieve a depth view of the situation.

Content analysis has been defined as a set of communication analysis techniques designed to obtain indicators (quantitative or qualitative) through systematic procedures as well as objective descriptions about contents of messages, allowing the inference of knowledge in relation with the received messages (Bardin 1986).

Regarding this research, content analysis has been developed through the following stages: objective and systematic lecture of responses, highlighting of principal aspects, identification of common and distinguishing aspects, and conclusion enactment. Moreover, in order to systematize data analysis, some Llamas's et al. (2001) recommendations have been followed:

1. Defining content universe and selection of the sample;
2. Electing analysis unit (sentences and paragraphs obtained from open questions);
3. Establishing rules list:
   - Presence or absence of certain elements: quantification of responses with two values; Yes/No
   - Frequency or number of occurrences of certain content regarding responses about their course expectations.
4. Establishing categories based on contents. Main categories were:
   - Interest of MOOC: Review about the interest of MOOC.
   - Innovation of MOOC: Review about MOOC innovation grade.
   - Students' expectations: Learning expectations of the student.
5. Treatment and analysis data: Quantitative and qualitative data analysis and presentation of percentages.

Content analysis technique was used to analyze the open-ended questions. Descriptive statistics were carried out on the closed-ended survey questions.

12.3.4 Results

12.3.4.1 Expectations and Previous Knowledge

Previous knowledge level which students have about communication and M-learning and the knowledge level which they consider will acquired during the course has been analyzed, as well as the interest level and innovation perceived in the formative proposal and expectations placed on the course. It could be highlighted that 39.26 % of participants had an initial previous knowledge about mobile communication and the 28.15 % of students did not know anything about this subject. On the other hand, it is found that 28.15 % had a medium previous knowledge (see Fig. 12.1).

It could also be highlighted that 45.19 % of students consider that they would **acquire** a medium level of knowledge and the 39 % consider that they would acquire a high level of knowledge (Fig. 12.2).

Apart from that, a considerable percentage of participants (more than 97.8 %) replied that it was an interesting course and the 2.2 % did not answer the question.

Students specially appreciate the innovative thematic of the educative proposal ['(…) is innovative to apply it in the classroom'] and relevance of the subject treated ['(…) Because social networks, distance learning, etc. is something teachers can not do without currently'].

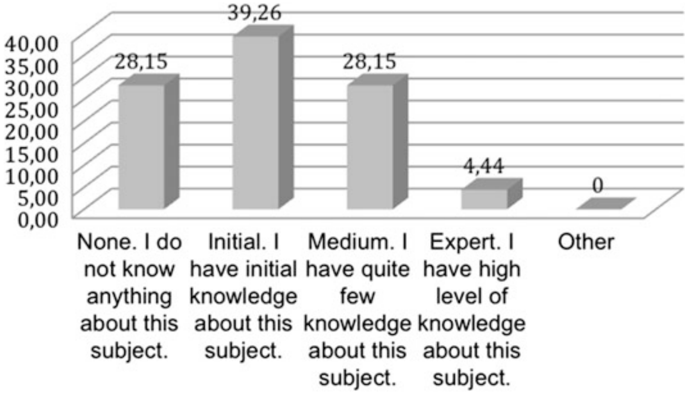

Fig. 12.1 Previous knowledge

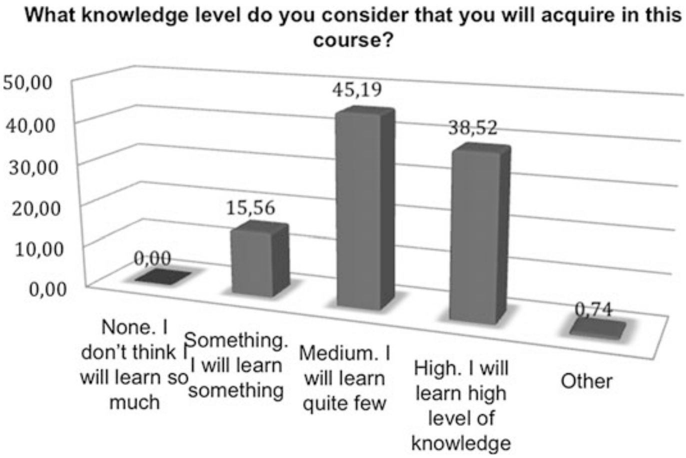

Fig. 12.2 What knowledge level do you consider that you will acquire in this MOOC?

On the other hand, it is found that 95.6 % of students considered that the course was an innovative experience and the 3.7 % did not answer the question. Among the reasons discussed, they include the novelty which involves the use of social networks and their treatment in the course ['To me, whatever involving networks and mobile use in the classroom is innovative'; 'because it is a proposal that takes into account the IT and the use of appropriate networks in learning'], for the ubiquity of the MOOC ['if, by doing so from anywhere'], the course constructivist approach ['(…) I think so, in general, in the MOOC, an effort to approach the connectivism without losing pedagogic rigor is highlighted']. One student said he did not think an interesting proposal because '(…) there are still aspects that improve the user experience … a little platform environment'.

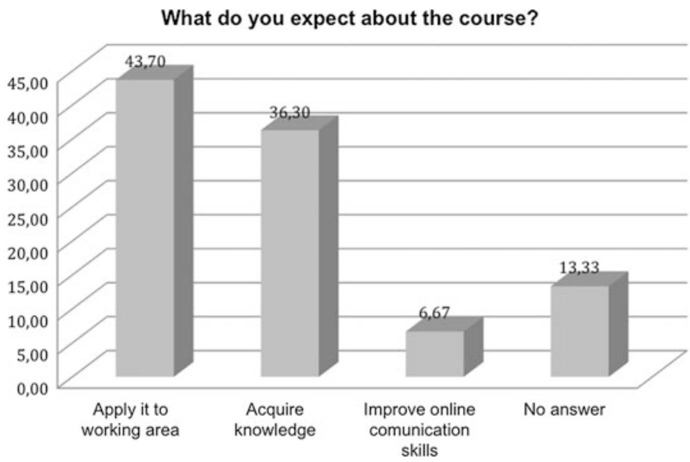

Fig. 12.3 What do you expect about the MOOC?

Moreover, responses to the question about students' course expectations have been categorized into the following types:

1. Developing practical skills for the implementation of the thematic in the work area (implementation in the classroom, field of culture and art, etc.).
2. Acquiring theoretical and or practical knowledge about the subject (virtual classrooms, M-learning, complete my training, etc.).
3. Improving my personal communication skills for network collaboration.

It is found that 43.7 % of students expect to develop practical skills for the implementation of the thematic work area (implementation in the classroom, field of culture and art, projects, etc.), 36.30 % think that they will acquire theoretical and/or practical knowledge (virtual classrooms, M-learning, complete my education, etc.) and 6.7 % say they expect to improve their communication skills in virtual tools (see Fig. 12.3).

12.3.4.2 Satisfaction, Expectations Fulfillment, and Acquisition of Knowledge

The study about students' satisfaction in the MOOC 'Communication and M-learning' shows that there are aspects which have to be improved and/or reviewed, but, on the whole, it could be said that students' satisfaction has been suitable.

It has been showed that 60 % of students replied that they had a medium acquired knowledge and, also, 30 % of them commented that they had acquired high level of knowledge (Expert level) (see Fig. 12.4).

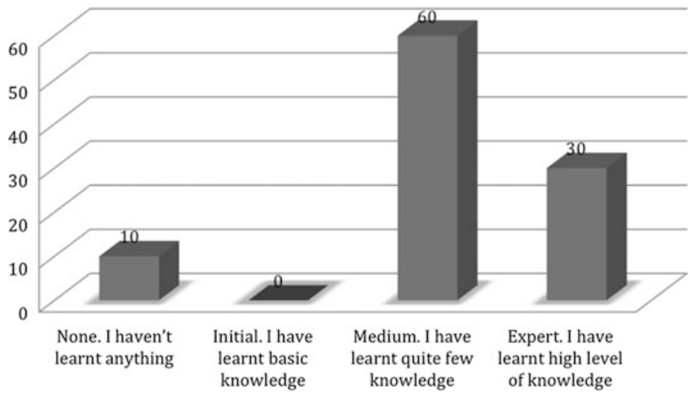

Fig. 12.4 What knowledge level have you got from this course?

It is generally seen that students feel that they have fulfilled their expectations with regard to the level of learning acquired (75 %). Also, it is found that they have obtained what they expected from the course (70 %) and it has been an interesting (90 %) and innovative (75 %) MOOC. There have been no answers to open questions, which would have allowed to know the reason for these claims.

Post-test				
Options	Have your expectations been met in relation to the expected level of learning?	In general, have you got what you expected with the course?	Have you found interested in the training proposal?	Do you consider it is an innovative educational experience?
Yes	75	70	90	75
No	25	30	10	25

12.3.4.3 General Assessment

General information: Users' profiles and background

Survey respondents' profile is a woman (50 %) from Spain (59.09 %) and the rest from Venezuela, Brazil, Perú, and Mexico), highly educated (54.55 % have a Bachelor's or Master's degree, 13.64 % an Associated Degree and 13.64 % a Doctorate Degree) and employed (59 % full time and 18.18 % part-time) at mostly an area related to Education (54.55 %). Friends and social networks have been the most successful dissemination ways (31.82 %), followed by the ECO website (22.73 %), newsletter/email (13.64 %) and others (9.09 %).

Content: Overall feedback on the courses’ contents
As regards courses’ contents, it might be claim that most of the students consider the MOOC is suitable. Fifty-five percent of students claimed that the courses’ contents are adapted to the issue of the MOOC and the 25 % of them affirm it was ‘a large degree’. Also, 55 % of the students are ‘completely’ agreed with the assent that the contents have been to ‘a high degree’: interesting, rigorous and updated.

Also, students consider that the contents have been ‘completely’: interesting (55 %), rigorous (40 %) and updated (50 %). It could be concluded that for the majority of the students the contest are interesting, rigorous, and updated.

So, it has been found that the MOOC has been improved with regarding the previous iteration.

Regarding the structure and temporal organization of the course, it is concluded that: students have been working on the course an average of 2.69 h per week. Moreover, it is observed that 75 % consider that the course has had an appropriate extension and an adequate ‘distribution of workload’ (60 % of students).

It is concluded that in its third iteration the MOOC has had better assessment than in the first iteration, not only about contents, organization, but also about structure and organization and workload distribution.

Resources: Overall feedback on the courses’ resources
Students have rated as ‘very good’ some aspects such as: subtitles provided in videos (50 %), documents (40 %) and, in general, audio–visual materials (55 %).

Learning Methods: as above…
Regarding to the learning methodology, the following aspects could be highlighted

- The personal dedication required for the course has been considered ‘high’ by 75 %.
- Furthermore, it has been assessed that the course has got these aspects ‘completely’: promotes creativity (50 %); ‘discussion and personal reflection in the field worked’ (40 %); it is designed to achieve the objectives (58 %); and that the course promotes student’s involvement and interaction among students (55 %).

Regarding the first interaction, a greater degree of dedication but with greater appreciation of the activities, the degree to which the course promotes student involvement and communication among its members as well as the achievement of the objectives is observed.

Communication and interaction process
Regarding the statistics it has been observed that the number of students who registered (765), only 217 of them (28 %) started the MOOC and 58 of them (8 %) passed the MOOC.

Regarding to communication and interaction process, students have valued the attention of the faculty in the forums, chats, etc. as ‘very good’ (30 %) and ‘good’ (30 %).

With regard to the 'social interaction in general and support from other students', 45 % considered it 'good' and 45 % as 'excellent'. Although the 'Posts and comments made by other students' have been rated as 'good' (35 %) and 'satisfactory' (35 %). Moreover, forty-one percent believe that the course promotes communication and interaction among participants and, in addition, that the 'projects, papers or other resources shared by other participants' have been 'good' (45 %) and 'satisfactory' (25 %).

It could be highlighted that the communication and interaction process has been developed adequately and that the MOOC has been improved compared to first iteration.

Assignments

Thirty-three percent of the participants have appreciated the design of individual tasks adequately and 30 % classify them as 'very good' and 35 % as 'good'. The design of collaborative tasks was considered 'good' (45 %), 'adequate' (30 %) and 'very good' (20 %).

In relation with the previous edition of the MOOC, it is concluded that the evaluation has improved in these aspects.

Assessment

Forty per cent have considered interesting the assessment system and the 35 % of students have considered it very interesting. And, the assessment system has been valued as 'little fair' by 35 % participants but the 60 % of participants affirmed that the system is 'fair'.

Student support

Fifty percent of students believe that the support received by the teaching team (faculty) has been 'good' (40 %) and 'excellent' (25 %). On the other hand, students have assessment the technical support as 'very good' (33 %) and 'good' (25 %).

Both, teaching team and technical support have improved.

Relevance of the learning outcomes for social acting

Forty-one percent considered 'to a certain degree' that what they have been learning during the course might be applied to their professional life. In addition, 66.67 % expect to 'learn new things', 55 % say they have learned with the course ('very much' and 'absolutely'), 33 % that their expectations have been fulfilled in a 'high degree' and they classify the course overall experience as 'very good' (33 %) and 'satisfactory' (27.78 %).

Accessibility and usability of the platform

The laptop or notebook was most used device (55.56 %), followed by the desktop computer (61.11 %), tablet (11 %) and mobile phone (22.22 %). Fifty-five percent of participants had at least one technical problem to access the platform (5.56 %), to log-in (5.56 %), to access video-lectures (0 %) and to access forum, quizzes and assessment of the work done by peers (5.56 %).

Recommendations for the sustainability of the initiative
Fifty percent of participants had started previously several MOOCs and finished some. ECO MOOC was completed by 38.89 % participants. On the contrary, participants who didn't complete it had not enough time (38.89 %). None found difficult the platform (0 %). One of them stated the problem of receiving "the course password very late". Anyway, 38.89 % participants would do another ECO MOOC in the future.

To sum up, it is important to highlight that most of the criteria have had most highly valued by students, which shows that changes incorporated in the course (contents, activities, evaluation system, educational resources, and organization) as well as technical aspects of the platform, have improved the quality of the MOOC. Nevertheless, the biggest challenge that remains to achieve is to increase the number of students participating in the course.

12.4 Conclusion

Designing an M-learning activity, publishing an article in Wikipedia, and interacting on Twitter and Facebook are some of the activities participants must do in order to pass the course. Their own partners correct the works according to a peer-to-peer pedagogy, an evaluation system that 6 out of 10 students found just.

While it is imperative to find ways to reduce the percentage of students dissatisfied with the peer-to-peer assessment, a high level of satisfaction with the MOOC has been observed. Generally speaking, data show that a considerable percentage of participants (more than 70 %) replied that it was an interesting and innovative course and state that their expectations have been met with regards to the level expected learning. On the other hand, in brief, it could be highlighted that the students have acquired a medium and high level of knowledge.

Students expectations in relation to the course are very high. Most of them believe they will get a medium or high knowledge. It can be considered an interesting proposal, valuing especially its innovative theme in education. Also, it has been valued the MOOC as an innovative proposal for the novelty which involves the use of social networks, the possibility offered by this type MOOC to do it anywhere.

On the other hand, it could be concluded that most students had a low level of knowledge (zero or initial) before starting, although a highly percent of them (almost 75 %) was highly educated. One interpretation of this is that the MOOC is an attractive model to complement their training.

Moreover, it can be concluded that students hope to develop practical skills especially to enable them to apply mobile communication and learning processes in the classroom. Furthermore, they valued positively that the activities promote creativity, reflection and interaction, which at the same time invites to insist on a connectivist process and a constructivist learning based on the relational factor.

The sampling error obtained in the post-survey does not allow to do generalizations regarding the degree of satisfaction, expectations fulfillment and level of knowledge acquired. However, it is believed that this data are interesting enough to be considered in this research. In fact, it is considered that the low number of responses of this survey reflects the high abandon level which has been registered in the MOOC.

It has been found that only 28 % of the students started the MOOC and 8 % finished it. So, the biggest challenge that remains to achieve is to increase the number of students participating in the course, because out of 765 enrolled in the course, only 58 students finished it. In this sense, it is risky to draw conclusions about the success or failure of the course in relation to its objective of avoiding high dropout rates.

However, the small number of participants made it possible for teachers to attend individually the different problems in forums and other environments, something that students appreciated positively.

Furthermore, the presence of teachers did not eclipse the creation of a working community among students. They interacted and shared articles and other resources, according to the survey, they were useful.

Moreover, it is concluded that pre-survey reliability is low. According to Morales (2007b), this fact could be due to a lack of heterogeneity between the opinions in the sample. In fact, data shows up homogeneity among students in the pre-survey, although it could also be considered as a lack of measurement precision.

To sum up, it is possible to conclude that the formative proposal has strengths and weaknesses. Among the course strengths there are quality, variety of content formats offered and accessibility of the didactic materials could be highlighted. One limitation of the learning process has been the difficulty for students to end the course, which might be due to excessive academic load European Credit Transfer and Accumulation System (ECTS) and/or course duration, among other variables. This aspect could be the explanation about the high level of students who abandon the MOOC. This will be one of the goals to be considered for future research.

12.5 Contribution of the Chapter

The chapter describes the advantages and limitations of training through MOOC model from an innovative and specific learning experience, not only from a methodological point of view, and also in relation to contents.

Besides, this contribution describes the feedback of the participants when they are invited to work collaboratively, as well as their preference for one or other didactic materials in the context of mobile communication and new devices.

Acknowledgments This research has been made within the framework of ECO Project, E-learning, Communication and Open-Data: Massive Mobile, Ubiquitous and Open Learning (Project no.: 621127). It is a project funded by ICT Policy Support Programme as part of the Competitiveness and Innovation framework Programme (CIP), European Union. ECO started in February 2014 and is funded to February 2017, with duration of 36 months.

Appendix 1: Pre-survey: Expectations and Previous Knowledge

1. **Which level of previous knowledge do you have in relation with communication and mobile learning process?**

   None. I've never studied or worked with this theme
   Initial. I have basic knowledge on the subject
   Middle-level. I have worked and/or studied this subject before
   Expert. I usually work and study aspects related to this issue
   Other:

2. **What level of knowledge do you consider you will acquire in this course?**

   None. I do not think I'll learn a lot.
   Something. I'll learn something.
   Middle-level. I will acquire enough knowledge
   High. I will acquire much knowledge
   Other:

3. **Do you find interesting this formative proposal? Why?**

   Yes
   No
   Other:

4. **Do you consider this ECO course is an innovative educational experience? Why?**

   Yes
   No
   Other:

5. **What do you expect from the course?**
6. **How did you get noticed about this course?**

   Twitter
   Facebook
   Blog
   Other:

Appendix 2: Post-survey: Satisfaction, Expectations Fulfillment, and Acquisition of Knowledge

1. **What level of knowledge have you acquired in the course?**

   None. I learnt nothing.
   Middle-level. I gained considerable knowledge.
   Expert. I gained expert level knowledge.

2. **Have been fulfilled your expectations regarding the expected learning level? Why?**

   Yes
   No
   Comments

3. **Did you find interesting this formative proposal? Why?**

   Yes
   No
   Comments

4. **Do you think that is an innovative educational experience? Why?**

   Yes
   No
   Comments

5. **Generally speaking, have you got what you did expected with the course?**

   Yes
   No
   Comments

Appendix 3

This survey measures variables which are related, such as: quality of contents, learning methodology, communication and interaction process, assessment system, support given to students, relevance of the learning outcomes for social acting and recommendations for the sustainability of the initiative.

This questionnaire authorship is shared between different project partners. This fact doesn't allow us to include it in this chapter. However, it is available on the ECO Project web (http://goo.gl/m9eoCm).

This questionnaire bibliographic reference is as it follows: Fueyo et al. (2015). Deliverable D.4.3 Title Report on users satisfaction, Lead: University of Oviedo, WP4. Author(s): Aquilina Fueyo, Santiago Fano, Javier Callejo, Francis Brouns, Alfonso Gutiérrez, Adeline Bossu, Carol Fowler, Lina Morgado, Sonia Santoveña, Sunne Eichler, Alessandra Tomasini, Raquel Pedrosa, Fatima Merino, Javier Lozano, Carlos Rodriguez Hoyos Mariana de Lima. 75–84.

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Alejandro Silva has a Degree in Journalism and two Masters in Radio and in Social Networks and Digital Learning. Since 2014 he has been working for the University of Zaragoza on the pedagogical framework design of the project "ECO, Elearning, Communication and Open-data: Massive Mobile, Ubiquitous and Open Learning" of European Commission, as well as on its implementation in open courses. He also takes advantage of his experience in broadcasting in order to develop usable audio contents.

Chapter 13
MOOCs: A Viable Business Model?

Yves Epelboin

13.1 Building a MOOC

Building a MOOC has been, in the beginning, the work of teachers, pioneers, and volunteers, who did not count their time, who had decided, for various reasons to jump in this new venture. This is why the time to build a MOOC, i.e., its cost has been systematically underestimated.

In a conventional course, the teacher stands alone in front of his/her students. The preparation and writing of the course, therefore, are essentially solitary tasks. A certain part of the preparative work may be done collectively, but ultimately, the teacher alone is in control of what he/she delivers to the students and documents are judged more by their contents than by their form. But building a MOOC is not just assembling a number of already existing documents and notes and quickly shooting some videos. It is much more demanding because all documents will be available worldwide and judged by numerous people. Quality has become an important matter (Butcher and Wilson-Strydom 2012) and online learning has been the first to profit from this momentum. The reputation of the institutions as well as the authors might be at risk if this is not taken into account (Parr 2014). In brief, to become a MOOC, a course must be rebuild from scratch.

A MOOC is a project, which requires the skills of very diverse people, as we will explain later. Like any team project, it requires a project manager to run it. As one may imagine, most teachers are unlikely to be willing to add this to their existing workload. They do not all possess the necessary skill and must be helped. MOOCs belong to a new manner of working, at all stages, when building the MOOC as well as when delivering its contents to thousands of students. This is quite revolutionary!

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13.1.1 Teachers

Teachers are the project commissioners: they define the objectives of the course and its progression. They write a part of the contents, they search and choose OER documents to be part of the course, think about the contents of the quizzes and of the assessments, supplement with links to documents available on the Web. They also appear in the videos and, according to the individual skills and ease in front of a camera, the time devoted to the shooting and the work needed to edit the videos might be astronomically long!

13.1.2 Pedagogical Support

In most cases teachers are not expert in online learning and the skills of an instructional designer are required. It is a hybrid role, lying in the intermediary zone between teaching and digital engineering. At the same time this person must be able to exchange with the teachers about the contents and the pedagogical progression and have a good knowledge of the tools being used, especially the Learning Management System (LMS), which will be used to distribute the MOOC.

Before opening a MOOC to the general public, it must be tested. Otherwise accidents may occur, which may seriously damage the success of the course: misjudgment of the workload per week, errors in exercises and quizzes, technical errors such as missing or wrong links… A MOOC is a one shot story and the short history of MOOCs is already full of small catastrophes! See for instance Barshay (2013). A good advice is to recruit (and to pay) doctorate students in the discipline for this job. Master students may suffice depending on the level of the course.

One of the main pedagogical principles of a MOOC is the flipped classroom. Students must work and help each other. For this purpose all MOOC platforms offer tools such as forums and their animation is of the uttermost importance. Teachers must participate to this animation but do not suffice. Additional web animators or community managers are requested. Their role is to follow the discussion among the participants, to restart it whenever needed and to answer to unresolved questions by the students.

This means that, for the pedagogical aspects, teachers are supplemented by teams of people.

13.1.3 Support Staff

The quality of the videos is an essential point in the evaluation of a MOOC. A course may contain up to one hour of videos per week, divided in sequences of

10–15 min maximum. The human attention span decreases very greatly beyond 9–12 min. It has been shown that the degree of attention paid when watching a video decreases fairly rapidly (Guo 2013). Thus, the course sequences need to be divided up so as to conform to the format of the videos, which the students are used to watching on YouTube!

The institution must have access to an equipped studio—preferably with several cameras, as it is best to be able to switch between different angles of view. The editing of an hour requires up to thirty hours or more. This time could be reduced, but to the detriment of the quality.

A graphic designer is needed any time in a course containing graphics and pictures. Depending on the nature of the textual documents, the work is extremely variable, ranging from simple formatting for an ordinary document to the drawing of graphic diagrams and illustrations. Certain complex illustrations may require more than a day of work, others an hour or less; for the scientific domain, the writing of documents with complicated formulae may be a lengthy process. This depends heavily on the form and quality of the documents delivered by the teachers. The working time needs to be evaluated on a case-by-case basis, and experience shows us that it is extremely variable: the preparation of documents of the same length may require less than a day of work in some cases, or up to a month in others. However, the expertise of the graphic designer is always crucial.

The responsibility of the web designer is to install the documents in the MOOC platform. He/she is working closely with the instructional designer and shall be able to use the tools provided by the LMS. Possibly he/she may have to rework existing documents and the job needed varies.

So, altogether, building a MOOC may require the collaboration of 5–10 people. This is quite new to most teachers and many may fill uncomfortable, having the filling to loose their freedom and their ideas.

13.2 Cost of a MOOC

13.2.1 Human Resources

We have first considered a course, 8 weeks long, equivalent to one hour in front of the teacher and one hour of applied lecture and the official work time for the teachers as recognized by the university for online distance teaching. Our evaluation of the workload was based on 15 years of practice of distance learning at UPMC-Sorbonne universities and our experience in building websites and recording videos of courses. For the support staff our evaluation was based on our practice for recording videos of course, building websites, and supporting teachers for the LMS. Then, in a second time, these estimations have been discussed in a seminar with a number of people who had been responsible for the first 10 MOOCs of the French MOOC platform FUN (2013). All participants agreed that the time had been underestimated and, in agreement with their experience, the results, as shown below in Table 13.1, have been corrected and correspond now to a 6-week course. Later we have confronted our results with American colleagues, who have confirmed our estimations. We consider that the course is being used 3 times with 20 % of modification before each rerun.

For details see Pomerol et al. (2014), Chap. 2.

The cost of a MOOC, therefore, is a great deal higher the first year than it is for a traditional course. For the subsequent years, the necessary updates represent about 1/3 of the initial time—i.e., 20 h for the documents, and much less for the preparation of the oral content.

Table 13.2 corresponds to the workload of the pedagogical support. Compared to a classical course it already increases the workload by 50 % about.

Table 13.3 presents the work of the support staff. This is the most important factor. The workload is comparable to the one of the teachers!

These figures may vary considerably according to the discipline: a medicine course with many figures and graphics means much more work for the support staff, as well as for the teachers, to design these illustrations than a law course, which is mainly textual. Moreover, according to the local copyright laws, many figures, which could be projected in an amphitheater, must be completely redesigned for their use on the Web.

There is one main lesson to learn: building a MOOC is much more demanding than preparing a course and require skills, which not always exist in the universities. Subcontracting the work can be costly, thus, before engaging enthusiastically in the MOOC adventure, institutions must evaluate the means to be involved and their own capacities. It is a strategic decision, which must involve the highest levels of the university, i.e., the Presidency.

Table 13.1 Teachers: working hours

Task	Hours			Total	Comments
	Course 1	Course 2	Course 3		
Oral preparation	40	8	8		
Documents writing	90	20	20		
Writing of exercises	40	10	10		Varies with discipline
Recording of video	32	8	8		
Preparation of quizzes and homework	32	6	6		
Preparation of the project	30	5	5		
Total	264	57	57		
Total time				378	Preparation of the MOOC
Animation MOOC	48	48	48		When open
Total MOOC	312	105	105	520	

Table 13.2 Pedagogical support: working hours

Task	Hours			Total
	Course 1	Course 2	Course 3	
Instructional designer	40	8	8	
Project manager	60	12	12	
Testers	60	12	12	
Total	160	32	32	
Total for the MOOC				225

Table 13.3 Technical support: working hours

Task	Hours			Comments
	Course 1	Course 2	Course 3	
Video recording	32	6	6	
Video editing	240	50	50	Can be reduced to the expense of quality
Formatting of texts	10	2	2	Variable according to the initial documents production
Illustrations	35	7	7	Variable depending on the number and complexity of the documents
Integration	15	3	3	
Participation in meetings	10	2	2	
Total	342	70	70	
Total for the MOOC				480

Table 13.4 shows the cost, for the salaries, on the basis of 5000 €/month for the teachers, 4000 € for the support staff. At the time of the writing the euro and the dollar have about the same value.

It must be emphasized that this cost corresponds to the total cost of the human resources but does not take into account the environment needed for their work:

Table 13.4 Cost of human resources

	Year 1	Year 2	Year 3	Total €
Teachers	15,000	5200	5200	
Teaching support staff	6000	1200	1200	
Technical support	10,000	2000	2000	
Total	31,000	8400	8400	
Total cost (approximate)				48,000

housing, training… and ordinary equipment such as personal computers. The practice is to multiply the previous estimation by a factor 1.8–2.

13.2.2 Logistics: Environment to Build a MOOC

The logistics may be divided into two parts: first the equipment locally needed, inside the institution, to create the documents, textual as well as illustrations and videos, and second, the environment needed to distribute the course and make it available to the students. We will discuss this point later together with the business models for the MOOCs providers because we believe that it would be unwise for a single university to be its own provider: running an Information Systems environment 24/7, accessible for tens of thousands users or more without disturbance is not within the reach of most universities.

The software, to create the documents, is not a problem, being available everywhere (word processing program, Photoshop, Illustrator or equivalent, Adobe Premiere or Final cut Pro, etc.). The same is true for the resources needed for video production, with the exception of a studio.

The cost of a studio varies considerably, according to the desired quality and sophistication of the videos. The first factor to be taken into consideration is the available skills. It would be useless to build an expensive studio for video beginners. It rises from a few thousands euros to record an oral speech up to €30,000–50,000 to be able to change the background, to be able to record a writing hand and to multiply the points of capitation. EPFL (2012), in Lausanne, has written a short memo to guide the newcomers.

13.3 Comparison of the Costs of Different Methods of Teaching

When MOOCs were reaching the peak of inflated expectations of the Gartner hype curve (2015), much has been said about the end of the universities since MOOCs would permit a mass education for a much cheaper price. See for instance Frey (2013) or The Economist (2014) but looking at the previous figures one can imagine that the reality is not so simple.

Let us now compare the costs when delivering the same course in a hybrid mode, i.e., a SPOC (Small Private Online Course) with small groups of students in face-to-face classes like it is used at EPFL or in the classical approach, i.e., in a lecture hall. The SPOC needs fewer teachers because plenary lectures in the amphitheater are suppressed and the number of application lectures in small groups is reduced. When delivering the course as a MOOC, there are no more teachers in front of the students and we only have to add the wages of the tutors whose number increases slowly with the number of students. This cost is drowned in the total cost to build the MOOC, especially considering the variability of our estimation between 30,000 € and 100,000 €!

In our calculation, we consider one teacher for 50 students and a meeting every two weeks for the hybrid mode (SPOC). For the classical delivery one hour in the theater per week and one meeting every week in small groups (50 students). Since we did not have a precise estimation for the cost of the buildings, our estimation is based on the lower bound of rental prices. This therefore includes the depreciation of the assets. Thus this curve is not true when expanding the number of classrooms can be made only through the huge investment of building new premises. In such case, whenever the institution does not possess the money for investment it becomes impossible to add new classes on campuses and SPOCs and MOOCs become the only solution. This will have to be remembered when presenting some business models later.

The cost increases rapidly with the number of students because the salaries of the teachers represent an important part of the expenses.

Distance education and SPOCs are about the same and are represented on the same curve. Distance education requires personal exchanges between the teachers and the students and the workload is about the same. The only difference is the cost of the buildings.

For the classical delivery, our estimates are based on the official working time of Higher Education teachers in France: 6 h of work for one hour in front of the students in the lecture hall, 4 h of work for one hour of applications lecture with small groups of students. Playing with all these variables and different estimations for the cost of the MOOC, gives always curves as shown (Fig. 13.1).

Below 200 up to 300 students the cheapest means to deliver a course is the classical approach. Blended learning (SPOC) becomes cheaper only for large classes above 500 students. A conventional MOOC, i.e., delivering a course without face-to-face interaction and no personal interaction is never of interest

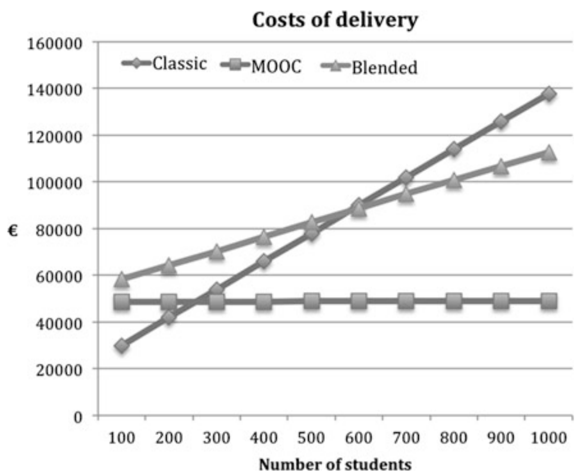

Fig. 13.1 Cost of delivery of a course depending on the method and the number of students

below 300 students. These values vary with the real cost of the MOOC and other variables such as salaries, buildings… which may change from one university to another, but the message is very clear: savings can be made, using MOOCs or SPOCs, only for very large groups of students. For a single university it may only work for the freshmen years.

This leads to two conclusions: increasing the number of students or grouping universities, to share the costs, are the only solutions to save money. These are just the solutions, emerging in some US universities.

13.4 Why to Invest in MOOCS?

MOOCs can be used in various contexts: initial or lifelong education or simply for personal development. The list of possible motivations is infinite.

In the classical framework of universities, MOOCs permit to innovate by offering alternative methods of teaching and learning, complementary, or substitute of the traditional methods. The MOOC approach is not really new since traditional Learning Management Systems (LMS) already permit this approach. But it has been seldom used. MOOCs add the new Web 2.0 popular social aspects, and are a unique opportunity to generalize initiatives, which, in the past, have had difficulties to go beyond the prototype stage and were kept in a niche. In a globalized world, where it would be necessary to open a university everyday to educate the young generation, MOOC are the only realistic substitute to educate large masses of students. This is true in Africa and Asia, but also in a number of other countries.

Before proposing a strategy and its business model, it is necessary to clearly define the goals, prioritize them, and estimate the budget required. The following list summarizes possible orientations. The order of presentation has no meaning.

1. *As a support for an educational transformation*
   SPOCs might be an important constituent of a change in education, including the first year in university. This is one of the major objectives of the EPFL in Lausanne. Flipped pedagogy through MOOCs aims to make the students involved in their training. This approach is being thought mainly for newcomers, in the first year of bachelor. One of the concerns is to train the students to be autonomous. This approach has some limitation since the campus social life, at least in Western societies, is an important aspect of the culture for young people and it is necessary to offer spaces where they may work together, watch courses videos together and, more generally, mix. In other words it is necessary to create learning spaces and learning centers.
2. *For students who missed an examination*
   When a student does not succeed in a module for the first semester, at least in France, he/she has to wait until June to pass again the examination. In the mean time he/she no longer addresses the matter. This is also relevant for students who have been allowed to go into the next year without completely acquiring the previous year.

3. *At the entrance of the University*
   Many students engage in Higher Education without having the level and/or without really knowing the discipline they have chosen. Specialized short MOOCs could help them to realize the direction in which they undertake studies, what does it means and also and to assess themselves their skills in order to avoid disappointment.
4. *For lifelong learning, specialization, improvement of professional skills.*
   When addressing people already engaged in their professional life, face-to-face exchange may not be necessary and may be replaced by any exchange tool, from videoconference (Skype for instance) to simple chat. However each student must be able to interact with a teacher and establish a personal relationship. This is the only difference with a MOOC, where students remain quite anonymous and require a different approach called SPOC (Small Private Online Course).
5. *For all international students who cannot access higher education.*
   Universities from less developed countries, Africa and Asia first, would appreciate a help from more developed countries. Not all countries speak English and there is a place for other languages. Moreover the approach to teaching and learning is strongly related to the national culture and a number of countries might be interested in a different approach from the dominant US one. The best approach would certainly be to help these countries to develop their own MOOCs, taking into account their own culture.
   Culture dissemination being one of the HE mission, such MOOCs are a good means to fill it.
6. *To share an expertise or learning on any topic with anyone.*
   The scientific reputation of excellence of a university must be based on two legs: research and teaching. It is one of the missions of the universities. Moreover it is a good means to establish and maintain the reputation of the institution.
7. *To attract good students from all around the world at bachelor or master level.*
   Students from abroad as well as students who have been following other curriculums would be better prepared to attend a curriculum, especially at higher level, when using MOOCs before arriving.

Table 13.5 summarizes the possible uses.

MOOCs from categories 1 and 2 are intended primarily for internal use, although some may be used for a general public for a modest additional price. The reverse applies to categories 5, 6, and 7. MOOCs from category 6 can be called prestige MOOCs. Their aim is to promote the excellence of the institution. They must correspond to areas of excellence in Research and must involve the laboratories. This category also includes peculiar courses, which may attract a large number of students, such as Scala programming at EPF. This is the only case where cost is not a discriminating factor, although internal use is not forbidden! In fact the cost of such a MOOC is much lower and more efficient than a classical promotional campaign.

To summarize the present section, we have explained how universities are constrained by the high expenditure that represents MOOCs. For most usages, in

Table 13.5 Seven business objectives for MOOCs

	Objective	MOOC	SPOC	Level	Remark
11	Educational transformation	opt	X	B1, minors	All levels. Priority for larges groups of students
22	Remediation	opt	X	B1, B2, B3	Failed modules from past semesters
33	Entrance in university	X	–	B1, High School	Evaluation and initiation courses
44	Longlife learning	–	X	All levels	
55	Foreign students	X	Opt	All levels	
66	Knowledge sharing	X	Opt	All levels	
77	Recruiting students	X	Opt	Master or bachelor	

Opt: Optional, B1, B2, B3: Bachelor levels

Europe, in the US and in countries, where the density of existing universities and colleges is high, this cost can be recovered only for large numbers of students such as newcomers in universities or through an active policy for distance education. In other parts of the world, mainly Africa and Asia, where it should be necessary to build one university everyday, using MOOCs may drastically decrease the capital investment in buildings and teacher training. However it is not so easy to maintain a link between students and teachers as the experience of the virtual university in Senegal seems to show it (Caramel 2015).

13.5 Possible Business Models

We did not yet address the problem of the MOOCs distribution, i.e., possible business models for MOOCs providers. We will discuss this point in the first part of this section and then show examples of universities working together with these providers and their own business models.

13.5.1 Business Models for MOOCs Providers

There are two kinds of providers. The most well known, Coursera and EdX (see Fig. 13.2), distribute MOOCs build by others. They act as the editors of a collection of books and partner with universities. Others, such as Udacity, MiriadaX in Spain not only distribute contents but also build their own. Business models, for the first categories, can thus be imagined only on the distribution of contents. For the second category, the content is also a value. Udacity is an interesting example. It started in

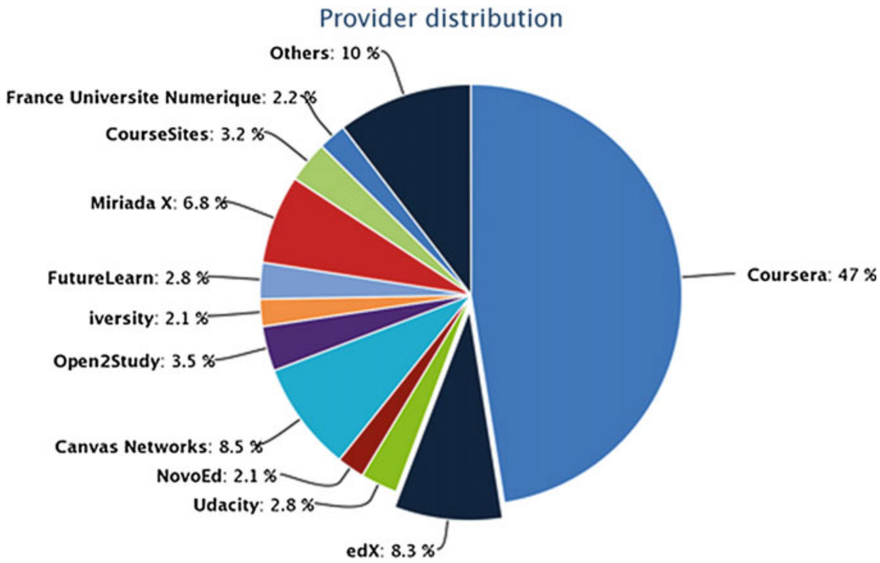

Fig. 13.2 Provider distribution in 2013 according to Shah (2013)

the first category, then its founder, S. Thrun declared that "there was no money to make with universities" and switched to continuous education, where he sells his services to companies as well as to individuals.

13.5.1.1 Coursera, EdX, and Others as MOOC Editors

Coursera

Coursera is an enterprise venture, which has raised its capital from various venture-capital structures involved in innovative areas (Wikipedia 2015) and partners with universities that deliver their courses for free but depending on the contract, pay a certain percentage of the revenue generated by the reuse of the MOOC by other universities or interested bodies.

Coursera generates revenues through the delivery of different levels of certifications. The basic was just an attestation of success at the end of the course. It was delivered for free but seems to have disappeared since May 2015. The verified track certificate is delivered with a signature track, which allows verifying the identity of the student. Its price varies from a few tens dollars up to one hundred about. Coursera is making more than $1 Million per month in revenue from verified certificates (Shah 2015). The upper level is specialization. Specializations are made from bouquets of coherent MOOCs and the added cost ranges between $250 and $500. In some ways it is blurring the distinction between university grades and free MOOC consumption. In an interview at the Wharton school Koller (2012), one of the two Coursera founders, claimed "*In five years we will be able to offer most curricula in most disciplines.*" In a new interview (Koller 2015) she recognizes that "*MOOCs will not put universities out of business*" and acknowledged that Coursera is turning more to young adults who want to improve their education.

Some people doubt that Coursera will be able to make money from certificates only and wonder if it may not turn into an online university later. For the moment D. Koller claims that "*the pressure* [is] *to bring in revenue because we want to bring revenue back to our university partners so that they can sustain their course development.*"

One must still wait to verify what will be the future.

EdX

EdX has a complete different business model. First of all, it is not a private company but a foundation with primary funding from MIT, Harvard, and the Bill and Melinda Gates Foundation. More than 50 institutions have joined them. EdX delivers an Open Source version of its platform so that more than 120 installations exist now around the world. EdX President Arnt Agarwal declares that EdX wants only to be self-sustained and partners may choose between two models. In the first one, EdX retains most of the revenue made from the course. In the second one it may provide assistance to its partners and act as consultant (Kolowich 2013; Ross 2014).

In this model EdX is not opened for free to its partners universities: they must pay which is a difference with Coursera. On the other hand Coursera does not accept all universities and selects its partner, according to its views. EdX encourages another form of partnership through the development of Open EdX, which has been adopted by many consortiums and private companies such as FUN in France, XuetangX in China, Edraak in Jordania…

Students may obtain for free an Honor code certificate, simple attestation of participation. They may also obtain verified certificates similar to the Coursera ones for a fee between a few $tens and $100. Xseries certificates are equivalent to the Coursera specializations.

A main difference between both business models is that EdX must just sustain itself and will not give any return to its initial investors. For further developments and to increase its share of students, at international level, EdX counts on its partners' consortiums, which are running Open Edx. Coursera, on the other end, keeps its sources for itself.

France Université Numérique (FUN 2013) is the representative of such a partner. Launched by the Ministry of Higher Education in France in June 2013, it made the choice of Open EdX as soon as available. It is now a consortium of French universities. FUN delivers only unverified certificates. Very soon some partners will offer ECTS (European Credit Transfer System) through classic examinations or distance control like EdX and Coursera. Members of the consortium pay a fee from

€5000 for two MOOCs per year up to €20,000 per year for an unlimited number of MOOCs, five SPOCs per year and the possibility to use the platform to deliver their courses for online continuous education.

Other Providers

Futurelearn (2013), in UK, is another example of MOOC Provider. Started as a charity from the Open University, Futurelearn wants to bring the best of UK universities worldwide. More recently it has invited foreign universities to join but publishes courses in English only. Futurelearn develops its own software with a different insight toward the pedagogy, encouraging interactions among the students. Access is free but a statement of participation (a simple unverified certificate) costs 29£. A statement of Attainment (verified certification) costs 119£. Futurelearn does not look for other resources. Its total dependency from The Open University is also a weakness: the charity recently announced that it was in deficit of £17M, due to the declining number of students registering for its distance learning.

In the category MOOCs editors, we could mention a number of other providers. It is often difficult to understand if they do not belong also to the second category—MOOCs builders and editors—and what is really their business model. For instance, Iversity (2015) in Germany, at the same time works with universities and develop its own line of courses. Moreover, Iversity's goals are much larger, willing to become a ECTS broker among European universities. Today it is not easy for an European student to include external ECTS in the curriculum of the university where he/she is registered. Iversity view is to act as an intermediary.

13.5.1.2 Udacity

Udacity started, like Coursera, as a private company and with the same objectives: to complement or to be a substitute to the classical Higher Education approach. He went to the point to work with San Jose University but this initiative was a failure, very few students passing the final grade with success. He concluded that massive open online courses do not work for Higher Education (Waters 2014) and turned quickly toward professional development (Chafkin 2013). Udacity offers its own courses to the public for a small amount of money (some are free) also develops courses at the demand for companies. It works together with names such as Google, Facebook, and ATT… For $200 per month students may follow selected bouquets of courses developed with the industry (similar to Coursera specializations) and obtain nanodegrees. It includes a personal coaching and pretends to become an alternative to university grades for people already engaged in their professional life.

Udacity pretends to build its business model by working with the industry to offer intensive courses oriented toward high skill jobs. The company said it officially reached profitability in July 2015 (Mathewson 2015).

Looking at EdX business model on one hand and Coursera and Udacity on the other one, it seems that Coursera is more and more following Udacity business model finding more potential from partnership with the industry.

13.5.1.3 Others as MOOCs Builders and Editors

Udemy (2013) follows a different business model. It acts as an online marketplace where independent instructors, you, anybody, or me can build and sell courses. Udemy is taking a share of the money that students pay to follow the courses. This share depends on who is recruiting the students, the teacher or Udemy. Other vendors use the same business model and the competition may become tough to retain the best teachers (McGuire 2014).

It would be difficult to cite all existing providers with their diverse business models. For instance, in France, Openclassrooms (2013) has built its model on a free offer of its courses. For a small amount (€20 per month), students have access to complementary documents and exercises, for a higher one (€300 per month) they have access to an individual monitoring by means of videoconference and other facilities. Openclassrooms is also building a network of relations with State agencies to train unemployed and build some courses with HE institutions who deliver grades for its courses. It is a mix of Udacity and Coursera business models.

Maintaining a list of all startups in the MOOC business is quite a challenge. See for instance Class Central (2015) although it is mainly oriented toward the US market.

13.5.2 Examples of Business Models for Universities

Various conferences in Europe show that the interest for MOOCs in Europe does not yet reach the peak of the hype curve, showing a large difference of the strategy between the European HE institutions and the US ones. This is clearly explained in the Porto (2014) declaration in favor of open and online education. But, to our knowledge, very few business models seem to appear in Europe when the path is already paved in the US. In other parts of the world (Middle East and Asia) the situation is also unclear.

13.5.2.1 Business Models for US Education

The level of the fees, in the US institutions, has reached an unacceptable level and the result is that the total student debt is greater than the housing one, of the order of $1200 Billions! Between 2002 and 2012 the mean debt per student has doubled, so that more and more young people are asking themselves about the value of HE study above the Bachelor level. At the same time there is a demand for more college's seats at a reasonable price. As we have explained before (Sect. 3.3) the expectation to decrease the cost of education by the means of MOOCs is a false one, except in two cases: being able to assemble large cohorts of students or when the investment to build new premises is required. Since the required investment is above the financial possibilities of most universities, they must imagine some kind of cooperation among the institutions. In the U.S., Coursera and EdX are playing this role.

Arizona State University, one of the largest U.S. Universities, has established, in partnership with EdX, the Global Freshman Academy (Hill 2015), an online program to offer to freshmen the first year of university, for a lower price. Students must acquire eight credits among 12 courses, each for $200, but they will pay only in case of success. The only non-reimbursable fee is for the verified certificates, which will cost $45. This means that a year of study will cost less than $6000 and that most of the money *will be paid in case of success only*. The number of students is unlimited. ASU is paying for the courses development and EdX for the platform. Knowing the number of students, who leave the university without anything, the smart idea with this project is to pay in case of success only. ASU and EdX believe that they will attract enough students to recover the investment.

Another example (Straumsheim 2015) is the online MBA program from Urbana Champaign University; it is built in partnership with Coursera. This iMBA will be made of specializations. The contents, made of 18 courses, will be available for free as MOOCs. Students, who pursue the iMBA, will follow the same courses with the addition of all the university facilities and mentoring from a distance for $1000 each. They must also pay $79 for each verified certificate. The total cost of the degree will be about $20,000. A great idea is that they can take (and pay) the courses individually and postpone their decision until the end, thus paying by fractions, if they go to the end of the program. Once again, this model allows students not to pay before knowing their chances of success. Coursera recovers some funds through the verified certificates; the University expects to bring enough students in its existing MBA to cover its expense.

MIT has a different approach, considering using the same courses internally as SPOCs and a selection of them externally as MOOCs. The smart idea is that the additional expense is very limited when using internal resources outside. Since Open EdX is their LMS, the additional cost to transform an internal course into a MOOC is just exporting the course to EdX and paying for the animation of the course. They also plan to use MOOCs as an admission test. Newer is a pilot program for a micromaster degree, which can be obtained online through selected MOOCs and verified certificates. Successful students may then apply for a second semester on campus to complete their degree.

These examples show an ongoing direction, in the U.S., to mix online and on campus courses, to decrease the fees addressing the courses to a larger number of students. At the same time, in a world where universities are competing to recruit the best students, MOOCs are a good means to attract and test good students. Some universities, for instance, offer grants to the students, who succeed in their own MOOCs.

More generally, in the US, MOOCs are now merging in the online offer. Some may be opened to the general public and, at the same time, being used internally with a full mentoring.

13.5.2.2 Business Models in Europe

A very important difference, between Europe and the U.S. is that (with the exception of UK except Scotland), most universities are under State regulations and that the level of fees is rather limited. Thus the interest in MOOCs is seldom to decrease the cost of the fees. Reasons to build a MOOC are more relevant to the categories presented in Table 13.5. None university believes that it may recover the expense needed to develop MOOCs except for the few, which may be sold for continuous education. This is why business models are mostly based on the possibility of obtaining grants from national and European agencies.

At The European level EADTU (European Association of Distance Education) is trying to assemble information about existing MOOCs and to act as a hub through the European initiative OpenupEd (OpenupEd 2013). It is only a relay of information.

EPFL in Lausanne (Switzerland) is one a few HE institutions with a clear business model. Pioneer for the MOOCs in Europe, working with Coursera and EdX, EPFL has first offered MOOCs as an efficient communication medium and has been very successful in this. It now offers full curricula, delivering ECTS for €30, a full cursus being made of 8–12 ECTS. Examinations are of the classic form in partners' centers (EPFL 2014). This hybrid education is oriented mostly toward French speaking Africa, where EPFL expects to find a relay of development.

Other initiatives, where institutions deliver ECTS, slowly emerge all around Europe, but, as already mentioned, these ECTS are not, for the moment, transferable between institutions and thus cannot be part of a diploma and are of very limited value. This may change when MOOCs will be used intensively in the universities as part of their distance learning activity but nothing, comparable to the U.S.s is yet visible. EPFL is an exception.

So, to conclude, no clear business model is yet emerging in European universities.

13.5.2.3 Asia and Africa

Education is certainly one of the main objectives, in any country, for a better future. This requires huge capital investments; it is not only a question of finances. Most countries in Africa and Asia do not possess the number of required teachers and their training will take years. They do not have the capacity, in capital investment and in human resources, to build classical universities. A special form of MOOCs, if adapted to the local environment and local culture, is the only solution. Teaching through MOOCs will lower the number of required teachers and the capital investments to teach a huge number of students. For the moment most of the initiatives are coming from the Northern countries and the main providers. Most do not yet have any business model and are supported by the enthusiasm of local universities, who do a fantastic job with very modest means. Edraak (2013) is a political one for Arabic speaking countries. Oyo and Kalema (2014) have explained the state of online courses in Africa and why this continent is far from thinking about business models. See also eLearning Africa news 2015.

In Asia, MOOCs have mainly be the playground of the main US providers except for the Chinese state agency XuetangX (XuetangX 2013) already mentioned. Singapore, Hong Kong universities obviously have the capacity to build and distribute their own MOOCs but it is too early to speak of business models.

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Chapter 14
Quality Frameworks for MOOCs

Darco Jansen, Jon Rosewell and Karen Kear

14.1 Introduction

Goal number four of the UNESCO Sustainable Development Goals states: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (UNESCO 2015a). In addition, the *Education 2030 Declaration* (UNESCO 2015b, point 43, page 16) states "The provision of tertiary education should be made progressively free, in line with existing international agreements". MOOCs are generally seen as contributing to these goals as they provide complete learning experiences without any costs for the participants. However, this does not necessarily mean that MOOCs ensure quality education for all.

In exploring this issue, we start with the question: what is a MOOC? Bates (2015) considers MOOCs to share a combination of the four key characteristics related to the acronym Massive Open Online Course. A collaboration of EU-funded MOOC projects extended this to the following definition[1]: "an online course designed for a large number of participants that can be accessed by anyone anywhere, as long as they have an internet connection, is open to everyone without

[1] http://www.openuped.eu/images/docs/Definition_Massive_Open_Online_Courses.pdf.

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entry qualifications and offers a full/complete course experience online for free". This definition was recently validated amongst European institutions (Jansen et al. 2015).

This definition positions MOOCs as part of both online and open education. But what openness means has been the subject of debate (Open Education Handbook 2014); openness must not be associated only with "free". In general, open education has the primary goal of removing barriers to education (Bates 2015). Mulder and Jansen (2015) examine whether MOOCs can be instrumental in opening up education. Their main conclusion is that MOOCs cannot remove all barriers to learning, and hence can only contribute, to a certain extent, to ensuring quality education for all. The main flaw is that quality assurance and accreditation schemes are not yet equipped for MOOCs.

This raises question of the relation between MOOCs and formal education. Are MOOCs essentially forms of non-formal education, with related flexible provision? Or are MOOCs a pathway to higher education, helping to ensure inclusive and equitable quality education for all? The latter option implies the need for similar quality assurance processes as in formal education.

This chapter reviews current and emerging practice for the quality assurance and quality enhancement of MOOCs. It stresses the importance of the use of international quality frameworks for MOOCs, embedded in institutional quality processes. In addressing the issue of how best to assure quality in MOOCs, the chapter considers the question of why quality matters for MOOCs. Quality frameworks and processes are then discussed, and illustrated with two case studies. In this context, the OpenupEd Quality Label for MOOCs is considered.

14.2 Why Does Quality of Moocs Matter?

Starting from the perspective of MOOC participants, we can argue that learners are entitled to a high quality learning experience, whether they are enrolled on a fee-paying, credit-bearing course or a MOOC. On this basis, it is valuable to consider whether the quality of MOOCs should be assessed in the same way as a university course with degree awarding processes, a question posed by Ehlers et al. (2013).

14.2.1 Quality Pedagogy and Dropout Rates

MOOC have the promise to widen access to higher education to millions of people, including the developing world, and ultimately enhance the quality of life for millions (Daniel 2012). However, MOOCs generally attract only well-educated learners who already have higher education qualifications, and are already in employment (Macleod et al. 2015). MOOC provision is dominated by a handful of platforms supported by elite universities, and very few MOOCs offer formal pathways to recognised academic qualifications. This poses a potential threat of inequality of access (Schuwer et al. 2015).

There is widespread scepticism of the quality of MOOCs and the pedagogies employed, for example those of xMOOCs (Gaisch and Jadin 2014). Evidence supporting this sceptical view can be found in a study by Margaryan et al. (2015), which evaluated a sample of 76 MOOCs using a checklist of 37 items based on existing instruments for instructional design quality. The research included principles of effective learning activity, learning resources and organisation. The MOOCs evaluated were a random sample from those available in the late 2013 across a variety of platforms. The authors found that, while all MOOCs were well-packaged, they all scored poorly overall (median 9, range 0–28, on a scale from 0 to72) indicating poor instructional quality. Lowenthal and Hodges (2015) reviewed six MOOCs applying the Quality Matters rubric intended for traditional for-credit online courses. They concluded that "two of the MOOCs could pass this review and, therefore, be considered high quality online courses".

Poor quality pedagogy is considered a threat that can damage the reputation of the institution and counteract the vision of MOOCs as being the best that higher education has to offer (Schuwer et al. 2015). However, alternative MOOC approaches exist, providing more inclusive and social approaches. Examples are pedagogical approaches like the well-known cMOOC (Siemens 2012) and the more recent sMOOCs model (Brouns et al. 2016). In addition, inclusive MOOC partnerships have emerged, such as the ECO project (Osuna Acedo et al. 2016) and the OpenupEd initiative (Mulder and Jansen 2015). These initiatives are characterised by distinct criteria and quality processes related to common features, specific pedagogical models, training of skilled (e-)teachers and scalability of re-using MOOCs and MOOC content.

A controversial topic related to the quality of MOOCs is the reported low completion rate. Neuböck et al. (2015) and Macleod et al. (2015) have confirmed earlier findings by Hollands and Tirthali (2014, p. 42) that only "3–15 % of all enrollees" complete a course. Jordan (2014) reported that the majority of MOOCs had completion rate of less than 10 % with a median of 6.5 % (p. 150), although more recent data show some improvement to a median of 12.6 % (Jordan 2015). For many commentators, high dropout rates are a sign of the poor quality of MOOCs. But this may be only true in relation to the metrics of formal education i.e., if MOOCS are a pathway to formal higher education, low completion rates are disastrous. However, it is argued that many MOOC participants do not want to do the entire course; they are interested in gaining information and knowledge, but do not intend to get a certificate of completion. To make the personal learning objectives more visible, experiments with digital badging systems can be applied (Schön et al. 2013), and the motivations and intentions of participants can be measured (Kalz et al. 2014).

14.2.2 MOOCs for Lifelong Learning and Continuous Professional Development

MOOCs have prompted a broad discussion on the use of technology-based modes of teaching and learning in formal higher education and continuous professional development (CPD), as well as in initiatives to open up education. It is expected that new modes of teaching and learning, including MOOCs, will have an impact on the further development of these three areas of provision and will change the higher education landscape (CPL 2015). MOOCs have become a symbol of a larger modernisation agenda for universities, intertwined with the concept of "unbundling", and with related economic imperatives about the viability, scalability, and sustainability of higher education (Selwyn 2014). Institutions are developing online variants based around their own range of programs in order to raise their national and international visibility, while helping to improve internal quality (e.g. Manturuk and Ruiz-Esparza 2015).

14.2.3 Unbundling of MOOC Services

The growth of the MOOCs movement raises issues relating to the function and practice of quality assurance. Currently, universities consider the quality assurance of the MOOCs they provide to be an internal matter. However, MOOCs and other new modes of teaching are part of the move to unbundling of educational services. MOOCs are complete courses consisting of educational content, assessments, peer-to-peer tutoring and/or some limited tutoring by academics. All of these components can be outsourced by higher education institutions to third parties, for example, video recording of lectures, automatic grading programs, authentication services and exam centres. Partnerships are growing between universities and for-profit education companies, including major educational publishers and global testing services. Partnering allows universities to fast-track into MOOC provision without the need to build internal capabilities. As a consequence, quality assurance systems can no longer focus only on educational institutions. However, Ossiannilsson et al. (2015) note that national higher education 'quality assurance standards and other regulatory instruments cannot easily be applied to partner organisations as they were not designed to regulate' such entities (p. 46). Up to now, national quality assurance agencies in Europe have not considered the quality assurance of MOOCs to be within their remit (e.g. NVAO 2014). This would need to change if MOOCs were to become considerable parts of degree programs in the future.

14.2.4 Consequences for Quality Processes

Since MOOC provision is much more open to external scrutiny than is campus-based higher education, the quality of what a country's own universities offer as MOOCs is important to the 'national brand' of its higher education system; MOOCs form a window into the quality of the national HE system as a whole. The UK QAA recognised this in their 2014 position statement which states that MOOC providers should "ensure that they reflect the established reputation of UK higher education" (QAA 2014). MOOCs may therefore be part of a general endeavour to maintain competitive position in an expanding global market. These concerns will influence the degree of support of national governments for MOOCs and open education.

But this raises questions about how to ensure good governance, quality and overall responsibility for educational credentials. Assuring the quality of MOOCs should be seen as the shared responsibility of MOOC platforms, cross-institutional partnerships and institutions, possibly with guidance and oversight from national quality agencies. To consider the balance between these stakeholders, an institutional and a MOOC platform perspective will be studied later in this chapter. In addition the quality label of a pan-European MOOC partnership (OpenupEd) is discussed in this context.

14.3 Quality Frameworks and Quality Processes

The previous section suggests that quality of MOOCs can be considered from the following four perspectives.

1. *Quality from the learner's point of view.*
   MOOCs attract a diverse range of learners, who come from different backgrounds and have wide ranging motivations for enrolling in a particular MOOC (e.g., Hill 2013; Kizilcec et al. 2013). Considering quality from the perspective of learners requires engaging with the diverse goals, expectations, learning behaviours, and abilities of learners to facilitate their own learning.
2. *Quality connected to the pedagogical framework of the MOOC.*
   The pedagogical model of MOOCs should be designed to scale gracefully to unlimited numbers of participants, requiring the teaching and support effort to not increase significantly as the number of participants increase. Current research is beginning to examine qualitative indicators for dialogue and interaction that can guide the choice of pedagogical model. For example, Downes (2013) has formulated four key success factors in this area: autonomy, diversity, openness and interactivity.

3. *Quality related to the input elements*.
   These may include aspects such as instructional design, the content and resources, multiple choice questions and assessment, the technology employed, and the quality of the teacher (e.g. Margaryan et al. 2015; Lowenthal and Hodges 2015). For example Costello et al. (2016) found a number of flaws when analysing the multiple choice questions of several MOOCs. These aspects fit with the conventional views of course quality.
4. *Quality based on outcome measures*.
   These might include the number of learners completing a MOOC or achieving certification. These metrics are (relatively) easy to measure. However, we know that not all learners intend to follow the instructional pathway of a MOOC. Taking completion rate as a measure for the quality of a MOOC has therefore been criticised (e.g. Weller 2013; Clark 2016). It is argued that low values of conventional measures, such as retention and completion, may not signal poor quality.

Consequently, the concept of quality in online education, and particularly in MOOCs, is complex. There are a variety of stakeholders involved: learners and educators, higher education institutions (HEIs), MOOC platform providers, quality agencies, governments, and potentially employers and others who might recognise achievement in a MOOC. Quality can also be viewed at three levels: macro (national), meso (institution) and micro (course) level (Nordkvelle et al. 2013).

Figure 14.1 provides a simple view of MOOC quality processes. A learner faced with a choice of MOOCs will wish to be assured of their quality, and might wish to use reviews and recommendations of other learners. However, despite the very large numbers of MOOC learners, no MOOC rating website has become prominent and, given that many MOOCs are presented only once or a few times and may be changed between presentations, this approach may never bear fruit.

A potential learner therefore only has available a notion of brand reputation attaching to the MOOC platform, the originating institution, and possibly the course

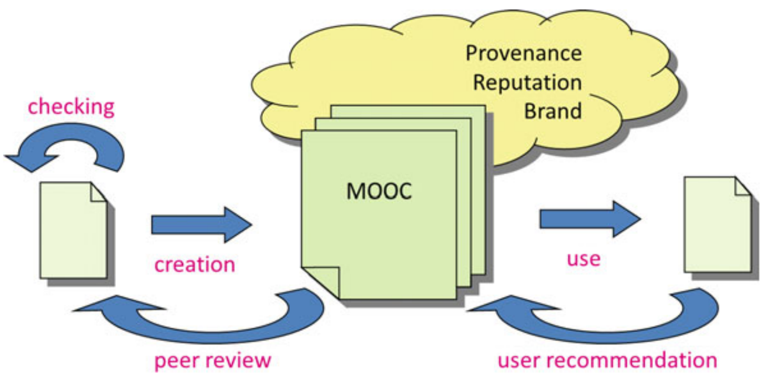

Fig. 14.1 A model for MOOC quality processes

author. However, Daniel (2012) cautions that university brand is a poor measure of quality in online teaching, since reputations are gained primarily in research rather than teaching. Nevertheless, both HEI and platform have a stake in maintaining their brand reputation. They can impose control by acting as reviewer and final gatekeeper, and also ensuring that a quality process is followed during course creation (This assumes that MOOCs remain predominantly products of HEIs and are often related to core curriculum.)

One can see the system encapsulated in Fig. 14.1 as a quality system where improving quality should be reflected in some measure. However, what should be optimised for a MOOC: learner satisfaction, completion rate, or some other measure? These conventional measures may not be appropriate if the intentions of MOOC learners differ from those of a conventional university student (Ehlers et al. 2013). Butcher and Hoosen (2014) also question whether tightly structured frameworks for quality assurance can be applicable to MOOCs, because openness and flexibility are primary characteristics of these new approaches. However, the authors also suggest that, since both conventional HEIs and MOOCs offer higher education, quality principles developed for HE could be used to improve the quality of MOOCs and OER.

One way of dealing with these tensions would be to use a national or international quality framework which carries with it a certification or label. Such a visible recognition would act as a reassurance to all the stakeholders in MOOCs—learners, authors, institutions, platforms, employers, and quality agencies. In this chapter, we focus on the OpenupEd Quality Label as an example.

The question then arises whether such a MOOC quality label should focus on product or process, and this echoes a long-running tension in the landscape of quality assurance in education. Ossiannilsson et al. (2015) characterise this as a spectrum: from systems which check compliance to norms and often focus on product, to systems that aim at quality enhancement by focusing on process. They align this with a maturity model: low maturity systems are characterised by externally set norms, whereas in high maturity systems institutions have embedded processes aimed at quality enhancement towards their own objectives.

Ossiannilsson et al. (2015) present a global survey of quality models for e-learning. They find that most models take a holistic view of quality, recognising the need to address many aspects of the enterprise. Although the models vary considerably in the detail and number of quality indicators, most cover a consistent set of important dimensions. For example, the E-xcellence framework uses six dimensions: Strategic Management, Curriculum Design, Course Design, Course Delivery, Staff Support and Student Support (Kear et al. 2014). If there is a consensus that this range of dimensions is appropriate for e-learning generally, it seems appropriate to use a similar framework for MOOCs.

The following case studies illustrate these ideas, and explore how quality can be assured during the development and presentation of MOOCs.

14.3.1 Case Study: The Open University

This first case study discusses the UK Open University (UKOU), and its processes for offering MOOCs. This case study is presented broadly according to the six quality dimensions mentioned above.

14.3.1.1 Strategic Management

The UK Open University (UKOU) has a mission to increase access to higher education. Its courses and qualifications are open to all, regardless of prior qualifications. Most UKOU courses require payment, but since 1992 the UKOU has offered some learning resources for free. At the time of writing, it offers MOOCs in partnership with FutureLearn, as well as offering online open courses via its OpenLearn OER repository,[2] some of which offer Mozilla badges on completion. FutureLearn MOOCs have a definite start time, and are hence presented to a cohort of learners; in contrast, OpenLearn courses can be studied at any time. In both cases there is a well-structured process for the development of the course, and for monitoring it in presentation, so that it can be improved.

The development of an open course follows a similar process to that used to develop all UKOU modules, although at a smaller scale. It still involves a number of staff from across the university, including academic faculties and the Learning and Teaching Solutions (LTS) unit which carries out course production.

14.3.1.2 Curriculum Design

A central Open Media Unit (OMU) has a specific remit to oversee and support open access developments, and each faculty has an Open Media Fellow whose role is to encourage the development of open access resources within the faculty. The process for approving a new course begins with a proposal from the faculty. This is then subject to institutional approval by OMU. In the case of a FutureLearn MOOC, there is also an approval process by FutureLearn, which depends on the fit with existing and proposed FutureLearn MOOCs from all partners.

14.3.1.3 Course Design

One aim of the design stage is that the course should provide a mix of different media and activities which will engage learners and support their learning. In the case of a FutureLearn MOOC, each week's study consists of a number of 'steps' of up to 20 min study time. The steps include resources and activities, e.g. videos,

[2]http://www.open.edu/openlearn.

animations, discussions. Interaction between learners is encouraged by having a discussion thread associated with every step. At the end of each study week there is a quiz so that learners can check their knowledge and understanding. During the course development stage, any third-party resources will be cleared for copyright; course authors are encouraged to use open educational resources or other material available via a Creative Commons licence.

14.3.1.4 Course Delivery

After several stages of drafting, critical reading, editing and checking, the course is put onto the platform—FutureLearn for MOOCs or OpenLearn for UKOU open courses. There is then a final check before it is signed off by the course authors as ready for presentation. For a FutureLearn MOOC in presentation, UKOU trained online facilitators monitor the discussion threads, engaging with learners in the discussions as appropriate. In addition, FutureLearn moderates the discussions to minimise any offensive contributions (learners can identify such contributions themselves).

14.3.1.5 Staff Support

Courses are typically developed during a short but intensive period by just one or two experienced UKOU academics. Course authors are supported by critical readers (who are often UKOU tutors) and colleagues from OMU and LTS, in particular an experienced OU editor. At an early stage in the course development, a Learning Design workshop takes place, based on a framework developed at the UKOU (Galley 2015; Conole 2013). The workshop involves specifying the aims/learning outcomes for each week of study, together with the learning resources and activities. Training is offered by the UKOU audio visual department for any staff who are to appear in course videos.

14.3.1.6 Student Support

Once the course is in presentation, a number of quality metrics and processes come into play. Learner activity is closely monitored and measured, and the data presented in detail back to the course authors in the form of a dashboard. Various measures of learner retention and activity are used as key parameters, both while the course is in presentation and once it is finished. For example, in a FutureLearn MOOC it is possible to tell if learners are struggling to complete a particular step; on this basis, the learning resources for that step can be improved for later presentations and the facilitators can be briefed on how to help learners in the current cohort.

At the end of the course, learners are invited to complete a feedback survey; or if they decide to withdraw part way through the course, they are invited to give feedback at that point. OMU also reviews the discussion threads, in order to investigate learners' reactions to different parts of the course. The survey data, together with retention data, student activity data and feedback gathered via the discussion threads is used to carry out a review after the first course presentation. On this basis, decisions can be made as to whether the course should continue in presentation and how it could be improved for learners in the future.

14.3.2 Case Study: FutureLearn

FutureLearn is an organisation that partners with universities and other groups to provide MOOCs on a wide range of topics. It is a limited company wholly owned by the UK Open University (UKOU) and benefits from the UK OU's long experience of online learning. The initial 12 FutureLearn partners were high status UK universities. At the time of writing, FutureLearn has 73 partners: the majority are universities in the UK and other countries, but there are also partners such as the British Museum and the European Space Agency.

FutureLearn courses typically last 3–8 weeks, and require 2–5 h of study per week. The largest course, on English as a Foreign Language, attracted 400,000 learners in early 2015. FutureLearn has over 2.5 million registered users in more than 190 countries. In July 2015, 60 % of FutureLearn users were from outside the UK; 60 % were female; and the age range was from 13 to 93 (JISC 2015). Most users already have a degree, but FutureLearn also has resources aimed at school leavers, including those making the transition to university.

FutureLearn has its own MOOC platform and hosts the MOOCs from all partners. The MOOC platform will operate on a range of devices, using different browsers. FutureLearn set out to create a 'modern, attractive, experience' for the learner (Simon Nelson in Chung 2015) and it won the UXUK award for best user experience in late 2015.[3] The pedagogical approach aims to make the learning experience simple and well-structured. Learning resources (e.g. text and videos) are organised into "steps", which can be flagged as completed so that learners (and FutureLearn) can easily keep track of their progress. A model of social learning also informs the design; for example, discussion threads are closely integrated with the learning resources in each step so that learners can share ideas and experiences related to the material they are studying.

The FutureLearn approach of combining a clear structure and navigation with opportunities for discussion and debate appears to have led to high learner retention. An average of 22 % of the people who begin a FutureLearn course are (to use FutureLearn's term) 'fully participating learners': they have carried out at least 50 % of the steps and all the assessments (typically weekly quizzes). In terms of the

[3]http://uxukawards.com/.

number of people who sign up for a FutureLearn course, 12 % are fully participating learners.

FutureLearn has a publicly available set of 'Openness Principles' which indicate its philosophy[4] with regards to open education, intellectual property and privacy. FutureLearn also has a detailed policy on 'Accessibility and Inclusion', which is used when reviewing courses.[5] This specifies the responsibilities of both FutureLearn and of the partner organisation providing the course material. The policy refers to FutureLearn's compliance with the World Wide Web Consortium's web content accessibility guidelines.[6] For example, the FutureLearn platform can be used via a keyboard and a screen reader; attention is paid to suitable font sizes and use of colour.

Learners may pay for a 'Statement of Participation' to demonstrate that they have completed a course, including the assessment. For some courses, and at a somewhat higher cost, FutureLearn offers invigilated examinations, in collaboration with Pearson VUE,[7] which lead to a more formal "Statement of Attainment". No FutureLearn courses currently provide credit points from the partner universities, although there is nothing to prevent this if the partner considers it appropriate.

14.4 The Openuped Quality Label

The OpenupEd partnership is an alliance of institutional MOOC providers, brought together by the European Association of Distance Teaching Universities (EADTU), who agree to follow the quality principles and practices represented in the OpenupEd Quality Label. The partners in OpenupEd have a commitment to opening up education through MOOCs to the benefit both of learners and of wider society. To this end, partners endorse the eight distinctive features described in Table 14.1 as guiding principles for their MOOC offering.

The OpenupEd Quality Label provides a process-based quality enhancement framework for MOOCs and their providers. It was derived from the E-xcellence label[8] (mentioned earlier) which provides a methodology for assessing the quality of e-learning in higher education. E-xcellence has a review process that is based around a number of benchmark statements, grouped according to the six dimensions of Strategic Management, Curriculum Design, Course Design, Course Delivery, Staff Support and Student Support. E-xcellence has been periodically updated in the light of feedback from its reviewers and to reflect the changing nature

[4]https://about.futurelearn.com/terms/openness/.
[5]https://about.futurelearn.com/terms/accessibility-policy/.
[6]http://www.w3.org/TR/WCAG/.
[7]http://home.pearsonvue.com/.
[8]http://e-xcellencelabel.eadtu.eu/.

Table 14.1 The distinctive features of OpenupEd MOOCs

OpenupEd distinctive features	Explanation
Openness to learners (OL)	This captures aspects such as: open entry (no formal admission requirements), freedom to study at time, place and pace of choice, and flexible pathways. A broader perspective stresses the importance of being open to learners' needs and providing for a wide variety of lifelong learners
Digital openness (DO)	Courses should be freely available online but in addition apply open licencing so that material and data can be reused, remixed, reworked and redistributed (e.g. using CC-BY-SA or similar)
Learner-centred approach (LC)	Courses should aid students to construct their own learning from a rich environment, and to share and communicate it with others; they should not simply focus on the transmission of content knowledge to the student
Independent learning (IL)	Courses should provide high quality materials to enable an independent learner to progress through self-study
Media-supported interaction (MI)	Course materials should make best use of online affordances (interactivity, communication, collaboration) as well as rich media (video and audio) to engage students with their learning
Recognition options (RO)	Successful course completion should be recognised as indicating worthwhile educational achievement
Quality focus (QF)	There should be a consistent focus on quality in the production and presentation of a course
Spectrum of diversity (SD)	Courses should be inclusive and accessible to the wide diversity of citizens; they should allow a spectrum of approaches and contexts, accounting for a variety of language, culture, setting, pedagogics and technologies

of e-learning in HE; at the time of writing (2016) the current benchmarks and manual (Williams et al. 2012) are being updated.

The OpenupEd quality label[9] (Rosewell and Jansen 2014) builds on E-xcellence by taking a similar approach; however, it adopts a lighter weight process and adapts the benchmarks to better suit MOOCs. The benchmarks are divided into two groups: one that applies at institutional level and a second that applies to individual courses. The institution should be considered against the full set of institutional-level benchmarks but only at intervals. Every MOOC needs to be considered, but only against the much smaller number of course-level benchmarks.

An outline of the OpenupEd Quality Label process is as follows. OpenupEd partners are expected to be higher education institutions (HEI) that meet national requirements for quality assurance and accreditation. The HEI should have an internal procedure to approve a MOOC, typically a "light-touch" version of the procedure applied to formal courses. The HEI should endorse the eight distinctive OpenupEd features listed in Table 14.1. New partners will obtain the OpenupEd

[9] http://www.openuped.eu/quality-label.

Quality Label by a self-assessment and review process that will consider benchmarks both at institutional and course level (for two courses initially). The label must be renewed periodically; between institutional reviews, MOOCs will be reviewed at course level only. The HEI is expected to evaluate and monitor each MOOC in presentation, including data on participation, completion and student satisfaction, and an assessment of equality, quality, and diversity.

The self-assessment and review focus on the 21 institutional and 11 course-level benchmarks. A "quick scan" checklist is provided (Fig. 14.2) which lists the benchmarks with an accompanying grid to record two aspects. Firstly, an overall judgement on the extent to which the benchmark is achieved is recorded using a four-point scale: not achieved, partially achieved, largely achieved, or fully achieved (E in Fig. 14.2). Secondly, a mapping can be made between each benchmark and the eight OpenupEd distinctive features; an initial mapping is provided but this can be adapted where necessary (D in Fig. 14.2). For example, in Fig. 14.2 benchmark 22 "A clear statement of learning outcomes for both knowledge and skills is provided" is mapped to the distinctive feature "IL—Independent learning" to suggest that evidence gathered in relation to this benchmark is also likely to provide evidence of a course suited to independent learning.

The quick scan can be used to give an initial picture of areas of strength and weakness. It can also highlight: where benchmarks may not be fully appropriate; where they may fail to capture good practice in a particular HEI or MOOC; and where additional detailed indicators might be helpful. The quick scan should then be fleshed out by a more detailed self-assessment process, ideally including different stakeholders such as teachers, managers, course designers and students. This should gather evidence for each benchmark, including the extent to which the evidence also supports the distinctive OpenupEd features. A plan detailing improvement actions is then prepared. The documented self-assessment and the improvement plan form the basis of a final review and discussion with external assessors, who then prepare a final report including their recommendation for the award of the OpenupEd Quality Label.

A number of documents and templates support this process. Assessor's notes are provided that cross-reference the OpenupEd benchmarks to additional indicators

A	B	C	D									E			
	Benchmark / indicator		OL	DO	LC	IL	MI	RO	OF	SD		NA	PA	LA	FA
	Course level														
22	**A clear statement of learning outcomes for both knowledge and skills is provided.**	10				x									
23	**There is reasoned coherence between learning outcomes, course content, teaching and learning strategy (including use of media), and assessment methods.**	11			x	x	x		x						
24	**Course activities aid students to construct their own learning and to communicate it to others.**				x										

Fig. 14.2 Part of the quick scan checklist. Key: *A* Benchmark number; *B* Benchmark statement; *C* Cross-reference to E-xcellence manual; *D* Mapping to OpenupEd features (Table 14.1 for abbreviations); *E* Grid for recording benchmark achievement (*NA* Not achieved; *PA* Partially achieved; *LA* Largely achieved; *FA* Fully achieved)

31 Assessment is explicit, fair, valid and reliable. Measures appropriate to the level of certification are in place to counter impersonation and plagiarism.

See comments to Benchmark 29 above.

The advent of digital badges (for example Mozilla open badges) provides a method of rewarding achievement that may be appropriate for MOOCs. The award of digital badges can be linked to automated or peer assessment. Digital badges have an infrastructure that verifies the identity of the holder and provides a link back to the issuer and the criteria and evidence for which it was awarded. Badges thus may provide a validated award that can be kept distinct from the HEIs normal qualifications.

See also:

E-xcellence benchmark #17
Chapter 3 *Course design*
§ 2.4 Assessment procedures
§ 3.4 Assessment
§ 4.2.5 Online assessment

Fig. 14.3 Example assessor's note, with cross-references to the E-xcellence manual

and background material in the E-xcellence manual (Williams et al. 2012), with supplementary material provided for MOOC-specific aspects where necessary (Fig. 14.3).

14.4.1 The OpenupEd Label in Practice

The initial partners in OpenupEd were all members of EADTU. The consortium took the view that MOOCs from these providers were already being created under institutional quality processes that met the requirements of the OpenupEd label, and the initial portfolio of OpenupEd MOOCs therefore were not required to go through an additional review process.

Rodrigo et al. (2014) report a self-assessment exercise of over 20 MOOCs on the UNED platform using the OpenupEd benchmarks. The assessed MOOCs had all been developed by experienced staff under a strong existing institutional quality framework for online learning; they could therefore be expected to meet the OpenupEd benchmarks. However, the exercise highlighted some benchmarks which could not confidently be scored as largely or fully achieved; for example not all MOOCs gave a clear statement of learning outcomes, and materials were published under a restricted rather than an open licence. These are aspects that could be taken forward for discussion and perhaps inform institutional policy, leading to quality enhancement.

The authors also report that additional and more specific indicators would improve the benchmarking for their institution; these include specific academic roles (curator, facilitator), a variety of certification (badges, ECTS credit), and flavours of MOOC pedagogy (c-MOOC, X-MOOC, SPOC). The OpenupEd assessor's notes do incorporate most of these issues (see Fig. 14.3 for example), but they were judged too specific to be included in the standard benchmarks. Rodrigo et al. also report issues such as teacher's workload and accessibility issues which became apparent during a course-level exercise, but which are covered by OpenupEd benchmarks at institutional rather than course level. The OpenupEd quality process suggests that initial self-assessment can be used to highlight benchmarks that are not fully appropriate to an HEI and to discover additional indicators needed to capture aspects of good practice. Rodrigo and colleagues therefore conclude that the OpenupEd Quality Label is a versatile tool, providing guidance with sufficient flexibility to meet an institution's aspirations without being a straitjacket.

14.5 Discussion

The two case studies in Sect. 14.3 presented aspects of MOOC quality from the perspective of an institution (the UKOU) and of a MOOC platform provider (FutureLearn). In the discussion that follows, we will focus on the joint enterprise—a representative MOOC designed by the UKOU and presented via FutureLearn—and do so through the lens of the OpenupEd Quality Label and its benchmarks (Rosewell and Jansen 2014). The discussion is mapped to appropriate the OpenupEd benchmarks (for example #1) and OpenupEd features (for example DO; see Table 14.1 for key). To complete a quick scan (Fig. 14.2) for a specific course would require in addition a judgement on whether the benchmarks and features are fully achieved or not.

14.5.1 Analysis of Case Study

Although we focus on this single example, it is likely that arrangements work similarly with other HEIs and MOOC platforms. It is also clear that quality emerges from the joint enterprise and is not solely the responsibility of one partner [#5, QF]. However, there is one reasonably clear division between the originating institution and platform provider marked by handover to the platform for publishing—before that point the weight of quality assurance falls on the HEI, with FutureLearn taking a greater role at and after handover [#6, QF].

The OpenupEd Quality Label takes the view that MOOC quality is best approached holistically, looking at the institutional processes as well as the completed product. Ossiannilsson et al. (2015) find the same approach in most e-learning quality frameworks. Both the UKOU and FutureLearn have clear strategies and processes for MOOC production which are seen as essential to ensuring quality [#3, #5, QF]. These include commissioning processes on both sides so that course proposals are scrutinised at an early stage, one output of which is a course description [#18, #22, OL, IL]. This ensures that the course will meet the needs of learners [LC], as well as contribute to a MOOC portfolio that meets the strategic goals of both the HEI and platform [#1, #8, OL]. The UKOU delivers MOOCs on FutureLearn (with certificates) and on OpenLearn (with badges) [RO], which also includes access material [#8, OL, SD] and tasters for core non-MOOC curriculum [#7].

Both the UKOU and FutureLearn take very clear positions on aspects such as openness [#11, #27, DO], accessibility and inclusion [#4, OL], and these values therefore permeate normal work, helping to ensure that material is produced that conforms to accepted standards without needing rework at a late stage.

Course design is mainly the responsibility of the HEI, but is supported by guidance documents from FutureLearn [#9]. A strong steer is provided by the affordances of the platform, which is directed to a particular pedagogical model [#13, #23, LC, IL, MI]. This model appears to be successful, although it may limits the freedom of course authors to take alternative approaches. At a practical level, this can be seen in the way that FutureLearn currently only hosts a restricted set of resource types and activities [#13, #23], requiring the author or HEI to make alternative arrangements for some resources; the result is that not all FutureLearn courses are entirely self-contained [#5].

The UKOU process for course design follows the model used in development of their standard non-MOOC provision [#6, QF], although with fewer staff and at an accelerated pace. The early learning design workshop ensures that there is coherence between content, teaching and learning strategy and assessment [#23, LC, IL]. This workshop, together with guidelines from FutureLearn and the affordances of the platform itself (with its clear design in "steps" and the emphasis on social learning [#20, #24, LC, SD]), also ensures that there is interactivity (student-to-student and student-to-content) to encourage active engagement [#29, LC, IL, MI]. Team writing and critical reading of drafts help to assure that content is relevant, accurate and current [#25, QF]. The process of course approval, which includes choice of authors, helps to ensure that staff have the required skills to develop material suitable for the proposed audience [#26, QF]. The UKOU already has significant capability in delivering online education with trained specialist support staff [#17, QF], but it has also provided some specific MOOC and media training [#15, QF]. The UKOU also has institutional structures and processes which promote educational research and innovation as important activities, for example, its Institute of Educational Technology [#2, #16, QF]. FutureLearn complements this with the FutureLearn Academic Network which exists to promote research around the FutureLearn platform and its learners [#2, #16, QF].

A clear division of responsibility is seen in course delivery, with FutureLearn having responsibility for providing the platform, which is effectively outsourced by the HEI, presumably with clear service level agreements and financial arrangements in place [#5, #12]. However, there is a shared responsibility for human input:

FutureLearn provide moderators and the UKOU provide the course facilitators who act in an academic role [#21, IL]. The UKOU provides training for those undertaking the facilitator role, ensuring that staff delivering the course have suitable skills [#15, QF]. FutureLearn publish policies and guidelines for support that is available to participants [#19, #21, OL, IL]. There is a further division of responsibility in assessment: UKOU authors create embedded self-assessment and a final quiz [#29, #30, LC, IL]; FutureLearn handles certification [#31, RO].

Finally there is also a division of responsibility for monitoring and evaluating courses. The FutureLearn platform provides analytic and survey data, which is fed back to the UKOU as a dashboard during presentation [#14, QF]. UKOU course staff monitor the presentation and are able to respond to issues raised in discussion threads, although there is limited scope for changing the material itself during presentation. A thorough review by the UKOU after presentation is used to decide whether to continue presentation and to identify changes required to enhance quality [#32, QF]; since this is overseen by an institutional body there is a mechanism to share experience more widely [#10, QF].

14.5.2 General Reflection

It should be clear from the above discussion that quality of MOOCs can only be measured against their design principles. Quality is the result of the application of a systematic process of design and evaluation, aimed at improvement over time. As such, quality enhancement for MOOCs is an iterative process, and design methodology at different levels of granularity can support this (e.g. see Dalziel et al. 2013, for learning design principles).

Quality needs to be thought about at both the institutional and course level, and the focus must include process and not just the resulting product. Both FutureLearn and the UKOU have invested in structures and processes that embed a concern with quality throughout the development, delivery and evaluation of a MOOC in order to assure the quality of any individual MOOC. Noticeably absent from the case study descriptions is any formal stage in the process that is labelled "Quality assurance": this is because a concern with quality permeates the whole process.

The OpenupEd Quality Label and its benchmarks is sufficiently broad ranging that it can capture the quality practices described in these two case studies. Clearly the contributions of both parties (UKOU and FutureLearn) would have to be considered as part of the review and label. Members of OpenupEd are expected to be HEIs and it would be the HEI and its MOOCs that would be labelled, rather than the platform provider. An interesting boundary case occurs when a MOOC is transferred from one platform to another; for example, MOOCs presented by the UKOU on FutureLearn are later made available as self-paced open courses on its OpenLearn site. In this case, the institution will need to check that the course still complies with the OpenupEd features.

14.6 Conclusion

This chapter has explored the key issue of quality in relation to MOOCs. It has considered how questions of quality are raised by MOOCs, and has proposed approaches for assuring the quality of MOOCs. The chapter illustrated these ideas through two case studies of quality assurance for MOOCs, one focussing on FutureLearn—a platform provider which supports many institutions—and the other on the UKOU—a single institution which uses multiple platforms. These case studies illustrated the different quality processes involved.

It is concluded that MOOCs require quality assurance processes that are tailored to e-learning, embedded in institutional frameworks. There are existing e-learning quality approaches intended for use in formal, credit-bearing education that can be pressed into service; Ossiannilsson et al. (2015) provide a useful overview and guide to the issues.

The chapter also introduced the reader to the pan-European OpenupEd framework for enhancing quality in the development of MOOCs. The OpenupEd Quality Label is derived from the E-xcellence label, an established approach to quality assurance of e-learning and blended learning that has roots in the experience of open and distance learning institutions.

As HEIs increasingly collaborate on a global scale on their MOOC provision, additional quality processes are required. This is related to the unbundling of educational services and illustrated with FutureLearn and OpenupEd. These two examples demonstrate that this unbundling introduces distinct quality processes at a cross-institutional level. The OpenupEd Quality Label requires courses to address openness to learners and open licencing and is thus firmly rooted in the Open Education movement. This international dimension is expected to gain in importance as new kinds of partnership emerge (Osuna Acedo et al. 2016) and if MOOCs are to become considerable parts of degree programs in the future.

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Chapter 15
Using Linked Data to Blended Educational Materials With OER—A General Context of Synergy: Linked Data for Describe, Discovery and Retrieve OER and Human Beings Knowledge to Provide Context

Nelson Piedra, Janneth Chicaiza, Javiera Atenas, Jorge Lopez-Vargas and Edmundo Tovar

15.1 Introduction

People want to learn. The education is seen as an essential, shared, reused, adapted, and collaborative social good. By providing free and open access to education and knowledge, people can fulfill this desire. Students can get additional information, viewpoints, and materials to help them succeed. Workers can learn something that will help them on the job. Faculty can exchange material and draw on resources from all around the world. Researchers can share data and develop new networks. Teachers can find new ways to help students learn. People can connect with others they would not otherwise meet to share information and ideas. Materials can be translated, mixed together, broken apart, and openly shared again, increasing access

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and allowing new approaches. Anyone can access educational materials, scholarly articles, and supportive learning communities anytime they want to. Education is available, accessible, modifiable, and free.

Open Educational Resources (OER) provides a strategic opportunity to improve the quality of education as well as facilitate policy dialogue, knowledge sharing, and capacity building. OER are part of the Open Education movement, and teachers, students, self-learners, and learning institutions are driving its development.

OER are typically made freely available over the Web or the Internet. Their principal use is by teachers and educational institutions support course development, but they can also be used directly by students and self-learners. OER are part of the Open Education movement, and teachers, students, self-learners, and learning institutions are driving its development.

In recent years, several researchers have developed various investigations about the relationships between the use of OER (vs. traditional materials), and student academic performance. No significant differences were found between the groups using traditional educational materials and using OER, thus indicating that OER could be substituted without any negative impact on learning. Additionally, the majority of faculty members perceive OER to be of approximately the same "trusted quality" as traditional resources (Allen and Seaman 2014).

In Lovett et al. (2010) is measured the efficacy of an OER statistics module in comparison with the traditional educational model at Carnegie Mellon University, and found that there was no significant difference between the two groups. This experiment was replicated in spring 2006 with the same, nonsignificant result. Thus, utilizing OER resulted in cost-savings without improving or sacrificing learning outcomes.

In another study focused on Carnegie Mellon's open statistics modules, (Bowen et al. 2014) researchers compared the use of a traditional textbook in a face-to-face lecture class with that of a blended approach utilizing OER. Bowen and colleagues found that, while students who utilized OER scored slightly higher than their peers on standardized exams, the difference was not statistically significant. A potential confound was that those utilizing OER received blended learning instead of traditional face-to-face instruction. Thus it is possible that the pedagogy masked the influence of OER. Nevertheless, it is relevant to note that in this study the use of OER did not lead to lower student outcomes.

Other case of study presented by Hilton III and Laman (2012) is focused on four math classes at Scottsdale Community College. These classes used the same departmental exam for each course for several years, which allowed faculty members to compare how students did on department exams when OER were used as compared with previous semesters. OER replaced traditional learning materials, and student results at the end of this semester were approximately the same as those obtained by students in previous years.

One major barrier on the way to a sustainable open educational environment based on OER is an appropriate global-scale interoperable and integrated approach ecosystem. A global-scale interoperable and integrated approach consists of a legal framework that promotes free and open access to educational materials, a focus of quality assurance in shared academic resources, and a technological vision that through the Web allows automatic processing of information associated with OER. Although, the OER itself has been described as early as 2001, detailed reusable insight into the relationship between OER offers and OER reutilization has remained scarce.

The purpose of this work is to show a way to enhance the face-to-face classrooms with integration of OERs, to create blended learning instruction. OER movement envisions a world where everyone, everywhere, anytime has access to the high-quality education and training they desire. The education is seen as an essential, shared, reused, adapted, and collaborative social good. The work is organized as follows: Sect. 15.2 we present the evolution of OER, in Sect. 15.3 we present challenges to adopting OER, including some open discussions and issues. In Sect. 15.4, we describe how Linked Data aim to connect OER concepts from diverse OER silos (in business management and information technology a silo describes any management system that is unable to operate with any other system). In Sect. 15.5, we present a framework to mitigate barriers in OER reuse. Finally, we present some conclusion and outline some future works.

15.2 The Evolution of OER

The general objective of OER projects is to deliver high-quality instructional content to an unlimited number of users at virtually no additional cost beyond the original cost of production or cost of adaptation. OER projects are committed to offering the world's learners, teachers, and self-learners free access to its many academic resources. An OER project seeks to capitalize on the potential of the Internet to eliminate borders, geographic distance, or other obstacles to the instantaneous exchange of knowledge and new ideas. Unlike distance learning programs that charge tuition, provide formal instruction, and limit participation, OER providers offer all course materials free to everyone with online access. Educators from around the world may upgrade their classes; students and self-learners may enhance their coursework or pursue self-study, OER content has the potential to substantially improve the quality of life of learners around the world; the general public may glimpse the depth and breadth of what leading universities are offering and benefit from reading lists and lectures.

Educational leaders around the world are using OER as a cost-saving source of curriculum, and also because of the opportunity it provides for supporting teaching and learning in a flexible and collaborative manner. To be sustainable, OER projects will have to look back to its roots in open source software—to a model where the community works together and principles of openness and sharing guide the development of educational practices, educational resources, technologies, and financial support.

15.2.1 Quality Education and Lifelong Learning with OER

UNESCO believes that universal access to high-quality education is the key to the building of peace, sustainable social and economic development, and intercultural dialogue. The International Covenant on Economic, Social and Cultural Rights (Article 13.1), recognizes "the right of everyone to education" (ICESC 1976). The Education for All is a worldwide UNESCO programme that involves more than 150 countries, and a large number of nongovernmental organizations. World Education Forum 2000 in Dakar, Senegal, resulted in the Millennium Declaration and the 2000 Dakar Framework for Action, which made global commitments to provide quality basic education for all children, youth, and adults (UNESCO 2000); and, the 2003 World Summit on the Information Society, Declaration of Principles, committing "to build a people-centered, inclusive and development-oriented Information Society where everyone can create, access, utilize and share information and knowledge".

Every person has the right to education (United Nations 1948): It has been almost 60 years since Article 26.1 and 26.2 of the Universal Declaration of Human Rights was written, and still we fall short of this assertion:

- "Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit."
- "Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace."

When educational materials can be electronically copied, reused, adapted, and transferred around the world at almost no cost, we have a greater ethical obligation than ever before to increase the reach of opportunity of education for all.

In this context, the role of OER initiatives is to help make this declaration a reality. Now we have legal conditions, a global communication infrastructure, and technical tools to convert educational materials into open education resources.

The term "Open Educational Resources" (OER) was first adopted at UNESCO's (2002) Forum on the Impact of Open Courseware for Higher Education in Developing Countries funded by The William and Flora Hewlett Foundation. In this year, UNESCO defined OER as "technology-enabled, open provision of educational resources for consultation, use and adaptation by a community of users for non-commercial purposes". OER means they must be free and provide the permissions to reuse, revise, remix, adapt, and redistribute. However, we need to examine the concept in more detail.

The OER concept was originated with the OpenCourseWare (OCW) movement started in 1999 when the University of Tübingen in Germany published videos of lectures online for its TIMMS initiative (Tübinger Internet Multimedia Server).[1] The OCW movement only took off, however, with the launch of MIT OpenCourseWare[2] at the Massachusetts Institute of Technology (MIT) in 2001 (MIT 2001). The William and Flora Hewlett Foundation, the Andrew W. Mellon Foundation, and MIT originally funded the program.

MIT President Charles M. Vest announced that the MIT will make the materials for nearly all its courses freely available on the Internet over the next ten years: MIT OCW, a project that took into account the power of the Internet, the capabilities of the World Wide Web, and its potential for new applications in education. President Vest focused on how OpenCourseWare reflected the idealism of the MIT faculty and the core educational mission of MIT (2001): “OpenCourseWare combines two things: the traditional openness and outreach and democratizing influence of American education and the ability of the Web to make vast amounts of information instantly available”. MIT’s reasoning behind OCW was to “enhance human learning worldwide by the availability of a web of knowledge”. MIT OpenCourseWare has a dual mission: First, to provide free access to virtually all MIT course materials for educators, students, and individual learners around the world. Second, to extend the reach and impact of MIT OCW and the OpenCourseWare concept (Vest 2004). With OCW, MIT does not provide education on the Web. MIT provides its core materials that are the infrastructure that undergirds an MIT education. Real education requires interaction. MIT OCW also stated that it would allow students (including, but not limited to its own) to become better prepared for classes so that they may be more engaged during a class. Generally, an OCW initiative does not require any registration and is not a degree-granting or certificate-granting activity. It is instead an effort to share knowledge, make the best educational use of the Internet’s potential, and act as enablers to achieving the universal right to education. The OCW movement was quickly reinforced by the launch of similar projects at Yale,[3] the University of Michigan,[4] and the University of California Berkeley.[5] Students, educators, and self-learners around the globe, many of whom are from areas where educational resources are scarce or difficult to access, have embraced OCW projects.

[1]Tübinger Internet Multimedia Server Initiative: http://timms.uni-tuebingen.de/archive/sose99.aspx.

[2]MIT OpenCourseWare is a large-scale, web-based publication of MIT course materials. The project was announced in 2001. http://ocw.mit.edu.

[3]Open Yale Courses http://oyc.yale.edu/courses Each course includes a full set of class lectures produced in high-quality video accompanied by such other course materials as syllabi, suggested readings, exams, and problem sets. The lectures are available as downloadable videos, and an audio-only version is also offered. In addition, searchable transcripts of each lecture are provided.

[4]Open.Michigan encourages researchers, learners, and instructors to maximize the impact and reach of their scholarly work through open sharing. http://open.umich.edu.

[5]Every semester, University of California Berkeley records several popular courses and offers them free to the public. Anyone can watch these OpenCourseWare recordings and learn from home. http://webcast.berkeley.edu.

Through OCW projects, educational organizations can share and contribute their educational resources, knowledge and expertise in a free, open and easily accessible manner. According to the OCW Consortium, an OCW project: is a free and open digital publication of high-quality educational materials, organized as courses[6]; is available for use and adaptation under an open license, such as certain Creative Commons licenses; and, does not typically provide official certification or access to faculty.

The notion of OER has numerous working definitions. UNESCO (2002) define OER as “teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions”. In this sense, open licensing is built within the existing system of intellectual property rights as defined by relevant international conventions and respects the authorship of the work; with the purpose of promoting the reuse of OER.

OER are typically made freely available over the Web or the Internet. Their principal use is by teachers and educational institutions’ support course development, but they can also be used directly by students and self-learners. OER include learning objects such as lecture material, references and readings, simulations, experiments, and demonstrations, as well as syllabi, curricula, and teachers’ guides (UNESCO 2002).

The purpose of the OER movement is to provide open access to high-quality digital educational resources. There is broad participation by universities, private organizations, and others. Projects include the Internet Archive,[7] Project Gutenberg,[8] Wikipedia,[9] Creative Commons,[10] Sun Microsystems Global Education Learning Community[11] and, as is the focus of this article, the OpenCourseWare Consortium.[12] The list of participating organizations grows every year as the principles of openness spread.

The Cape Town Open Education Declaration[13] is a major international statement on open access, open education, and OER, with the purpose of accelerating the efforts to promote open resources, technology, and teaching practices in education (CTOED 2007). To increase the reach and impact of OER, the declaration calls to educators, authors, publishers, and institutions to release their resources openly.

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[6]In some cases the full complement of course materials may not appear online due to copyright and other intellectual property issues.

[7]http://internetarchive.org.

[8]http://gutenberg.org.

[9]http://wikipedia.com.

[10]http://creativecommons.org.

[11]https://edu-gelc.dev.java.net/nonav/index.html.

[12]http://ocwconsortium.org.

[13]It emerged from a conference on open education hosted in Cape Town on 14 and 15 September 2007 by the Shuttleworth Foundation and the Open Society Institute.

In (CTOED 2007) the declaration suggests, "These OER should be freely shared through open licenses which facilitate use, revision, translation, improvement and sharing by anyone. Resources should be published in formats that facilitate both use and editing, and that accommodate a diversity of technical platforms. Whenever possible, they should also be available in formats that are accessible to people with disabilities and people who do not yet have access to the Internet."

The term OER is defined by the William and Flora Hewlett Foundation[14] (Atkins et al. 2007) as "teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others." In this definition, OER include "full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge".

The Organization for Economic Co-operation and Development (OECD) defines OER as: "digitized materials offered freely and openly for educators, students, and self-learners to use and reuse for teaching, learning, and research" (OECD 2007). This definition included as OER, "learning content, software tools to develop, use, and distribute content, and implementation resources such as open licenses". Wikiversity[15] cites this definition and say "OER are documents, media, software and processes that are useful to teaching, learning, education and assessment, and that are made openly accessible and reusable by anyone for any purpose, free of barriers or restrictions".

Wikipedia suggests that OER refers "digital materials that can be reused for teaching, learning, research and more, made available free through open licenses, which allow uses of the materials that would not be easily permitted under copyright alone". Whereas that, the Wikieducator OER Handbook[16] says that the term OER, "refers to educational resources (lesson plans, quizzes, syllabi, instructional modules, simulations, etc.), which are freely available for use, reuse, adaptation, and sharing."

OER Commons[17] says that OER are "teaching and learning materials that you may freely use and reuse, without charge. That means they have been authored or created by an individual or organization that chooses to retain few, if any, ownership rights. OER often have a Creative Commons or GNU license that state specifically how the material may be used, reused, adapted, and shared". Some examples of OER materials cited by OER Commons are: "full university courses, complete with readings, videos of lectures, homework assignments, and lecture

[14]Since 2002, the Hewlett Foundation has worked with OER grantees to improve education globally by making high-quality academic materials openly available on the Internet. http://www.hewlett.org/programs/education/open-educational-resources.

[15]Wikiversity is hosted by the Wikimedia Foundation, a nonprofit organization, http://en.wikiversity.org/wiki/Open_educational_resources.

[16]Wiki Educator: http://wikieducator.org/Oer.

[17]OER Commons: http://www.oercommons.org/about.

notes, interactive mini-lessons and simulations about a specific topic, such as math or physics, adaptations of existing open work, electronic textbooks that are peer-reviewed and frequently updated, elementary school and high school (K-12) lesson plans, worksheets, and activities that are aligned with state standards."

Downes (2011), define OER as "materials used to support education that may be freely accessed, reused, modified and shared by anyone". Commonwealth of Learning[18] defines OER as "materials offered freely and openly to use and adapt for teaching, learning, development and research"

In 2012, UNESCO organized the international event for Open Education, the OER World Congress with aiming at creating awareness on policy, governmental, institutional, and user level. The main outcome was a global recommendation to governments and institutions, the Paris Declaration, especially regarding international collaborations and accessibility (UNESCO 2012). The Declaration shows the importance of OER and gives recommendations to governments and institutions around the globe.

In short, the notion of open education envelops a simple but powerful idea that the world's knowledge is public goods and that the Web provides an extraordinary opportunity for everyone to share, use, reuse, and adapt knowledge.

15.2.2 Open Licenses to Enhance Educational Opportunities

It is widely recognized that reuse of educational resources by both individuals and organizations may have significant creative and economic benefit for educational environment. Making educational content accessible and open beyond the walls of the original authoring institution can benefit everyone involved, including the reputation of the author and the institution itself (Caswell et al. 2008).

In 1983, Richard Stallman—founder of the Free Software Foundation (FSF)—announced the foundation of the GNU (Stallman 1983). GNU was launched as an operating system that would be put together by people working for the freedom of all software users to control their computing. The purpose of this project, housed within the MIT Artificial Intelligence Lab, was to build Unix-compatible software and share it freely with anyone. In 1991, Linus Torvalds released the first version of the Linux kernel.[19] Torvalds used GNU tools to develop Linux, at the present, a popular open source operating system built on the same open principles and licensed under a GNU General Public License (GPL).

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[18]Commonwealth of Learning (CoL.org): http://www.col.org/resources/crsMaterials/Pages/OCW-OER.aspx.

[19]Notes for Linux release 0.01 https://www.kernel.org/pub/linux/kernel/Historic/old-versions/RELNOTES-0.01.

Stallman announced the GNU Free Documentation License (GNU FDL or simply GFDL) in 2000, a copyleft[20] license for free documentation, designed by the Free Software Foundation for the GNU Project, giving readers the rights to copy, redistribute, and modify a work and requires all copies and derivatives to be available under the same license. In 1998, David Wiley announced the first open content license. This license was based on the premise that educational content should be freely developed and shared "in a spirit similar to that of free and open software" (Wiley 2003). The idea that content should be free and openly available became popular quickly. In 2002, Creative Commons, a nonprofit organization founded by Lawrence Lessing, released their first set of copyright licenses that helped content producers license their content for sharing and reuse. Creative Commons provides a similar license provision condition to GNU General Public License, called Share-alike.

Wiley (2014) indicates that the open content is content that is licensed in a manner that provides users with the right to make more kinds of uses than those normally permitted under the law. The primary permissions or usage rights open content is concerned with are expressed in the "5Rs Framework". These permissions are granted to users' free of charge.

15.3 Challenges to Adopting OER

We agree that all human beings are endowed with a capacity to learn, improve, and progress. Educational opportunity is the mechanism by which we fulfill that capacity. When educational materials can be electronically copied, reused, adapted, and transferred around the world at almost no cost, we have a greater ethical obligation than ever before to increase the reach of opportunity.

One of the two fundamental concepts related to OER is "the ability to freely adapt and re-use existing pieces of knowledge" (Abeywardena 2012). In Allen and Seaman (2014), potential barriers and concerns of teachers for not using OER are reported. In the analysis of this work, a nationally representative faculty sample is used. A total of 2144 faculty responded to the survey, representing the full range of higher education institutions (two-year, four-year, all Carnegie classifications, and public, private nonprofit, and for-profit) and the complete range of faculty (full- and part-time, tenured or not, and all disciplines). Almost three quarters of the respondents report that they are full-time faculty members. Just under one quarter teaching online, they are evenly split between male and female, and 28 % have been teaching for 20 years or more.

[20]CopyLeft (a play on the word copyright) is a general method for making a creative work as freely available to be modified, and requiring all modified and extended versions of the creative work to be free as well. Under copyleft, an author may give every person who receives a copy of a work permission to reproduce, adapt or distribute it and require that any resulting copies or adaptations are also bound by the same licensing agreement.

The three barriers that faculty cite impacting the adoption of OER are related to the ease of finding, selecting the appropriate resource, and evaluation of OER (Allen and Seaman 2014). In detailed, with more than half of the faculty aware of or using OER stating that the lack of a comprehensive catalog of resources is a barrier to OER use (51.5 and 57.5 %, respectively). The lack of a catalog and the difficulty of finding what is needed are the most often cited barriers. All three of the most mentioned barriers are related to the ease of finding appropriate material. This corresponds very closely to previous findings, where faculty listed the time and effort to find and evaluate these sources as the most important barrier to adopting OER. In this paper, a majority of faculty reported that difficultly in searching and the lack of a comprehensive catalog on OER materials were important barriers to their use of OER. Concern about licensing and its constraints on potential use and adaption was the fourth most mentioned barrier to OER adoption. The level of concern drops considerably after these top four issues. Most faculty that are aware of OER report that they have little concern that OER is up-to-date, easy to use and edit, or easy to integrate into the technology they are currently using. Barriers reported are: (a) No comprehensive catalog; (b) Too hard to find what I need; (c) Not enough resources for my subject; (d) Not knowing if I have permission to use or change; (e) Not relevant to my local context; (f) Not high quality; (g) Not used by other faculty I know; (h) Lack of support from my institution; (i) Too difficult to integrate into technology I use; (j) Not effective at improving student performance; (k) Too difficult to change or edit; (l) Too difficult to use; (m) Not current, up-to-date.

15.3.1 Enhance the Reusability of OER

Open educational digital materials and repositories occur in a rich diversity of types and representations. They are linked to the specific application packages that were used to create or manage them. They are easily misidentified. They are generally poorly described or annotated; they often have insufficient metadata attached to them to avoid their gradual susceptibility to loss of value. OER needs to be not only gathered and stored, but also made useful and visible, a process that takes substantial human work, even if heavy automation can aid in the process.

The reusability of OER is about maintaining the semantic meaning of the educational material and its content, about maintaining its provenance and quality, about retaining its interrelatedness, and about securing information about the context of its creation, use, reuse and adaptation, and the right semantic representation and data used to describe the OER.

Reuse is to make use of a resource for other aims, usually for a purpose unintended by the original creator. Thus creators of OER should consider the degree to which they want their OER to be open, and license the resource accordingly. In addition for licensing, there are technical aspects that make OER suitable for a new use or purpose, easier to discover, adapt, and remix, and consequently affect the level of openness of an OER. This implies the right to adapt, adjusts, modify, or alter the content itself.

15.3.2 Enhance the Discoverability of OER

The OER should be designed to be easily adaptable for other users. It should have metadata sufficient for discoverability. OER reusability means that the content is relevant to the specific needs of a user, which is technologically accessible and that it is sufficiently open for use, reuse, remix, adapt, and redistribute.

The openness of a digital resource is to work in the open as much as possible. It is not enough to just have a policy or principle of action of openness adopted or proposed by a government, consortium, organization, or individual. OER initiatives seek to be as understandable, reusable, adaptable, and inspectable as possible. Consequently, one of the primary benefits of an OER is that it can be discovered and adapted to the needs of specific situations.

Most of OER repositories are licensed under Creative Commons Licenses. The use of open licenses can help users to discover materials that they know can use, reuse, adapt, and redistribute. Different studies have highlighted the difficulty, finding OERs and how this affects their use. In White and Manton (2011), some of the causes that affect the location of OERs are identified: technical issues around search engines and repositories, practical searching skills, and the volume of available resources in different subject areas. Additionally, authors identified three factors that influence the decision to reuse of digital material: improve quality, meet a teaching need, and peer suggestion. While discoverability is probably the major barrier to reuse, tutors are still expecting to find useful materials online and are prepared to spend time searching for them.

15.4 Breaking Down OER SILOS

15.4.1 The Semantic Web Is a Web of Data

In May 2001, Tim Berners-Lee, the creator of the Web (Abrams 1998), Jim Hendler, and Ora Lassilla announced the Semantic Web, which they classed as a machine-processable data Web: “The Semantic Web is not a separate Web but an extension of the current one, in which information is given well defined meaning, enabling computers and people to work in better cooperation” (Berners-Lee et al. 2001).

W3C[21] also defines that Semantic Web is a data Web. These data may come in all sorts of formats, languages, styles, and structures. This approach to the Semantic Web is aligned with the original view of the Web proposed by Berners-Lee in the late 1980s, where the meaning of the information plays a key role, and the information is stored within a global, distributed database of data linked via the Web (Berners-Lee 1989). Unlike the current Web of linked documents, a Web of linked data is able to describe data models, concepts, and properties that are then connected, consulted, and combined on the Web, as if they were simply part of a global database.

The main contribution of this approach is that the Web of linked data constitutes an evolution of the current Web towards a global information space where browsing is driven by structured and linked data rather than by documents as is now the case. Consequently, we argue that these advances are a possible means of supporting interoperability, accessibility, and reusability of the data types like the OER.

The goal of Linked Data is to enable human beings to easily share structured data via the Web just as they share documents now (Bizer et al. 2007). The philosophy of Linked Data is that the value and usefulness of data increase in proportion to their links with other data. On this ground, Linked Data use the Web to create different types of links among data from different sources (Heath and Bizer 2011). In line with this vision of the Web, data and their relations come to play key roles. The availability of data sources based on Linked Data principles help to generate new opportunities to exploit AI techniques focused on machine learning, knowledge representation, information extraction, information integration, and multiagent environments.

Recently, sectors of government, academy, industry, and independent groups and individuals have published millions of RDF[22] data on the Web. RDF is a general-purpose language for representing and publishing structured data on the Web. Data described in HTML documents are now expressed in the RDF language. In a Web with data described in RDF, machine agents will be able to process and interpret data more efficiently. Software agents can exploit, that is, gather, aggregate, interpret, publish, and mashup these data automatically, etc.

15.4.2 Foundations of Linked Data

Semantic Web technologies and, more precisely, Linked Data are changing the way information is stored, published, and exploited. The term "Linked Data" refers to a set of best practices for publishing and connecting structured data on the Web

[21]The World Wide Web Consortium (W3C) is an international community where Member organizations, a full-time staff, and the public work together to develop Web standards. Site: www.w3c.org.

[22]Resource Description Framework (RDF) is a standard model for data interchange on the Web: http://www.w3.org/RDF/. For technical details, see http://www.w3.org/standards/tech/rdf.

(Berners-Lee et al. 2001). Linked Data provides to data consumers an opportunity to merge data distributed across different datasets (Heath and Bizer 2011).

Linked data is mainly about publishing structured data in RDF using URIs rather than focusing on the ontological level or inference. In this sense, OER provided with Linked Data (Linked OER Data) supports the process of discovery, reuse, integration, and interoperability of open educational materials.

The W3C's Semantic Web provides a common framework namely Resource Description Framework (RDF) for describing resources on the Web. With RDF, automated software can store, exchange, and use machine-readable information distributed throughout the Web, in turn enabling users to deal with the information with greater efficiency and certainty; also, RDF data can be shared and reused through application, enterprise, and community boundaries.

The Linked Data Design Issues, outlined by Berners-Lee (2006), provide guidelines on how to use standardized Web technologies to set data-level links between data from different sources (Heath and Bizer 2011). Linked data is an opportunity to mitigate complexity in OER reuse. Linked OER Data environment enabled us to discover and reuse open educational materials. These Linked Data Design Issues, in OER context, are:

1. Use URIs as names for things, which can be unambiguously identified (e.g., OERs, coursewares, OER creators, OCW providers, knowledge areas, learning paths, and other concepts).
2. Use HTTP URIs so that people can look up those names. With the aid of URIs, the corresponding OER data and relevant interlinked data can be dereferenced.
3. When someone looks up a URI, provide useful information, using the standards (RDF, SPARQL) to describe linked OER data, which are machine-readable and repurposed to serve the proposed architecture to enhance integration with reused and interoperated OER data.
4. Include links to other URIs, so that they can discover more entities. Linked Data—particularly data available using open licenses—has an important role to play on information systems and could be a key feature for Open Education based on OER data on the Web of Data.

As already mentioned, Linked Data aim to link data from diverse sources for the purpose of generating more extensive knowledge about a topic. For example, a search starts by identifying the requested information; then, a search-engine searches the content of the page. If all these data are related, it is easy to "skip" from one site to another until we find exactly what we are looking for. In Piedra et al. (2014a), authors apply the Linked Data Design Issues to explore, visualize, and use information that is semantically related to OER that are accessible via the Open Education Consortium. Linked data have the potential of create bridges between OER data silos. The OER data obtained from the different open repositories were cleaned, disambiguated, and formalized for later processing according to Linked Data Design Issues and using LOCWD/LOERD Vocabulary. In this work, the authors demonstrate that the use of linked data approach on OER repositories provides the framework for their evolution into a more interoperable and integrated system for sharing, connecting, and discovering resources, data and metadata of OER initiatives. Moreover, OER resource metadata can be enriched using datasets hosted by the Linked Open Data cloud. Also, this study advocates the use of Linked Data technologies as an enabler for the development of the next generation of OER, allowing the separation of semantics from syntax, the improvement of discoverability and access, and the use of common vocabularies. Additionally, the Linked OER Data environment enabled us to discover educational resources (Piedra et al. 2014c), and show data visualizations (Piedra et al. 2014b).

15.4.3 Open Educational Resources Linked Data Life Cycle

In the same way how the Internet works, OER movement works as a flexible, distributed network of heterogeneous data sources (in content, technology, storage, and structure) that being interoperated will facilitate access and the mixture of an extraordinary range of information. In this section, we describe our proposal for generating, publishing, and consuming OER Linked Data. The proposed life cycle is based on guidelines proposed in Piedra et al. (2014a). We have extended and adapted this proposal to cover OER repositories, resources, and data features and needs. Interoperability of different resources and repositories is ensured through the Serendipity Semantic Framework proposed (see Fig. 15.1).

The semantic architecture refers to the strategy and technologies that integrate and interoperate OER form different repositories. These components include different data collection mechanisms, such as OER harvesting using OAI-PMH protocol, OER portals and other open-access repositories that are key for the end users. As an essential part of the architecture, the project will make tools to navigate through the content available to the different types of users who enter the platform.

15.4.3.1 Selection of Data Sources

To date, most OER data are collected in heterogeneous and distributed repositories, such as OER Commons,[23] OCW initiatives,[24] Merlot,[25] and other OER repositories, where data are annotated using different metadata mechanisms (e.g., IEEE LOM,[26] ADL SCORM,[27] custom metadata schemas), and retrieved by ad hoc mechanisms,

[23]Open Educational Resources Commons: http://www.oercommons.org.

[24]OCW Consortium, OCWC: http://www.ocwconsortium.org and http://ocw.universia.org.

[25]Merlot: http://www.merlot.org/merlot/index.

[26]IEEE Learning Object Metadata (LOM) http://ltsc.ieee.org/wg12/.

[27]Advanced Distributed Learning (ADL) Sharable Content Object Reference Model (SCORM). http://www.adlnet.gov/capabilities/scorm.

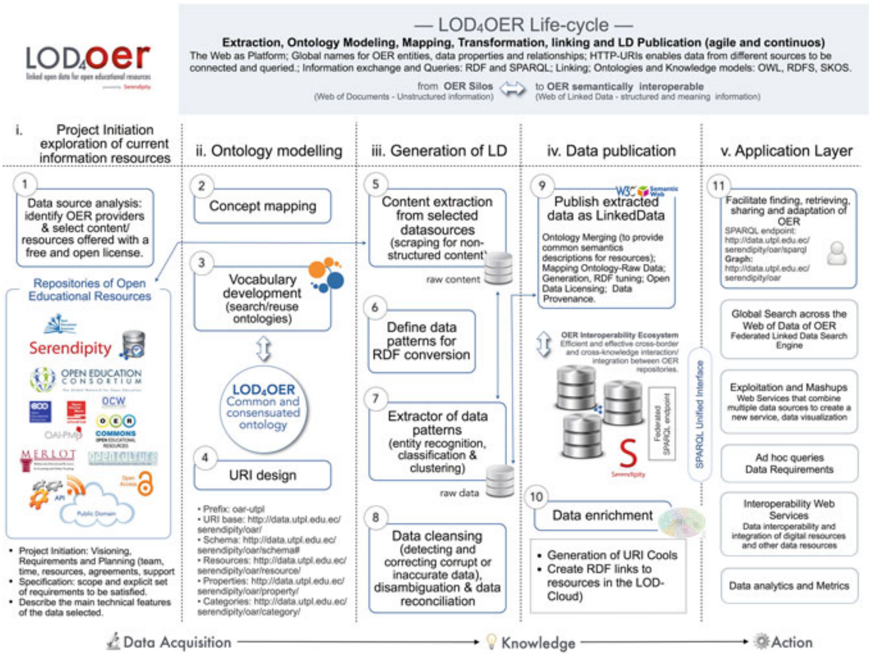

Fig. 15.1 Overview of the framework of integration of OER in the design of higher education courses

individual Web APIs/Services or other mechanisms (e.g., OAI-PMH[28]); however, these technologies are limited because the data cannot be dereferenced.

The initial step is to identify and select the OER repositories that are available in the Web, then extract metadata and educational resources with Open Licenses. There is a large amount of unstructured data of an OCW resource available on the Web, but only in a human-readable representation, HTML (Piedra et al. 2014a, b, c). Most OCW websites do not have APIs for data consumption. So, the only other alternative to automatically reconstitute the underlying data from an OCW website is to use web-scraping techniques. In the other hand, the OAI-PMH protocol is the fundamental basis of the model for harvesting metadata related to academic resources, which is defined according to the Dublin Core schemas. The *Harvester2* application was used to harvest metadata by means of OAI-PMH, that is, via the "list Records" verb. The extracted metadata are stored in a database of relational data in the form of triplets.

This catalog is available at https://datahub.io/es/dataset/serendipity. The data sources consist of educational resources from OER portals, and open access repositories with OAI-PMH available.

[28]Open Archives Initiative—Protocol for Metadata Harvesting. http://www.openarchives.org/pmh/.

Examples of OER properties include the name of the resource, its creation date, abstract, keywords, information about creator, language, open license information, format, MIME type, expected study duration, expected level of difficulty, and so on. On the other hand, content metadata correspond to the properties of the knowledge and skills designed, such as learning objectives, learning pathways, and examinations.

Identifying appropriate data sources to answer OER user questions is challenging. While the widespread availability of existing OER repositories provides an opportunity for answering educational use cases without the high expense associated with primary metadata collection, the OER provider must be chosen carefully to ensure that it can address the use case; that it has a sufficient number of digital resources; that key metadata are available; that there is adequate confounder control, and that there is a sufficient length of follow up.

15.4.3.2 URIs for Open Educational Resources

Within the Web of Data, URI is a single global identification system. There are some guidelines for defining URIs for RDF resources. However, in the context of geospatial data we have to consider some specific characteristic. OER Movement, as a community we need to still reach a consensus on how to define URIs for OER, specially to authors, OER types, organizations, consortiums, and subjects.

The concept of "interoperability" promoted on this work is conceived in terms of a common way to access data in the same format even if these data belong to heterogeneous repositories. Considering that different identification schemes will never speak with each other, this approach provides an interoperable framework, ontologies/vocabularies, and persistent identifiers, which support interoperability, persistent access, reuse, and exchange of information through the use of existing identifiers and associated objects across different systems, locations, and services.

The basic idea is that a common conceptual representation is the main condition to design added-value interoperability services, which can exploit the value of a scheme of representation agreed and shared across trusted systems in order to facilitate exchange, reuse, and integration of digital objects identified in these systems by different persistent identifiers.

With the increasing exchange of metadata, different identifier systems will clash in a repository ecosystem. Any type of additional persistent identifier is useful to linking and fetch more contextual Information (COAR 2015). In this approach the identifiers are URIs (Uniform Resource IdentifierI. An URI is a string of characters used to identify the name of a resource. Such identification enables interaction with representations of the resource over a network, typically the World Wide Web, using specific protocols. Schemes specifying a concrete syntax and associated protocols define each URI. The most common form of URI is the Uniform Resource Locator (URL), frequently referred informally as a web address. More rarely seen in usage is the Uniform Resource Name (URN), which was designed to complement URLs by providing a mechanism for the identification of resources in particular namespaces.

The syntax of generic URIs and absolute URI references was first defined in Request for Comments (RFC) 2396, published in August 1998, and finalized in RFC 3986, published in January 2005. In this sense, the UIR resolution is the key mechanism enabling a system to locate and access the identified object or information related to it on the Web. To resolve a URI means either to convert a relative URI reference to absolute form, or to dereference a URI or URI reference by attempting to obtain a representation of the resource that it identifies. The 'resolver' component in document processing software generally provides both services. One can regard a URI reference as a same document reference: a reference to the document containing the URI reference itself. Document processing software can efficiently use its current representation of the document to satisfy the resolution of a same document reference without fetching a new representation.

Two types of URIs were designed for this: one to identify the components of the vocabulary (classes, properties, and relations) and another one to describe the bibliographical material. To describe the materials, we used HTTP URIs—thereby taking into account the principles for the publication of data proposed by Tim Berners-Lee, which was done according to the following patterns:

- Prefix: oar-utpl
- URI base: http://data.utpl.edu.ec/serendipity/oar/
- Schema: http://data.utpl.edu.ec/serendipity/oar/schema#
- Resources: http://data.utpl.edu.ec/serendipity/oar/resource/
- Properties: http://data.utpl.edu.ec/serendipity/oar/property/
- Categories: http://data.utpl.edu.ec/serendipity/oar/category/
- Graph: http://data.utpl.edu.ec/serendipity/oar
- SPARQL endpoint: http://data.utpl.edu.ec/serendipity/oar/sparql.

15.4.3.3 Semantic Vocabularies for Describing OER

In this stage, mapping relations are established with other vocabularies. Figure 15.2 illustrates connections between equivalent metadata between Dublin Core and vocabulary design to describe OERs.

The usage of ontological and nonontological resources is essential to increasing the level of interoperability within the Linked Open Data context.

RDFS[29] vocabularies and ontologies provide the mechanism to organize the Web information in a structured way. The web contents can be understood by the computer as well as by human beings. In this way, the reusage of ontological and nonontological resources reduces the time of development and the related

[29]In practice, typed literals, that is, literals associated with an XML Schema data type, are used.

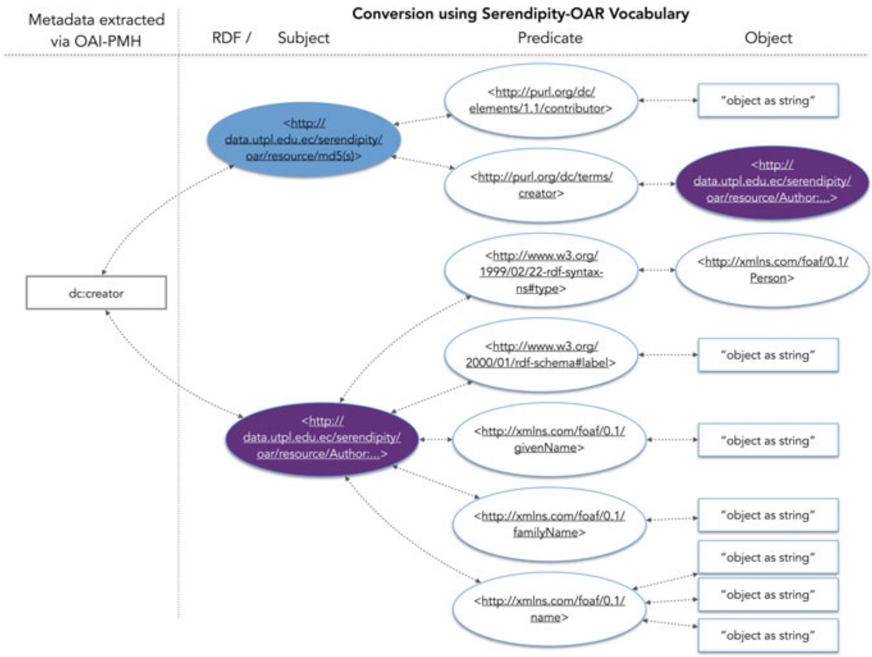

Fig. 15.2 OER metadata (extracted text) mapped with URIs

costs during this phase, which also contributes to the quality of the ontology (Villazón-Terrazas 2011).

Additionally, in Piedra et al. (2014a, b, c) authors described LOCWD RDFS vocabulary using W3C's RDF technology, for OER with the aim of describing the specific types and classes of resources in OCW domain. This vocabulary was called Linked OpenCourseWare Data (LOCWD). A machine-friendly version is also available in http://purl.org/locwd/schema on RDF/XML format. LOCWD is a RDF(S) vocabulary devoted to linking OERs, open licenses, OCW repositories, and other academic information using the Web. Different kinds of applications can use or ignore different parts of LOCWD. With LOCWD, the OER/OCW initiatives can retain some control over their information of materials and courses in a non-proprietary format.

LOCWD reuses a set of RDF(S) vocabularies. Each vocabulary includes a set of terms and classes that are common to a particular knowledge domain. The aim of these vocabularies is to connect the described OER domain with Datasets in the LOD cloud. Given that there are various vocabularies to model bibliographical resources, we aimed to select those that facilitated the integration and interoperability of data on the Web:

- RDF Schema[30] and OWL[31] are used to describe concepts of the vocabulary.
- Simple Knowledge Organization System (SKOS) to establish a model for the organization of knowledge, taxonomies, and other thematic hierarchies. The SKOS vocabulary was used to represent concepts or themes that were dealt with by the resource.
- DCAT[32] was designed to facilitate interoperability between catalogs of data published on the Web.
- FOAF[33] was developed to represent persons and organizations, as well as their attributes and relationships with other concepts.
- Dublin Core (DC) provides a vocabulary of "base" characteristics which are capable of providing descriptive information about any resource.
- Dublin Core Metadata Initiative (DCMI) Metadata Terms[34] is used to represent documents, as well as its attributes such as the title, creator, and relations with other entities.
- Bibliographical Ontology Specification[35] (BIBO) provides the main concepts and properties for describing citations and bibliographical references.
- VIVO[36] helps describe various concepts in the academic and scientific fields.
- Open Provenance Model Vocabulary[37] is used to describe the origin of data on the Web.
- Schema[38] help describe concepts such as materials, data properties, and relations between classes.

15.4.3.4 Data Cleaning and Linking

The cleaning of data is carried out with the objective of detecting and correcting corrupt or erroneous data. The process consists of analyzing inconsistent patterns in the data and in executing cleaning schemas. Among the cases that have been detected is variation in the format of certain metadata. Finally, problems of ambiguity were eliminated for the topics (dc: subject) and were added to each digital resource. A semi-automatic correction scheme was implemented based on the cleaning of detected patterns. Principal Tasks:

---

[30]W3C Recommendation: http://www.w3.org/TR/rdf-schema/.

[31]W3C Recommendation: http://www.w3.org/TR/owl2-overview/.

[32]http://www.w3.org/TR/vocab-dcat.

[33]http://xmlns.com/foaf/spec/.

[34]http://dublincore.org/documents/2012/06/14/dcmi-terms/.

[35]http://purl.org/ontology/bibo/.

[36]http://vivoweb.org/ontology/core.

[37]http://open-biomed.sourceforge.net/opmv/ns.html#Process.

[38]http://schema.org.

- Cleaning of generated data. These are activities that aim to reduce ambiguity and to purge the information that is extracted and generated during the process of conversion.
- Linkage of data by means of semantic relations (countries, bodies, concepts) with existing sources. In this way, we can establish linkages between a series of open data and contribute to its integration on a global scale and create the network effect.

15.4.3.5 Generation and Publication of Linked Data

RDF is domain independent. RDF coding, which enables machines to classify the contents and metadata located in a resource, is used to do this. RDF is essentially a data model that can be used to represent information in a machine-accessible and processable format, two key elements of the Semantic Web vision.

The key concepts of RDF are resources, properties, and sentences. Resources are the things that we want to represent (real or abstract things). Each resource has a URI (Uniform Resource Identifier). It is important to remember that an identifier does not necessarily give access to the resource. Properties are a special type of resource whose function is to describe relations among resources. Properties also use URIs as identifiers. Identifying resources and properties using URIs builds a global and distributed schema of unique names.

RDF is based upon the idea of making statements about resources (in particular web resources) in the form of subject–predicate–object expressions. These expressions are known as triples in RDF terminology. The subject denotes the resource, and the predicate denotes features or aspects of the resource and expresses a relationship between the subject and the object. URIs are used to identify these resources.

RDF Schema (RDFS) is used to represent web resources and SPARQL (Standard Protocol for RDF Query language) is to extract information from RDF graphs for machine-understandable representation.

Converted data extracted from standard, open, and interoperable formats can be done in such a way that it facilitates access and reusage, and resolves the problem of digital resources restricted to storage devices.

In order to create RDF from the harvested OER metadata, a custom generator was developed based on Jena. An important stage in the process of generating RDF data was the assignation of URIs to the extracted texts. In this sense, the OER metadata were mapped with URIs from the most appropriate terms. This enabled the resources to be interoperable and to be integrated with other data series.

Once the RDF data have been created and stored, we can select web interfaces or applications to display the data in a legible format. There are some tools, however, that can be connected to the RDF repository and can present recovered data such as web pages, or as graph schemas. One of the most popular tools to display RDF data in tabular form is Pubby,[39] which is a java application that is used by recognized repositories of triplets. The publication of data on the Web by means of standard technologies proposed by W3C improves accessibility, availability, and integration of these resources to others.

The proposal facilitates the existence of diversity of methods and standards in the processes of each supplier of OER. In Piedra et al. (2015b), the process described was performed in order to publish metadata extracted from open and distributed digital repositories that supported OAI-PMH—for the interchange and harvesting of metadata. As a result, OER linked data is accessible via services or public query libraries. In this way, data can be processed, reused, combined, integrated, and used for several purposes. Specially, faculty, practitioners, and students can find, exchange, and easily access open educational materials. Advantages of this approach have been defined through the implementation of three usage scenarios of recommendation. Filtering method is based on queries to OER data through technology recommended by W3C.

Usage scenario 1:

- *Goal*: Finding OER to compose Massive Open Online Courses in Engineering Education (Piedra et al. 2015a).
- *Motivation*: Reduce the workload for educators during the creation of learning material and provide personalized learning paths according to their styles and preferences.
- *Approach*: Recommend OERs that are similar to educational resources planned by the MOOC designer and others resources shared in social networks, i.e., OER discovering via Social Network Analysis and OCW Syllabus. In this work, the authors integrate the best features of recovery and filtering of Web information, with the aim of finding the most suitable resources that can be recommended to the course designer.
- *Results*: A query engine based on SPARQL was designed to filter the most relevant resources from LOWCD repository. With SPARQL it is possible to filter OER data using multiple categories or taxonomy concepts, combining with other search criteria at the same time. This approach is a natural way to guide the faculty to find suitable material for reuse in massive courses created to meet specific requirements.

Use scenario 2:

- *Goal*: Identify the main domains of an OER according to fields of taxonomy of knowledge (Chicaiza et al. 2014).
- *Motivation*: In closed or specific learning material repositories, contributors classify them manually using heterogeneous knowledge schemas. Instead, OERs are published on the Web in an open, extensible, and distributed environment where common people share resources and labeled them with different

[39]Pubby is available at: http://wifo5-03.informatik.uni-mannheim.de/pubby/.

vocabularies. Therefore, an open architecture that captures new resources and classifies them according to formal taxonomy is required to provide more relevant resources for user.

- *Approach*: Classification of OER according to disciplines of thesaurus enriched with DBPedia concepts. DBpedia resources are a good starting point to define keyword meanings due to the fact that a huge part of the knowledge base is related to classes in the DBpedia Ontology (Cano et al. 2013).
- *Results*: Classification of OER according to the disciplines of the Computer Science field defined by the UNESCO nomenclature. The main purpose of determining the topic or main topics of an OER, according to the categories defined by a controlled knowledge system, is to improve the organizational capacity of materials and therefore increase the chances of being discovered by machine agents as well as by individuals.
  Once the OER corpus is categorized, faceted search services or display based on categories of knowledge can provide the necessary support for users in order to find their own resources in a guided way, according to their own interests.

Use scenario 3:

- *Goal*: Generate personalized lists of OER based on a user's profile.
- *Motivation*: Informal or self-directed learning processes will depend largely on what the learner is able to reach without a guide or a tutor. Suitable characteristics of an OER can change depending on the user's learning expectations and objectives. In order to improve the accuracy of results of queries of users not tied to an educational institution, specialized search engines index the OER content and they filter the results according to specific metadata values.
- *Approach*: An approach based on linked data facilitate the localization of the most relevant materials to support goals and requirements of a particular user. Flexible design leverages open knowledge sources, which are described by semantic technologies. User's data and OER encoded in formal languages can be linked and thus find paths for suggesting the most appropriate resources. The filtering method based on queries is a flexible and versatile way which user can learn more about a domain and can provide feedback to system in order to get more accurate results. To help learners to find the most appropriate OERs, the framework manages data both learners as of OERs and it must find paths between the two datasets. To achieve this goal, a layer based on SKOS categories or concepts connects different representations: User–User, User–OER, and OER–OER.
- *Results*: Web services and applications based on semantic content and linked data demonstrate the power of semantic technologies such as adaptation and customization of the learning experience from the preferences, tastes, and requirements of self-learners.
  To illustrate the mechanism for query and flexibility to recover OERs according to the profile of a user, the following script shows a query template, which determines the topics related to the concepts of user's interest and based on this extended set of terms, engine selects OERs that are labeled with them.

```
PREFIX recsysd: <http://recsys.utpl.edu.ec:8080/oer/resource/>
PREFIX recsysv: <http://recsys.utpl.edu.ec:8080/oer/schema/>
PREFIX wi: <http://xmlns.notu.be/wi#>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX dct: <http://purl.org/dc/terms/>
PREFIX wi: <http://xmlns.notu.be/wi#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX locwd: <http://purl.org/locwd/schema#>
SELECT DISTINCT ?user ?userInterest ?relatedTopic ?oer WHERE
{ VALUES ?user { recsysd:user02 }
  VALUES ?preference {foaf:topic_interest foaf:interest
wi:preference}
  VALUES ?relation {dct:subject skos:broader}
  ?user ?preference ?userInterest.
  ?userInterest ?relation ?relatedTopic .
  ?oer rdf:type locwd:OER .
  ?oer [] ?relatedTopic .
}
```

As shown in Table 15.1, the semantic filtering can return relevant results that do not have the exact user's terms. Also, the utilization of formal languages such as RDF and OWL enables the visual representation of entities, and their properties and relationships. This feature provides a friendly environment for the user to express his/her information needs.

15.5 Framework for Integration of OER

15.5.1 Enhance the Discoverability and Reusability of OER

OER are not only freely available, but self-learners, students, and faculty alike encourage their reuse, remix, and adaptation. Reuse is to make use of a resource for other aim, usually for a purpose unintended by the original creator. Thus creators of OER should consider the degree to which they want their OER to be open, and license the resource accordingly. In addition to licensing, there are technical aspects that make OER suitable for a new use or purpose, easier to discover, adapt and remix, and consequently affect the level of openness of an OER. This implies the right to adapt, adjusts, modify, or alter the content itself.

The openness of a digital resource is to work in the open as much as possible. It is not enough to just have a policy or principle of action of openness adopted or proposed by a government, consortium, organization, or individual. OER initiatives seek to be as understandable, reusable, adaptable, and discoverable as possible. Consequently, one of the primary benefits of an OER is that it can be discovered

Table 15.1 OER list recommended for user interested in Java Programming

User	UserInterest	RelatedTopic	OER
recsysd:user02	dbr:Java_(programming_language)	unesco6:120302	recsysd:OER2417
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER136
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER146
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER180
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER1969
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER3069
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER3250
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER3861
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER3862
recsysd:user02	dbr:Java_(programming_language)	dbc:Sun_Microsystems	recsysd:OER39
recsysd:user02	dbr:Java_(programming_language)	dbc:Object-oriented_programming_languages	recsysd:OER747

and adapted to the needs of specific situations. While discoverability is probably the major barrier to reuse, teachers are still expecting to find useful educational materials online and are prepared to spend time searching for them.

The OER should be designed to be easily findable and adaptable for other users to other purposes. It should have metadata sufficient for discoverability. OER reusability means that the content is relevant to the specific needs of a user, which is technologically accessible and that it is sufficiently open for use, reuse, remix, adapt, and redistribute.

15.5.2 Synergy Between Linked OER Data and Human Expertise

Teachers have a principal role in selecting educational resources. The effort to search, find, evaluate resources (of any kind), and integrate them into the curriculum is substantial.

Most academic leaders are at least somewhat aware of OER. There is wide agreement among academic leaders that OER save time and resources in the development of new courses. The most important barriers to adoption—identified by faculty—are the time and effort to find, evaluate, remix, adapt, and integrate OER. The level of effort in searching of OERs is only slightly more difficult than the effort in searching for traditional resources.

Recommender systems are forms of machine learning that attempt to perceive in data complex patterns using a variety of statistical and algorithmic techniques based on fairly raw data. These systems have proven effective at perceptual tasks and recognizing certain attributes/features from datasets, which then allows the system to predict something or find some pattern that was hidden. But so far, these systems can do some specialized tasks well, but only under certain circumstances since they are still fragile and easily deceived.

In any analytics problem domain, one of the most important roles people play is to define what the goal is. It is easy to build a system to optimize a value, only to discover you picked the wrong problem. Humans will for a long time be the ones who solely define problems, understand what is really important, and verify that a system is functioning as expected against an intuitive understanding of a problem domain.

In educational context, systems that make recommendations on the best ways of learning are always white box systems that are monitored, improved, and have recommendations decided/approved by people. Humans are needed to provide context, to frame the problem, to generate the goal, and for example to decide what learning path to apply or OER to use (see Fig. 15.3). Even today's most advanced recommender systems are restricted application that perform a single task really well, but do not have a broader context.

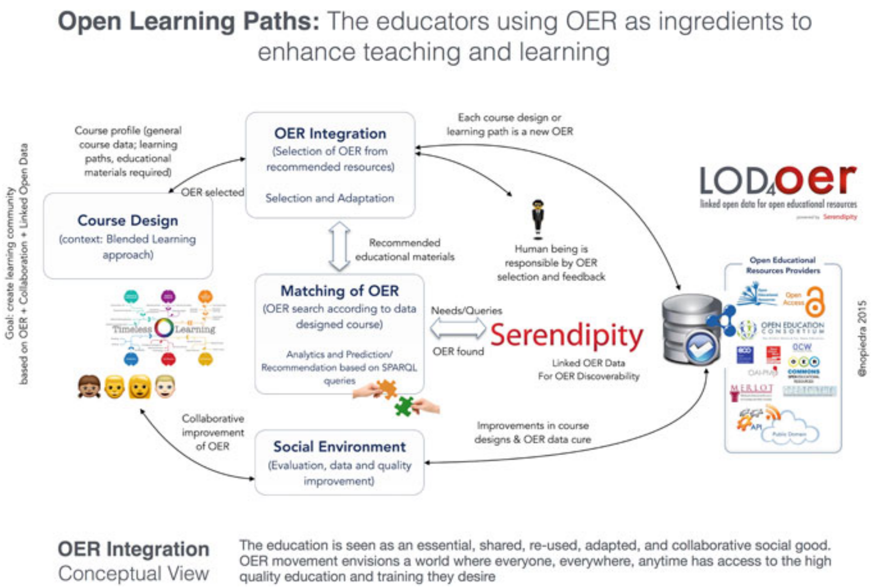

Fig. 15.3 A general context of synergy: linked data for describe, discovery and retrieve OER and human beings to provide context

15.5.3 Blended OER with Traditional Learning

We agree that all human beings are endowed with a capacity to learn, improve, and progress. Educational opportunity is the mechanism by which we fulfill that capacity. Most academic leaders are at least somewhat aware of OER. There is wide agreement among academic leaders that OER save time and resources in the development of new courses. The most important barriers to adoption—identified by faculty—are the time and effort to find, evaluate, remix, adapt, and integrate OER. The level of effort in searching of OERs is only slightly more difficult than the effort in searching for traditional resources.

When teachers set up blending courses, it takes a great deal of preclass organization. The material that they teach in a traditional classroom setting must be transformed to fit the hybrid medium. Teachers need to generate creative ways and uses good practices to teach, reuse OER and convert the material from one medium to another so that messages and meaning are not lost. This increases preparation time for teachers. Furthermore, teachers may be untrained and unfamiliar with the tools and technology available.

Teachers have a principal role in selecting educational resources. The effort to search, find, evaluate resources (of any kind), and integrate them into the curriculum is substantial. The proposed framework combines the traditions of knowledge sharing and creation with emergent technology to create a vast ecosystem of openly shared educational resources, while harnessing today's

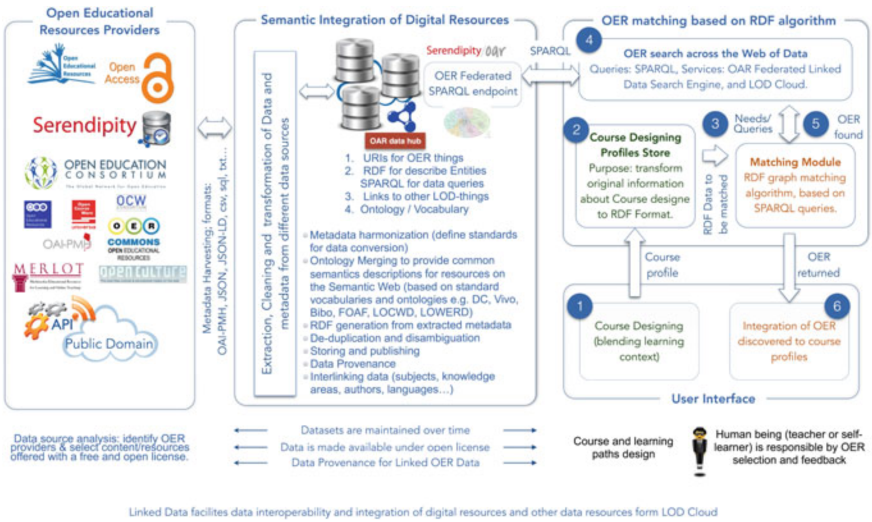

Fig. 15.4 Overview, framework for OER integration in the design of higher education courses

collaborative spirit to develop educational approaches that are more responsive to learner's needs.

The framework seeks to scale educational opportunities by taking advantage of the power of the Internet, allowing rapid and essentially free dissemination, and enabling people around the world to access knowledge, adapt it to your needs, connect, and collaborate.

In addition, the framework encompasses resources, tools, and practices that employ a framework of open sharing to improve educational access and effectiveness worldwide. While financial reasons might be particularly persuasive to students and other educational stakeholders, the core purpose of education is to support and improvement learning.

The entire view of information flow is shown in Fig. 15.4. The proposed framework uses ontology to matching educational resources. Data about course profiles are generated from information proposed by user and which describes course basic and special information.

In this framework, an important phase consists of select OER providers and harvesting metadata of OER. Once the metadata have been harvested, the modules of metadata transformation to RDF and data publication as Linked Data are executed. Linked Data generated are stored in Serendipity,—a triplestore of OER based on Virtuoso. The goal of third component is the OER discovery; the module is combined with SPARQL queries toward Serendipity triple store and dataset on Linked Open Data Cloud. The fourth component is user interface to course profiles storage. The purpose of course profiles generation is to transform information about course design to RDF format. The final part is the RDF graph-matching algorithm based on SPARQL queries.

The preliminary results of our work in the domain of OERs allow us to ensure that with approaches driven by linked data and Semantic Web technologies: OER initiatives will make it possible for teaching staff to concentrate even more on the actual process of teaching, on the interactions between teachers and students that are the real core of teaching and learning, and not continuously create educational materials.

15.6 Conclusion

Open concept is key; open allows not just access, but the ability to use, modify and adapt digital materials, data and information and so education can be personalized to individual users or woven together in new ways for large and diverse audiences. OER create the kind of participatory culture of learning, creating, sharing, and cooperation that rapidly change knowledge societies' need. OER will bring people of all backgrounds together and promote mutual understanding. In the ideal atmosphere of OER, there is no "provider" or "user", and everyone can devote to creation, organization, dissemination, and utilization of OER.

Reuse is to make use of a resource for other aim, usually for a purpose unintended by the original creator. Thus creators of OER should consider the degree to which they want their OER to be open, and license the resource accordingly. In addition for licensing, there are technical aspects that make OER suitable for a new use or purpose, easier to discover, adapt and remix, and consequently affect the level of openness of an OER. This implies the right to adapt, adjust, modify, or alter the content itself.

The openness of a digital resource is to work in the open as much as possible. It is not enough to just have a policy or principle of action of openness adopted or proposed by a government, consortium, organization, or individual. OER initiatives seek to be as understandable, reusable, adaptable, and discoverable as possible. Consequently, one of the primary benefits of an OER is that it can be discovered and adapted to the needs of specific situations.

The main contribution of this approach is that the Web of linked data constitutes an evolution of the current Web towards a global information space where browsing is driven by structured and linked data rather than by documents as is now the case. Consequently, we argue that these advances are a possible means of supporting interoperability, accessibility, and reusability of the data types like the OER. Linked data is mainly about publishing structured data in RDF using URIs rather than focusing on the ontological level or inference. OER provided with Linked Data (Linked OER Data) supports the process of discovery, reuse, integration, and interoperability of open educational materials.

In the future, we plan to contribute actively in OER community; for reaching consensus on the open questions we still have in open education domain: integration and reuse.

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Chapter 16
Designing Massive Open Online Learning Processes: The sMOOC Pedagogical Framework

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16.1 Introduction

The significant public awareness and media impact of the phenomena of MOOCs—the massive open online courses, has not been foreseen by the research community nor by the higher education community in general. Moreover, the phenomena soon

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became a political driver for higher education policy and institutional strategy as was the case in Europe (Jansen et al. 2015). In fact, MOOCs have activated the discussion on open and online education across the continent in universities and in national ministries (e.g., in the Netherlands, Norway, France, and the United Kingdom). This paved the way to the development of a specific program of the European Commission that aims to enhance the adoption of open education in Europe (European Commission 2013). This Opening Up Education program addresses two major goals, namely: (1) to innovate teaching and learning for all through Information and Communication Technology (ICT), and (2) to reshape and modernize the European Union (EU) education through Open Educational Resources (OER).

However, in spite of the support by policy-makers and institutional leadership and also the fact that Europe has the highest percentage of registered MOOC users, this new educational approach did not originate in Europe nor was it in widespread use by European providers. Pedagogical issues, strategic and cost questions are seen as factors that initially have delayed European institutions from entering into this movement (Yuan et al. 2014). However, this has changed the past two years. Three independent studies report that MOOC involvement in Europe is still increasing (Gaebel et al. 2014; Jansen and Schuwer 2015; JRC-IPTS 2016). These studies state that over 40 % of high educational institutions in Europe has a MOOC or is planning to develop one. In a further analysis Jansen et al. (2015) stated that this relates to the social-inclusive dimension of higher education in continental Europe, such that European institutions have more or less equal resources to be involved in MOOCs.

MOOCs originally started as proof of concept of the connectivist educational theory and obtained worldwide recognition because of its use as a content distribution tool by the leading universities in the United States (US). This mixed origin lead to the establishment of two basic very different pedagogical approaches, so-called cMOOCs and xMOOCs (Roscorla 2012; Siemens 2012b). The connectivist-inspired approach, cMOOC, highlighted the disruptive and networked nature of the learning experience (Bates 2015). However, this model clashes with institutional organizational culture, making it difficult to implement in formal environments. The second approach, identified as the xMOOC, focuses on the massive scale outreach and the potential for popularizing star professors and top institutions. Although the cMOOC and xMOOC approaches seem to be most commonly known other forms are in use. Clark (2013) identified eight types of MOOC (transferMOOCs, madeMOOCs, synchMOOCs, asynchMOOCs, adaptive-MOOCs, groupMOOCs, connectivistMOOCS, and miniMOOCSs) that are based on different pedagogies. Conole (2013b) highlighted a dozen dimensions on which a course could vary: the degree of openness, the scale of participation (massification), the amount of use of multimedia, the amount of communication, the extent to which collaboration is included, the type of learner pathway (from learner-centered to teacher-centered and highly structured), the level of quality assurance, the extent to which reflection is encouraged, the level of assessment, how informal or formal it is, autonomy, and diversity. As will be shown, these dimensions feature, amongst others, in the proposed pedagogical framework.

In this context, European researchers have focused on developing alternative, more collaborative approaches to MOOC design that have the potential to represent a solid qualitative alternative to the most commonly used models today. In comparing the results of surveys conducted in the United States (US)—like the survey by Allen and Seaman (2014), with European surveys Jansen et al. (2015) conclude that, in contrast to the US, a large majority of European high education institutions agree that "MOOCs are important to learn about online pedagogy". They also conclude that in Europe using MOOCs for student recruitment is not considered as important as in the US, but rather to reach new students and creating flexible learning opportunities (for those new students).

In Europe many collaborative, social pedagogic models have been developed (Schuwer et al. 2015), for example the iMOOC model (Teixeira and Mota 2013). Following this trend and building from the pilot experience of the iMOOC model, a research team from the EU-funded project *Elearning, Communication and Opendata: Massive Mobile, Ubiquitous and Open Learning* (ECO) conceived a new model that attempts to meet in a more comprehensive way the above-referred challenge. This model combines findings in the literature with experiences of the ECO project partners in developing and delivering MOOCs. This chapter presents a description of the ECO social and seamless sMOOC model and its most innovative features, its theoretical foundations and context of development, as well as scenarios of implementation.

In summary, the distinction between the US and Europe is not made as much as being based on location alone, but is due to different cultural environment, educational values, regulatory frameworks and higher educational institutions' systems. In fact, proven by the very nature of the European Union's role, there is the assumption of a European approach to open education and MOOCs, which it's not seen in any other region. Although in Europe several different attitudes and models are being used and as such a broader diversity verifies, the type of institutional approach as well as the priority given to pedagogical quality sets this apart from the dominant one in the US.

16.2 Learning in MOOCs

16.2.1 Defining MOOCs

Open educational resources provide valuable educational material, but might not directly be suitable for learning or self-study. These resources need to be embedded in instruction and a social (academic) community. MOOCs can be seen as open educational resources turned into courses by adding instruction, learning activities, tests, exams, etc. These courses are delivered online through the use of various technologies and are open to anybody. Because MOOCs are open to anybody, who might be located anywhere, and are open in the sense that no entry requirements are set, MOOCs potentially attract very large numbers of learners.

The MOOC territory, however, is still very much a space of innovation and experimentation. It is therefore understandable why researchers in this emerging field of online education practice have not reached yet a standard definition for massive open online courses. Important differences can be identified in how this phenomenon is perceived by the various communities of practitioners. This is due to the fact that ongoing pedagogical trends in MOOC design do not agree on the basic elements that constitute this learning experience. For instance, Selwyn et al. (2015) state that "MOOCs are courses available to masses of online learners for little or no cost". The definition proposed by Wikipedia[1] is based on an aggregation of common dimensions of a MOOC and is also one that is being referred to by many researchers such as Conole (2013a). According to this definition, a MOOC is: "*an online course aimed at unlimited participation and open access* via *the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for students, professors, and teaching assistants*".

However, this definition is not strict and can be disputed. In the framework of the pedagogical research developed as a collaboration with different EU-funded MOOC projects,[2] a more comprehensive definition was adopted that integrates a perspective more akin to the traditional conceptual elements used in open education, as ubiquity of access and social inclusion. In fact, it describes a MOOC as "*an online course designed for large number of participants that can be accessed by anyone anywhere, as long as they have an internet connection, is open to everyone without entry qualifications and offers a full/complete course experience online for free*" (Brouns et al. 2014). In 2015, this definition has been validated amongst European institutions (Jansen et al. 2015).

In this context, it is also important to use an enriched understanding of how MOOCs can be designed. Based on the definition above, different criteria for MOOC development were defined as well[2], for example criteria relating to the massive dimension or criteria for scalability.[3] Taking findings from the literature together with experiences of ECO project partners in developing and delivering MOOCs, this means that a MOOC as a full/complete course should not only include educational content but also facilitate interaction among peers (including some but limited interaction with academic staff), provide authentic activities and tests, including feedback (with well-designed rubrics for peer-assessment and AI engines for the integration of massive qualitative assessment), have some kind of (nonformal) recognition options and provide a study guide or syllabus (Brouns et al. 2014).

[1]http://en.wikipedia.org/wiki/Massive_Open_Online_Course.

[2]http://www.openuped.eu/images/docs/Definition_Massive_Open_Online_Courses.pdf.

[3]The pedagogical model of the course is such that the efforts of all services (including of academic staff on tutoring, tests, etc.) does not increase significantly as the number of participants increases.

16.2.2 The ECO sMOOCs Pedagogical Framework

In this sense, the proposal for a MOOC pedagogical framework presented in this chapter, the ECO sMOOC (social and seamless MOOC) model, brings a differentiated and more holistic understanding of the phenomena which sets it apart from other current approaches. ECO sMOOCs are "social", since they provide a learning experience marked by social interactions and participation, and "seamless", since ideally they should be accessible from different platforms and through mobile devices and integrate with participants' real life experiences through contextualisation of content via mobile apps and gamifications. Moreover, they should accommodate variety in pedagogical approaches, be open, be inclusive, and accessible to a wide diversity of citizens, pay special attention to both people in risk of social exclusion and people with visual and hearing disabilities. Each of these dimensions is further explained in this section. As will become clear, the ECO sMOOC model is presented as a pedagogical framework and not as a single model to allow for the flexibility in approach and design.

sMOOCs should be designed to accommodate a wide spectrum of approaches and contexts, accounting for a variety of languages, cultures, settings, pedagogies, and technologies (Brouns et al. 2014). Mulder and Jansen (2015) examined the different general dimensions that are important for MOOCs to be instrumental to open up education. They state that the pedagogical approach is very essential such that learners/participants are facilitated with appropriate incentives to make progress and to succeed in their learning efforts.

Following the traditional principles of open education, this sMOOC model pays special attention to inclusion, both for social or economic reasons and for physical disabilities.

Consequently, the presence of the traditional pillars of open education theory is mixed with elements from socio-constructivism. As a result, sMOOCs are designed to provide a learning experience marked by social interactions and participation. This aspect is complemented by seamless and ubiquitous learning (Wong et al. 2015). As the concept implies the courses should be accessible from different platforms and through mobile devices and integrate with participants' real life experiences through contextualisation of content via mobile apps and gamifications.

As mentioned previously, there is still a lot of variation in the current design of MOOCs and many fail to meet all the dimensions of the concept. In fact, MOOCs should combine large-scale participation with openness and quality learning. Openness cannot be mistaken with simply free access. For instance, open licensing of the resources used is a key part of the concept. In accordance, our ECO sMOOC approach implies the use of an open licensing policy, not just for the educational resources used (OER), but also for the platforms (open source) and for the data produced in the courses (open-data). The aim is to improve the learning experience and to contribute to the sustainability of the knowledge lifecycle.

A major element of discussion regarding MOOCs is how these typical informal learning experiences are being increasingly used in formal learning contexts. Having that in consideration, the approach used by the sMOOC model favors full access to the full course content at all times (always accessible by anyone anywhere), although allowing some flexibility. Depending on the institution's decision, sMOOCs may have fixed starting and ending dates. In a similar way, the model also allows the possibility of some limitation of the number of participants enrolled, due to availability of resources, as long as there is no enforced selection of participation. The model also foresees an access route to credit-bearing curriculum as an additional service (to be paid for) next to other free recognition options, such as badges and/or a certificate of completion.

Another very important point of discussion regarding the MOOC phenomena is language domination and its implication for cultural diversity in cross-border higher education provision. How can this challenge be addressed? The ECO sMOOCs (and their platforms) are by definition multilingual, providing access in different languages, and offer the possibility of contextualized learning through mobile technologies and gamification.

In short, the pedagogical approach suggested in the ECO sMOOC pedagogical framework presents a holistic view with strong connections to (historic) open education principles, supporting diversity, independent learning and is learner-centered. In fact, the courses designed in such a framework will create collaborative learning opportunities through a networked learning strategy. The model also supports adaptive learning strategies and ubiquitous, pervasive and contextualized learning. As a result of this, ECO sMOOCs have the potential to adapt to the changing intentions of participants during the course. The support for various pedagogical approaches, diversity, inclusiveness, ubiquitous and seamless learning sets it apart from other learner-centered forms of MOOCs.

16.3 Affordances for Active Participation

The previous sections elaborated on the need for a more collaborative approach that ensures a wide inclusion of people and learners catering for their needs. In the sMOOC pedagogical framework the social dimension is paramount. Therefore, the pedagogical approach is based on socio-constructivism, social and networked learning. The following section describes from a theoretical point of view how digital inclusion, ubiquitous learning and gamification could provide further affordances to motivate learners, increase participation and stimulate the social dimension. It is indicated how the ECO sMOOC pedagogical framework accommodates these concepts. This is illustrated with examples of how this is implemented in one of the ECO sMOOCs "Digital Literacy for Groups at Risk of Social Exclusion: Strategies for Social and Educational Intervention".

16.3.1 Digital Inclusion

The development of modern societies, of globalized economies and information and communications technologies, mark the early twenty-first century as a time of profound social challenges. Indeed, there are opportunities for personal and collective development, but also challenges and social gaps that require learners to acquire useful strategies to address them. Today, everyone not only has ample access to information technology and communication, but it has become imperative to learn how to manage and use them critically and responsibly. However, when access to and use of info-communication environments is absent or prevent, that becomes an important factor of inequality and exclusion for many people and collectives. Thus, the development of technology can be a tool for the democratization of knowledge or, rather, configured as an exclusion factor that would deepen the creation of a divided society, unable to cope with social inequalities, including those derived from the access—or lack of access—to the digital world (Andreason 2013; European Commission 2014).

Disabled people, seniors, immigrants, women, prisoners, and ex-prisoners and various social groups face a new reality of exclusion and social inequality in permanent risk of being excluded from the access to "normalized" ICT: they are in a situation of danger of "digital exclusion". To address digital literacy as a tool for social inclusion means to understand that *literacy* is not an exclusively instrumental training but that it includes critical training that enables the use of digital tools and devices to empower the transformation of the lives of people at risk exclusion. Therefore, digital inclusion encompasses dimensions aimed at improving the quality of life of individuals, including their ability to use new technologies to transform their social, labor, political and personal reality (Institute of Museum and Library Services, University of Washington, and International City/County Management Association 2012).

The ECO project has proposed different ways to promote digital inclusion through and in sMOOCs. One of them should be highlighted, and that is the development of specific and innovative training proposals for the training of professionals who are involved in working with the various groups affected by the digital divide. This route has crystallized in the sMOOC "Digital Literacy for Groups at Risk of Social Exclusion. Strategies for Social and Educational Intervention".[4] Not only is this sMOOC an educational resource and course that can be taken by those who want to learn about digital inclusion, it is also a course aimed at those people who are at risk of being excluded and draws on their expertise and experiences.

In the design of the sMOOC the principles of the ECO framework of putting the learner central, ensuring that social learning is supported, creating authentic and contextualized learning activities and resources, and bridging cultural and language issues have been explained. The sMOOC has been designed to build a *community of*

[4]http://hub8.ecolearning.eu/course/alfabetizacion-digital-para-personas-en-riesgo-de/.

practice in which different types of professionals are invited to think critically and creatively about the existing practices in the field of exclusion, gaps, and digital literacy, with the objective of engaging participants in a social learning network that allows them to independently, sensibly, and critically address the design of their own experiences. To achieve this, the sMOOC incorporates *social networking and Web 2.0 tools*, such as Facebook, twitter, Pinterest, eduloc, Youtube, etc., in order to integrate the experiences that the participants have in their personal and professional lives. This assisted in creating a *collective and collaborative intelligence* that has produced excellent contributions which have continuity beyond the course itself.

The objectives, materials, resources, and content of the course are designed to help professionals to analyze, design, implement, and disseminate their *own digital inclusion educational experiences* that contribute to the development of digital skills for individuals and groups at risk of social exclusion.

Among the main strengths of this initiative are the original and critical *perspective* from which the issue of literacy for people at risk of social exclusion is addressed; its ability to generate and sustain *social networking* among the professionals involved in the course; the *actuality* of their materials, which are also continuously evolving and whose usefulness is permanently contrasted with other users; the use of *different languages* and *learning resources*, facilitating the participation and success of a greater number of participants and the mainly practical approach aimed at designing and *sharing critical experiences* of social-digital literacy.

16.3.2 Seamless and Ubiquitous Learning

Seamless and ubiquitous learning is learning that crosses boundaries, real-life boundaries as well as conceptual and integrates learning experiences across dimensions, such as formal and informal learning context, social learning versus individual learning, online versus face-to-face. This learning experience exists transversally and synchronously in various learning environments (physical or virtual), platforms, networks, media formats, and contexts in a natural and continuous way (Cope and Kalantzis 2007; Wong et al. 2015). That is, the learner experiences and develops his learning activity as a continuous event, even when it happens in multiple and varied formats and platforms (Wong and Looi 2011).

Ubiquitous learning as innovative educational paradigm is made possible in part by the emergence of new media and their possibilities of interaction and multimedia communication (Tabuenca et al. 2012). The pervasiveness of the Internet, social networks, and mobile communication technologies not only enhance the access and exchange of information in a massive scale, but also promotes the emergence of social structures and relational strategies that seamlessly happen in both physical and the so-called virtual environments (Huang et al. 2010).

Ubiquitous learning strategies therefore span many dimensions and approaches. For several relevant dimensions the main feature is highlighted and it is indicated how this is or could be implemented in ECO sMOOCs.

Ubiquity of the access to information: The physical dimension as in location of the learner is no longer a determinant of learning, as it not only happens in academic and classroom environments. This implies a change in the cognitive processes that are considered "learning": the internalization of information and other memoristic processes are no longer important in a context in which the learner can look elsewhere for the information he needs when he needs it.

Because ECO sMOOCs are designed as an online hub where the information can be stored, shared as well as critically discussed or modified, they can be accessed through conventional media or devices via the internet.

Ubiquity as the portability of technology: Mobile and portable devices promote the integration of communication technologies in the daily lives of people. However, these technologies favor a type of interactive communication where the user not only receives but also issues and shares information. Porting communication technology equals having opportunities to exchange information anywhere, anytime, knowing that others also are taking advantage of this possibility.

ECO sMOOCs software provides users with the opportunity to access all the learning possibilities of sMOOCs in any type of portable device.

Ubiquity as interconnectivity: In the sense of the preceding points, the interconnectivity that is enabled by technology generates a social "expanded intelligence": Knowledge, memory, and the cognitive processing capabilities of a person are steadily supplemented and supported by the technologies that are used. Thus, the learner is always able to be in constant contact with other people with different backgrounds who know or are able to do things the learner does not know.

In ECO sMOOCs ubiquitous interconnectivity can be arranged by designing collaborative learning activities that promote knowledge uptake and creation through social interaction via social media model. The resulting dialogue and reflection ensures deeper understanding and knowledge cocreation.

Ubiquity as mainstreaming: This social approach blurs the traditional divisions between activities and spheres of life traditionally conceived as separate: work/play, learning/entertainment, access/creation of information, public/private, etc.

In ECO sMOOCs, the learner is autonomous to decide when and how to take advantage of the learning ecosystem of the sMOOC. The learner can decide what learning activities to take or what resources to read. Moreover, the sMOOC enables multiple learning path through alternative learning activities, and a bank of challenges with additional and/or optional activities, tasks and assignments.

Temporary ubiquity: In ECO sMOOCs there are no fixed learning schedules, so learning can happen at any time of everyday activity. Information consultation, transmission, and exchange of knowledge occur transversely to other daily activities. The interactions between users can be synchronous (live) or asynchronous (at different times) and learning expands throughout life, not limited to specific periods of training.

Ubiquity as globalized knowledge: The ECO sMOOC model proposes that learning does happen in closed environments, virtual or not, but in a globalized way and in multimedia and multiplatform spaces. ECO sMOOCs integrate different platforms (OpenMOOC, ARLearn, Polimi OpenEdX, iMOOC, Logi-Assist, and

WeMOOC) and permeate other virtual spaces (such as social media) so that the relational networks of learners occur simultaneously on different platforms and media. This way, knowledge flows, emerges, and overlaps in complex networks of social interaction.

It should be noted that like the use of educational technology does not equal learning, the ubiquity of technology does not equal the ubiquity of teaching-learning processes. Modern technology can be used to implement traditional teaching practices, transactional and memoristic, not exploiting their potential to promote new interactive, collaborative, and ubiquitous learning paradigms. That is why ECO sMOOCs ubiquitous learning-oriented design takes into account the following principles.

Institutional, spatial and temporal boundaries of traditional education must be blurred: A heritage of the educational institutions of our recent past is to consider that all learners need to be doing the same thing at the same time and that teaching and learning is a unidirectional transmission (one-to-many) of knowledge. In the era of communication technologies and information, these limits are not needed: learning can happen anywhere and anytime; apprentices learn collectively by sharing and interconnecting. The learning environment provided by sMOOCs is built around this concept and most learning activities can be discussed or carried out in a collaborative way. ECO sMOOCs do not adhere to the classroom model from conventional formal education, but provide nonformal and informal learning experiences.

Traditional teacher–learner roles must be blurred: In the traditional classroom, the teacher and his board were placed in front of students; the "lateral" communication from student to student was penalized. Under ECO sMOOCs ubiquitous learning paradigm, the teacher is a facilitator of learning experiences that the learner is able to self-manage: the teacher team has neither the information nor all the best information, which can be reached by other means. Learners are not passive recipients of learning, but participate independently and collectively, together with the teachers, in the collaborative construction of knowledge. Not only that, learners are put central, because they are responsible for their own learning goals and therefore have to take an active role in their own learning process. This is accomplished by creating authentic, situated and contextualized learning activities.

Recognize personal diversity as a potential: The traditional pedagogical designs assume an ideal "apprentice type", a "standard knowledge" that everyone, regardless of their personal characteristics, must achieve by the same means. ECO sMOOCs ubiquitous design assumes the need to empower learners to implement their personal characteristics when autonomously choosing the route they want to follow: the media and format; interaction tools and their use, etc. The multiplicity of learning activities, resources, and assignments ensures that all learners can adapt their learning style towards building their own knowledge.

Expanding and mixing media for the representation of information: In the digital age, information may have multiple formats. A fully developed ubiquitous learning environment, such as ECO sMOOCs, will be able to incorporate video, audio, text, and hypertext integrated social learning environments, not only as elements for the transmission of information, but as tool for creating it.

Promoting the development of conceptualization strategies: As the importance of memoristic learning decays, ubiquitous learning requires a range of metacognitive skills in the use of technological and educational media such as Internet media languages, semantics of sites and their structure, mechanisms of social interaction in social networks, the development of critical skills in selecting relevant information, etc.

Connecting individual knowledge to social knowledge: In the age of ubiquitous technology, learning is not about what you know but about what you can learn. When knowledge is just a few clicks away, learning and assessment strategies in sMOOCs include the ability to access it, to select critically, remix, rework, build, and share new knowledge from it.

Building collaborative knowledge communities: The ubiquity of learning allows forms of social interaction and reflection that can become true "learning communities". sMOOCs teaching staff collaborates in facilitating the enormous energies that emerge from the interaction and construction of knowledge between equals, between apprentices who work in social networks, involving individuals and groups apparently not part of the same learning context (family, friends, experts, social circles). Ultimately, sMOOCs use the potentials of ubiquitous learning and social networking for the construction of collaborative knowledge communities. This is mediated by designing not only individual, but also collaborative learning activities that stimulate and require discourse and interaction, and social media that not only provide opportunities to interact but also mechanisms that promote continued interaction, knowledge exchange and creation.

16.3.3 Gamification

Considering *gamification* as the use of game mechanics to enhance learning by strengthening learners' engagement in learning experiences, research has shown that game mechanics provide learners the ability to experience tasks within a meaningful and story-like safe environment to explore, stimulating motivation, reinforcing progress, allowing for non-coercive failing, and encouraging out-of-the-box thinking (Muntean 2011; Raymer 2011; Simões et al. 2013).

Game mechanics share some relevant structural similarities with instructional and learning design, while being able to enhance the interactive and emotional aspects of the present pedagogical model. In this sense, gamification scholar (Kapp 2012) defines game as "A system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction". Gamification, at higher or lower levels of implementation and complexity, depending on the needs and intent of course organizers, is used in ECO sMOOCs as a way to enhance communication and interaction in the learning community and provide a more rewarding and meaningful learning experience.

Gamification strategies of ECO MOOCs should focus on harnessing the motivational capability of games in order to empower learner participation, communication, engagement and achievements. However, research suggests that using extrinsic rewards as only gamification strategy can hinder self-reported interest in the learning experience (Bielik 2012). At the same time, studies on badge systems suggest these negative results are directly attributable to the poor design of the reward strategy itself (Antin and Churchill 2011; Bielik 2012).

Assuming that motivation is demonstrated by the individual's choice to engage in an activity and the intensity of effort or persistence in that activity (Garris et al. 2002), current psychological and pedagogical models propose that there are two categories that determine the learner's motivation to learn: extrinsic and intrinsic motivation (Ryan and Deci 2000; Vassileva 2012). At the same time, the social aspect of multiplayer games, in which competition, cooperation, and social interaction directly affect the player-learner's motivation and behavior, is of special interest for the implementation of game mechanics in communities of learning.

Hence, a successful gamification methodology should be able to appeal to all three categories, using extrinsic rewards (levels, karma points, badges) to promote engagement while trying to raise feelings of achieving mastery, autonomy, community, and sense of belonging (Muntean 2011).

Gamification strategies for ECO sMOOCs should focus on harnessing the motivational capability of games in order to empower learner participation, communication, engagement, and achievements and in particular apply those mechanisms that promote motivation.

Badges, Levels, and Points: Badges are awarded to participants when completing special course actions, such as the mandatory assignments defined to obtain an informal certificate of completion. Additionally, a point system in which participants earn points with each task or activity they have completed help them in monitoring their own course progress.

Karma System: Karma is intended to be a numeric indicator of the participants' level and quality of course engagement. It is developed in two ways:

- *Forum Karma*: An "upvote-downvote" system could be implemented to the forums in order to encourage interactivity and high quality submissions. Participants could be able to "upvote" (give 1 point) a good forum submission and "downvote" (−1 point) those which are not helpful. This way, helpful and rich submissions would earn karma points to those who submit them.
- *General Karma*: An additional algorithm that includes forum karma, badges/points, and achievements is created to provide a user's general karma. Karma points or the General karma gained by a participant can then be combined with other elements (peer-assessed artifacts, eportfolio, etc.) to obtain a certificate of completion, when considered adequate.

Additionally, the ECO sMOOC pedagogical model proposes to expand these strategies by allowing the use of advanced styles of gamification.

Story Mode/Bank of Challenges: When basing a course on this perspective, instructional design must go beyond "structural gamification" (the superficial addition of "points" and "badges") and reach "content gamification": the stage where all course elements are conceived under game thinking, adding story-like elements from the beginning of the course (for instance, starting with a challenge instead of a list of objectives). Under this perspective, contents and objectives are structured under a story-like narrative that encourages emotional engagement to the course material: the course's syllabus and all weekly learning materials could follow the same game-like structure, proposing meaningful challenges to the participants in order to progress through the course's story narrative. Besides the designed weekly activities/tasks, a collection of "challenges" should be made available. Participants can choose some challenges from the bank to complete if they have the time or want to do some extra work. They can obtain badges for successfully completing these challenges and later include them in their e-portfolios. This adds flexibility and diversity to the learning experience, creates more objects/"events" around which dialogue can develop, and provides an interesting focus/common ground for people participating in courses without a fixed start and end date. Suggestions for challenges can be contributed by participants and those reaching a defined point of agreement by the community—either using polls or other voting systems—could be included in the bank.

Achievement System: "Achievements" are a very popular award and reinforcement system in computer and console gaming which has proved equally useful when motivating action in learning environments. Game designers (or instructional designers) can specify an extensive list of participant actions that will be rewarded as special accomplishments. While "Badges" are focused on special learning challenges, achievements are mainly designed to encourage interactivity and engagement in the course. For instance, posting in a forum thread, publishing a blog post or sharing an artifact could be considered some initial achievements.

Serious games: Serious mobile games can be created through the ARLearn platform. These games could constitute a complete MOOC or be used as learning activities and assignments for MOOCs that are developed and delivered through one of the other ECO MOOC platforms.

16.4 First Findings: User Satisfaction

The pedagogical framework was used by the MOOC providers in the ECO project to design various sMOOCs on subjects such as digital literacy, math and computing, arts and creativity, while dealing with pedagogical uses of digital tools, or covering e-learning and innovative pedagogies (flipped classroom, creative uses of video, 'do it yourself' strategies as well as pedagogies for people with disabilities. The sMOOCs were designed to ensure a variety of learning resources, to provide a selection of both individual and collaborative learning activities, to favor collaborative approaches and to make use of quizzes and peer-assessment.

The evaluation of the ECO sMOOC approach is an ongoing process. Currently only data from user satisfaction questionnaires that were sent out to all MOOC participants of the first run is available. More data is becoming available with evaluation of reiterations of MOOCs.

16.4.1 User Satisfaction Questionnaire Design and Methodology

A specific questionnaire was developed in order to obtain a more complete understanding of the needs of the participants in the ECO sMOOCs and to improve user experience. The evaluation has been conducted on all 15 courses in 6 languages (English, German, French, Italian, Portuguese, or Spanish).

The questionnaire consisted of 5 sociodemographic questions, 2 on the student profile and 24 questions aimed to evaluate the design, content, and course development, as well as overall dimensions of the sMOOCs.

16.4.2 Overall User Satisfaction

The responses were analyzed and provided an overview over all courses as well as for individual courses. In total 289 questionnaires were analyzed. Here only part of the aggregated results is reported. The full report is available from the ECO project website (Fueyo et al. 2015).

The majority, 57 % are women, while 38 % are men. The majority of respondents are Spanish, Italian, and Portuguese. Only a minority of respondents are from countries not participating in the project. Most respondents, 73.6 % have higher education, mainly bachelor or masters, only 8 % have a PhD. The majority of learners (57 %) are working full-time. Most respondents (70 %) come from the educational field.

Respondents learned about the sMOOCs mainly through friends and social networks (28 %) and university websites (25 %). This confirms the strong relation between educational background and working field.

Most respondents (87 %) consider that the course contents were adjusted to the proposed instruction topic, and only 10 % are critical about adjustment of the course contents. Table 16.1 indicates that all dimensions of MOOC contents have been assessed mostly positively. Still, a quarter of respondents have been critical about the accessibility to the course contents by all people with different abilities and learning experiences.

Table 16.2 shows that of the set of dimensions related to the design of the courses, the highest user satisfaction can be found in the materials—videos, documents, and other—provided by the courses, while more critical opinions are

Table 16.1 Assessment on the content of the courses

Content assessment	Favorably assessment (%)	Negative assessment (%)
Suit the course topic	87	10
Are interesting	87	10
Are rigorous	82.5	14
Are up-to-date	88	9
Are accessible to all people	72	24

Table 16.2 Assessment on resources and support

	Good or very good (%)	Suitable (%)	Poor or very poor (%)	N/A (%)
Videos and video lectures	72	18	7	4
Documents provided	70	17	7	6
Audiovisual materials	67	17	10	7
Load distribution during the course	65	24	4	7
Design of individual tasks	65	24	5	6
Support given by the teaching staff	62	20	7	11
Video subtitles	57	22	7	14
Design of collaborative tasks	54	27	8	11
Platform usability	48	24	21	7
Suitability of tasks and online games	47	20	12	22
Technical support	44	20	15	21

directed to what can be considered the technical infrastructure, as in the platform. The assessment of the technical support, along with the appropriateness of test and *online games*, show an important percentage of users that choose not to answer: they do not have the experience in these dimensions. In between remains the core or didactic design nucleus, as well as the design of the learning tasks or the distribution of the workload during the course, which receives a largely favorable assessment.

In general respondents valued the design of individual tasks, the learning resources and support given by teaching staff a little higher than design of collaborative tasks and technical features.

One of the aspects that has reached a wide spread in the design of the sMOOCs is the assessment of tasks, works and even exams done by other partners or by other participants that are taking the same MOOC (peer-to-peer assessment). The response to this assessment strategy has been positive (see Table 16.3). The fact that 60 % has pointed out to agree completely or to a large extent with the fairness

Table 16.3 Percentage of respondents scoring peer assessment feedback satisfaction as “completely” or “to a large extent”

This method of assessment is interesting	72.32 %
This is a fair method of assessment	60.37 %

Table 16.4 Assessment of the interaction with other users as “Excellent” or “Good”

Social interaction and support given by other learners	59 %
Posts and comments made by other learners	63 %
Posts, educational artifacts and resources shared by the community of learners	58 %
Other users’ feedback and comments on my personal works	56 %

of this kind of assessment is an important basis to be taken in account when looking forward to the future.

In the ECO sMOOCs concept participation and collaboration is an important dimension (see Table 16.4). Therefore, it is to be highlighted that 63 % of the users consider the performance of other participants in posts and comments as *excellent* or *good*.

In response to other questions in the survey 61.5 % of learners considers the courses to be absolutely or highly well designed in order to enhance communication between participants and that ECO sMOOCs were considered to be participative courses.

Overall, the general user satisfaction with the ECO sMOOC model was highly positive: 28.3 % respondents have rated their experience as “very good” and 56.3 % as “satisfactory.” That is, most (85 %) are satisfied with the experience. Anyway, only 8 % rated their overall experience as unsatisfactory or highly unsatisfactory.

It is important to note that four out of every five respondents consider that the sMOOCs have been correctly designed to achieve their proposed objectives (see Table 16.5). Almost the same proportion considers that the courses promote learner creativity. The aspect that is less positively assessed by the respondents, in this dimension, is the interaction amongst learners, although still two-thirds consider that the design of the courses actively promoted such interaction.

Table 16.5 Percentage of users that indicated to agree completely or to a high extent on expectations, creativity, discussion, engagement or interaction aspects

Designed to achieve the proposed objectives	81 %
Promotes learner creativity	78 %
Promotes discussion and personal reflection	76 %
Promotes learner engagement	75 %
Promotes interaction amongst participants	65 %

Based on the results, the sMOOCs seem to have met the expectations: with 12 % of participants indicating that the course completely met their expectations and 49 % that the courses have met their expectations to a large extent. One third expected to learn new things, 14 % expected to receive a certificate, 13 % to improve their training and their professional opportunities and, lastly, a similar percentage pointed out that they enrolled in the courses in order to experiment and know about MOOCs. It should be taken into account that half of the respondents indicated that they have never taken a MOOC before.

From a career standpoint, 54 % of the respondents confirmed that our sMOOCs are of great relevance for their professional fields. Furthermore, 56 % of respondents consider that they have learned a lot in the courses. These dimensions are without doubt the basis of the highly positive overall assessment of the courses.

Perhaps one of the best indirect indicators of overall user satisfaction on the first edition of our sMOOCs is the response to the question about their will to take another ECO sMOOC again: 78 % says that they are willing to take an ECO sMOOC in the future. That is, almost four in every 5 participants would engage in future ECO sMOOCs.

16.5 Discussion and Conclusion

As mentioned in the beginning of this chapter, MOOCs have become a viral phenomenon in higher education. However, this explosion of interest and also of provision of courses was also followed by a lack of theoretical preparation or pedagogical experience. This has led to many failures and a generalized pessimism on the capability of this new format of online education to assure quality learning experiences and student success. Research needs therefore to develop new practice models built upon appropriate foundations that respect the principles of open education and take the most out of the new networked social environments. Similarly, in order for practice to be really effective, these new models must be embedded in a new educational and institutional culture (Bates 2015; Conole 2013a; Siemens 2012a).

The framework model developed by the pedagogical research team in the ECO partnership recognizes this challenge and has embraced it. The proposed sMOOC pedagogical framework relies heavily on a compromise between actual innovative practices of the partners involved, who have a relevant experience in networked learning and/or have been providing MOOCs based on the same pedagogical principles, so there is some evidence as to their validity.

The ECO sMOOC model has been designed as a framework that encompasses more than purely the pedagogical approach. Moreover, the ECO sMOOC framework is designed to cater for the diversity in educational approaches, systems and policies, culture and language and regulatory frameworks that differ across the countries in Europe. The ECO sMOOC framework is set well to cater for the current trends seen in adult learning towards autonomous learners controlling their own learning process, use and reuse of educational resources to facilitate personalization and ability to move between educational contexts (Castaño Muñoz et al. 2013). Even though, at first instance the ECO sMOOC framework might show similarities with other forms of MOOCs that rely on connectivism such as cMOOCs, the framework goes beyond the purely pedagogical approach. The Indeed the ECO sMOOC proclaims to be social and a social, connectivist learning approach features prominently in the ECO sMOOCs, because research (like that by Kellogg et al. 2014; Kop et al. 2011) has shown the benefits for learning performance and indicated that learner like and prefer this pedagogical design. The social aspect transgresses the principles of social learning though. It is social in various aspects, not only relying on social learning and connectivist principles, but social in that it aims at inclusiveness and ubiquitous. Inclusiveness not only refers to catering for those who are at risk of being excluded, either through social circumstances or disability, but also catering for personal learning goals and learning styles. The ECO sMOOC model supports flexibility and inclusiveness by allowing learners to set personal learning goals and reach those via alternative learning paths that are available in the sMOOC due to multiple types and choices of learning activities and resources. By using ubiquitous learning strategies and gamification to increase motivation, personalized learning further supports inclusiveness.

Because the sMOOC model is not restricted to a single MOOC platform, but can be delivered through a variety of MOOC platforms, media, and devices it can cater to various educational approaches and educational settings of institutions and presents further flexibility to the learner to choose when and where to learn.

The use of peer assessment, quizzes, badges, and other certification options accommodate the need of the recognition of learning that will become necessary in lifelong and adult learning (Castaño Muñoz et al. 2013).

Some relevant aspects are not yet covered, but need to be included in future improvements. Issues such as scalability, sustainability, costs, quality and business models are still topic of research (Schuwer et al. 2015). Some researchers reason that MOOCs offer a threat to higher education because of the gap it creates between accredited formal education and recognition of skills through nonformal education (Kalman 2014). In lifelong and adult learning, the need for recognition of learning is becoming more important. The European Credit Transfer System is already being by educational institutions across Europe in recognition of formal education and offers potential for acknowledging the more informal and nonformal learning supported by MOOCs (Castaño Muñoz et al. 2013; Schuwer et al. 2015). Others indicate that MOOCs can coexist with formal education and that there exist business models for varying services offered in accordance with delivery of MOOCs. These services range from certification services to tutoring, sponsorships, and sale of MOOC platforms (de Langen and van den Bosch 2013).

The ECO sMOOC framework builds on experiences of higher education institutions that have long time experience in online and distance education as well as development and delivery of MOOCs. These experiences, combined with findings in literature, resulted in the proposed ECO sMOOC framework. For the past 1.5 years, the ECO sMOOC framework has been used and will be used in the years to come in designing MOOCs for the ECO project. The scope and scale of the experimentation conducted so far support the validity of the assumptions. However, findings of this experimentation are being used to improve the pedagogical framework even further.

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Darco Jansen Since 2010, Darco Jansen is programme manager at EADTU. He is responsible for development of themes for EADTU(-members) on Online Education, MOOCs and OER, Employability and on social innovation. Darco's fields of expertise are e-learning, open innovation, educational business development, continuous education, non-/informal learning and workplace learning. He worked for over 20 years at the Open Universiteit of the Netherlands. Currently Darco is the coordinator of the first pan European MOOC initiative OpenupEd and coordinator of several European MOOC projects. http://nl.linkedin.com/in/darcojansen.

Chapter 17
Innovative OER Model for Technology-Enhanced Academic and Entrepreneurial Learning

Nenad Stefanovic and Danijela Milosevic

17.1 Introduction

In today's globalized and knowledge-based economy, education became a critical part of any organizational and personal strategy. This new economy is based on entrepreneurship in knowledge creation and sharing, innovation and creativity, lifelong learning, and utilizing information technology for developing and selling new products and services (Carayannis et al. 2006). Consequently, organizations need skilled and knowledgeable workers from, and the new ways to train those workers, and to share knowledge both within the organization and across organizational boundaries. The traditional model, based on mass production where competitive advantage was gained through decreasing production costs or increasing productivity, has given way to a need for organizations to adapt to changes in market conditions, seek new opportunities, enhance learning, embrace change and innovation, and create and share knowledge.

Similarly, learning needs and learning possibilities today differ fundamentally comparing to the twentieth century. The challenge is how to evolve from the rigid traditional institutional/organizational educational models towards more open, affordable and personalized learning models. Education in the coming decades will be more pervasive and accessible to more and more people (Bonk 2009).

Information technology makes it possible to simultaneously coordinate training activities in many different locations and beyond traditional organizational boundaries. This has enabled organizations to create new structures, such as the

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networked e-learning organization or the knowledge management system, that are more flexible and efficient, harness the best skills and experience of workers and eliminate many of the costs associated with running traditional educational and learning models.

Workforce in the new millennium is global, highly connected, technology-savvy and demanding. Also, the critical skills are scares and unevenly distributed around the world, so companies are forced to adopt innovative new ways to find people, develop capabilities and share expertise. The traditional education and training model is being superseded with more agile and flexible user-centric learning models. Furthermore, there is an explosion of various learning content that is delivered via Internet or intranets across various platforms. One of the recent global surveys reviled that two-thirds of organizations are fully aware of these trends and see it as ‘critical’, however, only 6 % of them think that they do not have the technological capabilities and know-how for effective realization of the new learning models (Delloite 2014).

Information technology serves as a catalyst and accelerator of knowledge creation, diffusion and use in the process of economic development. The new economy put emphasis on higher education and lifelong learning to make effective use of rapidly expanding knowledge base, and massive investments in research, training, education and software (Stefanovic et al. 2013).

By empowering workers (and potential workers) to become equal partners in the learning process, organizations can foster a culture of continuous learning and growth—driving performance, engagement and career development.

Individuals (students, unemployed and workers) have realized the importance of lifelong learning and they seek new ways to access quality learning content, collaborate and develop their competencies.

On the other hand, education institutions are also becoming aware of these trends and they are making efforts to adopt new teaching and learning methods supported by the latest information technology (IT) advancements. The main challenge is to create an approach that is agile, adaptable and in tune with learners habits outside of the classroom and their future employability (Microsoft 2014). This requires a holistic approach to integrating technology to support pedagogical goals.

Educational institutions are faced with two main challenges—first, there is a growing global demand for quality and cost-effective education, and second, as careers become longer and more diverse, the half-life of skills also becomes shorter and shorter, placing the focus on continuous training and development. What is needed is an innovative IT platform and open learning model that provide quality, flexibility and personalization, with services such as collaboration, social networking, search, content management, course management, assessment, analytics and security. The new open educational model requires adequate technological infrastructure: hardware, networks, software and services. Technologies such as cloud computing, Web 2.0, content management systems, multimedia databases, search engines and social networking are the key enablers for realization of modern open educational systems.

The enabling power of technology, especially information technology and social networking software, prompts a radical shift in economic and social interactions in societies around the globe. Existing traditional school-based, formalized educational and learning formats and models are unable to accommodate specific new learning needs. Therefore, customized to the respective purposes of personal well-being, inclusion or requirements for professional performance, lifelong continuous learning is no longer a choice but a necessity (de Langen and Bitter-Rijkema 2012).

Educational institutions as well as organizations are facing a number of challenges: globalization, an ageing society, growing competition both nationally and internationally and rapid technological development. The paradigmatic shift from the current system is moving away from classical educational institutions towards learning environments where individuals are encouraged to create, publish, share and learn online. Information technology allows educators around the world to digitally create, share and remix their course materials in so-called Open Educational Resources (OER) (Senges et al. 2008).

OER is based on the following core principles:

- Open access to content and metadata for various users (teachers, students, lifelong learners and organizations) which is free of charge.
- Flexible and liberal licencing model that facilitates reuse.
- Appropriate software system and tools which enable easier integration, reuse of services/components, as well as creation, publishing and consumption of educational content.

The reasons for individuals and institutions to use, produce and share OER can be divided into basic technological, economic, social and legal drivers (OECD 2007).

- Technology advances offer improved, less costly and more user-friendly information technology infrastructure.
- New business models have emerged and cost can be reduced through the reuse.
- Social drivers include a widespread use of social networking services and tools and willingness to collaborate and share.
- New licencing schemes emerged that facilitate free content sharing.

Even though educational resources and accumulated knowledge are traditionally considered as strategic intellectual properties, more and more individuals, schools and organizations are sharing digital educational resources and knowledge. Consequently, initiatives such as Open Educational Resources and Massive Open Online Courses (MOOC) combined with modern web technologies will play an important role in the educational revolution.

The remainder of the chapter is organized as follows: first, we provide background research related to OER initiatives, models and information technologies, and present critical analysis of existing research. Then, we introduce specific OER project and the novel open educational IT infrastructure model capable to meet demands of modern education and learning. Finally, we provide example of the real-world OER system that is based on the proposed model, and discuss the main advantages and benefits.

17.2 Open Education and Information Technologies—Background Research

With the world moving rapidly into digital media and information, the role of ICT (Information and Communication Technologies) in education is becoming more and more important and this importance will continue to grow and develop in the twenty-first century (Sarkar 2012). Information technologies, and particularly Internet and web technologies, had a profound impact on education. This redefined the way people learn, collaborate and exchange knowledge. On the one side, there is an increasing demand for education (students, unemployed, and employees), and on the other side, there are enormous amount of information and knowledge available on the Internet, educational institutions' internal systems and companies. Each party in this process has its own interest, being students, teachers, schools, government or companies.

Open Educational Resources offer higher education governance leaders a cost-efficient method of improving the quality of teaching and learning, while at the same time reducing costs imposed on students related to tuition fees and the purchase of expensive commercial textbooks and learning materials. Many scholars around the world are already participating in the OER movement even without support from the government or educational institutions (Plotkin 2010).

OER movement was brought to the awareness of the educational community by United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2002 (D'Antoni 2009). The movement began in 2001 when the William and Flora Hewlett and the Andrew W. Mellon foundations jointly funded MIT's OpenCourseWare (OCW) initiative, which today provides open access to undergraduate- and graduate-level materials and modules from more than 1700 courses (Smith and Casserly 2006). This initiative has inspired hundreds of other colleges and universities throughout the world to join the movement and contribute their own open educational resources. In general, there are four categories of OER, namely, open textbooks, open courseware, open online courses and open-source software and tools to support teaching and learning (Cheung et al. 2013).

OER initiative is also supported by several European Union initiatives and projects. The Open e-Learning Content Observatory Services (OLCOS) Project has explored how Open Educational Resources can make a difference in teaching and learning. Their initial findings show that OER do play an important role in teaching and learning, but that it is crucial to also promote innovation and change in educational practices. This project provides decision makers with an overview of current and likely future developments in OER and recommendations on how various challenges in OER could be addressed (Geser 2007).

Following on from the development of Open Education Resources and the Open Education movement (Yuan et al. 2008), the term Massive Open Online Courses (MOOCs) was first introduced in 2008. The original aim of MOOCs was to open up education and provide free access to university level education for as many students as possible. Key developments of MOOCs-style initiatives include: Coursera, Udacity, Khan Academy, edX, etc.

In contrast to traditional university online courses, MOOCs have two key features (Wikipedia 2012):

1. Open access—anyone can participate in an online course for free.
2. Scalability—courses are designed to support an indefinite number of participants.

On the other hand, the attention and hype around OERs and MOOCs has raised many concerns and criticisms in educational domain. These include issues related to sustainability (business models), pedagogical issues, quality of content and learning, low completion rates, as well as issues related to assessment and awarding systems (Yuan and Powell 2013). That is why these new educational initiatives need to be carefully planned, designed, implemented and maintained. This requires the new educational models, frameworks, processes and technology that include capacity building, culture of innovation and creation of modern e-learning environments.

Over the years, there were proliferation of different learning management systems (LMS), platforms and tools. They differ in terms of architecture, features, capabilities, licencing and robustness. These include Moodle, Blackboard, Edmodo and edX, among others. Some of them can also be used in cloud as a hosted solution. Additionally, certain content management systems such as Joomla or Drupal have e-learning capabilities through specific extensions. Since so many factors are involved when selecting learning platform, it can be very challenging to make the right decision. Even though every implementation is different, there are some common factors that should be taken into consideration when making these decisions. A robust LMS should include the following features: compliance, reporting, centralized and automated administration, self-service, powerful content creation and delivery, consolidated and scalable web platform, personalisation and reuse. And above all, LMS need to be cost-effective. However, traditional LMS are proving to be limiting for open and organizational learning and thus raise the possibility of a new cloud system to replace them (Lal 2015). The main challenges include compliance, scalability, maintenance, costs, integration and education service portfolio. Recent studies show that both administrators and users find existing LMS/OER systems inadequate to answer these challenges (Liu et al. 2015; Yates 2013). These include lack of certain service and features, use of different systems for different services (which complicates maintenance and integration and raises costs), issues related to scalability (especially important in OER scenarios with large number of users) and compliance with national and regional regulations and standards.

While most of the current OER initiatives focus mainly on providing access to static course material and offer low interactivity, a new generation of user-friendly web-based tools and services provides opportunities to offer potentially more interactive and effective OERs.

The latest evolution of the Internet, the so-called Web 2.0, has blurred the line between producers and consumers of content and has shifted attention from access to information towards access to other people. New kinds of online resources—such as social networking sites, blogs, wikis and virtual communities—have allowed people with common interests to meet, share ideas and collaborate in innovative ways. Indeed, the Web 2.0 is creating a new kind of participatory medium that is ideal for supporting multiple modes of learning (Brown and Adler 2008).

Such an infrastructure supports diverse ecosystems of people and learning resources that could have profound implications for preparing people for a rapidly evolving knowledge-based world, one demanding creativity, innovation and entrepreneurialism. The OER initiative has been a vehicle for building a culture of sharing. Now OER should be leveraged within a broader initiative—an international Open Participatory Learning Infrastructure (OPLI) initiative for building a culture of learning. The OPLI should provide participatory architectures for emerging visions and concepts such as the meta-university, the university in and of the world, "learning to be" sooner rather than later, and global-scale massification of higher education. It also extends across level and age: K–12, higher education and lifelong learning (Atkins et al. 2008).

The movement towards openness and transparency has increased as teachers and students have started adopting social software for both formal and informal education (Lai and Chen 2011). One of the recent developments towards social software in knowledge management involves tools that are applied by both educators and students to manage international collaborations and networking (Ha et al. 2011). The services and environments around OER have lately been moving towards collaborative functionalities and supporting the creation of teacher and learner communities (Sotiriou et al. 2013). Many initiatives are basing their OER services and environments especially on social software-like functionalities that place educators and learners as key users to share, discuss and work collaboratively on OERs (Ha et al. 2011; Sotiriou et al. 2013).

Besides proliferation of social networking services, another key trend is related to mobile technologies. Nowadays, majority of users use their mobile devices for learning, communication and content creation. Thus, one of the biggest challenges for OER success will be adequate incorporation of mobile services and technologies (Beetham and Sharpe 2013).

Although importance of information technologies in modern open education is widely recognized, there is no a holistic approach to information infrastructure and services capable to answer challenges of today's education. Most of the existing IT-related efforts for OER do not take into account many important aspects of education or the needs of different participants—schools, students, employees and companies.

In the following sections, we describe methodological approach, software architecture, services and features of the innovative software solution, which address important issues that face organizations when designing and implementing OER systems. The modular design and composite architecture enable flexibility in terms of the infrastructure and platform, available services, scalability and integration.

17.3 Developing Next-Generation Open Education Systems

Traditional educational systems cannot completely meet current educational requirements. On the other hand, many of the existing OER and e-learning initiatives did not fulfil high expectations. The main reasons include absence of holistic approach to education transformation and inadequate technologies that could fulfil contemporary educational needs.

In the following sections, we present an innovative education framework and OER system all within the context of the BAEKTEL (Blending Academic and Entrepreneurial Knowledge in Technology Enhanced Learning) project. The OER model proposed in this paper provides a novel approach to design and utilization of different cutting-edge technologies that are seamlessly combined to provide flexibility, scalability, personalization, collaboration, content management, searching and social networking.

17.3.1 The BAEKTEL Project

The objective of the BAEKTEL is to establish an OER framework for fostering technology enhanced learning within higher education institutions and lifelong learning within enterprises in Western Balkan countries (BAEKTEL 2013a).

Partnership with enterprises will be improved through blending of academic and entrepreneurial knowledge by means of OER. This would be achieved by setting up BAEKTEL, a platform that would enable higher education institutions to publish their learning materials, on the one hand, and on the other, offer an opportunity for enterprises to present expert knowledge in various forms, such as case studies, expert presentations on specific topics, demonstrations, know-how, etc.

The BAEKTEL platform envisaged by this project would make OER materials freely available to anyone, anytime via the Internet. BAEKTEL could thus provide educational support at all levels from preparations of university admission exams, additional students education, workplace education and lifelong learning, integration of creative research potential with industry and government institutions for the purpose of achieving better quality and accessibility of education by applying new technologies.

The core efforts in this project pertain to three sets of activities largely following each other: establishing a framework for OER development in Western Balkan (WB) partner countries (PC), development of BAEKTEL infrastructure and development of initial domain specific OER content repositories.

The BAEKTEL projects encompass the following development activities (BAEKTEL 2013b):

1.1 Analysis of existing European practice and principles in development of OER.
1.2 Review of policy-level documents addressing OER in EU HE institutions.
1.3 Analysis of legal and technological conditions pertaining to OER in WB PC.
2.1 Setting procedures and guidelines for publishing OER content in the WB.
2.2 Organization of workshops to facilitate adoption of regulations for publishing OER.
2.3 Conceptual design of the ICT solution for BAEKTEL OER framework.
2.4 Improving ICT infrastructure to support BAEKTEL.
3.1 Implementation of OER procedures and guidelines.
3.2 Development of a common BAEKTEL portal for indexing OER and TEL content.
3.3 Improvement and development of multilingual terminological resources and services used for OER multilinguality.
3.4 Training of persons responsible for preparation of OER content.
4.1 Preparation of educational and expert materials for OER repositories (academic and entrepreneurial cooperation).
4.2 Integration of prepared OER materials within BAEKTEL nodes and portal.
4.3 Recruitment of a representative group of students and employees from enterprises.
4.4 Further improvement of OER content (increase of usage and virtual mobility).

The guidelines outline the key issues in production and publishing of OER and provide suggestions on how to integrate OER into higher education process, or the lifelong learning process. The purpose of the guidelines is to encourage state institutions and competent officials to invest in the systematic production and use of OER and to integrate them into higher education, and to enable the academic staff, students and all interested individuals to participate in production and/or use of OER in order to improve the quality, increase availability and reduce costs of primary and higher education.

The BAKTEL network topology consists of a central repository, which should include (BAEKTEL 2015).

- BAEKTEL Metadata Portal (BMP) with metadata for all published OER within BAEKTEL network.
- Terminological web application for management, browse and search of terminological resources.
- Web services for linguistic support (query expansion, information retrieval, OER indexing, etc.)

- Annotation of selected resources (not all)
- OER repository on local edX platform.

The aim of the BAEKTEL Metadata Portal is to provide structured access to information on open education resources within the BAEKTEL network. To OER creators, the Portal will provide OER metadata management, and to learners, metadata search and direct access to learning resources, such as courses, training materials, guidelines, case studies, best practices, etc., available in any media, which can support education.

BAEKTEL metadata portal is a Web application for managing, browsing and searching metadata, but also uses web services for terminology and linguistic support. Bearing in mind that OER content in the network can be published in various languages, web applications and related web services support multilingualism in BAEKTEL network. It provides a structured approach to information about open educational resources. Portal is the central repository with metadata for all published OER within BAEKTEL network. To creators of OER the portal provides input of metadata, and to students effective searching of metadata and direct access to educational resources, such as courses, training materials, guidelines, case studies, examples of good practice, etc. The portal is designed using an Open Source solution—ResourceSpace.

Within the BAEKTEL network all WB partner institutions involved in producing OER content are expected to implement the procedures and guidelines by creating a network node, where the necessary hardware and software equipment to support the acquiring, assembling and publishing of OER content will be installed.

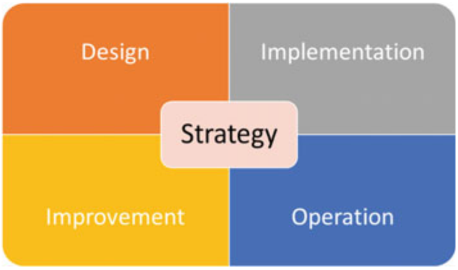
The software and hardware within BAEKTEL nodes should provide for combining different forms of educational processes and teaching content, such as plain and dynamic text, power point presentations, video clips and animations, etc., in order to adjust the educational content to various needs and learning styles of the end users.

17.3.2 Innovative Open Education Framework

In this section, we present a holistic framework for innovative education and learning that is agile, adaptable and in tune with the current and future educational demands. This framework should be capable to transform the learning process and the learning experience.

Realization of modern twenty-first century open education systems requires careful planning and holistic approach. This process should be carried out in phases and involve transformation in all aspects of learning and education practices (Fig. 17.1).

Fig. 17.1 OER lifecycle



The first phase includes demand management, defining vision statement and the strategy for realization of appropriate business model. The design phase involves service design, capacity building and plan for redesigning existing educational processes and platforms. Implementation phase consists of the following activities: knowledge management, change management, configuration management, release and deployment management, as well as validation and testing. Operation phase deals with day-to-day activities such as incident management, problem management, course management, assessment and access management. Finally, improvement phase encompasses other phases and ensures quality through continuous improvement, service level management and monitoring.

In order to successfully carry out the transformation from traditional to web-based open education model, it is necessary to apply both educational and infrastructure frameworks.

Innovative educational framework includes four key dimensions in successful transformation. These dimensions are critical success factors individually but more effective when connected with each other (Microsoft 2015).

1. Teaching, Learning and Assessment.
2. Building Capacity.
3. Leadership and a Culture of Innovation.
4. Learning Environment.

Using the Framework helps leaders think through each of the pieces of reform, how technology can successfully enable student outcomes, and how all the pieces interrelate.

Each of these four dimensions take on the innovative use of information and communication technologies and the adequate technology infrastructure. This infrastructure should be reliable, secure and scalable to support different number of users. This infrastructure should be based on the cloud services such as: compute, networking, storage, media, learning, collaboration and analytics.

The following section describes methodological approach, software architecture, services and features of the innovative software solution, which address important issues that face organizations when designing and implementing OER systems. The modular design and composite architecture enable flexibility in terms of the infrastructure and platform, available services, scalability and integration.

17.3.3 Architecture of the OER 2.0 Platform

Many innovative efforts to establish student-centred, problem-based learning and technology-rich learning environments have not succeeded because they did not take a holistic approach. This includes taking into consideration different groups of users (students, teachers, unemployed people and workers) and their various needs when it comes to education and learning. In this section, we introduce a novel IT open education platform capable to support these requirements.

We describe methodological approach, software architecture model, along with services and features of novel open education platform named OER 2.0, which address important issues when designing and implementing next-generation open education systems.

OER 2.0 is cloud-based, multi-tiered, multilayered and composite web system, which comprises various technologies, tools and applications. Figure 17.2 shows the architecture of the system, including the platform stack, main services and functionalities, as well as the specific education services.

It is built upon Azure cloud and utilizes certain infrastructure, platform and software services. This approach differs from the traditional e-learning systems where all the infrastructure, data and services are hosted on-premises. Cloud-based approach provides higher availability, better scalability and reliability, while at the same time decreasing costs and facilitating quality of services.

With the purpose of providing better manageability, performance, flexibility and consolidation, OER 2.0 utilizes IaaS (Infrastructure as a Service) such as virtualization technologies. The networking services provide private networking, load balancing and hybrid networks. This approach can support various education scenarios, and enables deployment of wide range of solution in an agile way.

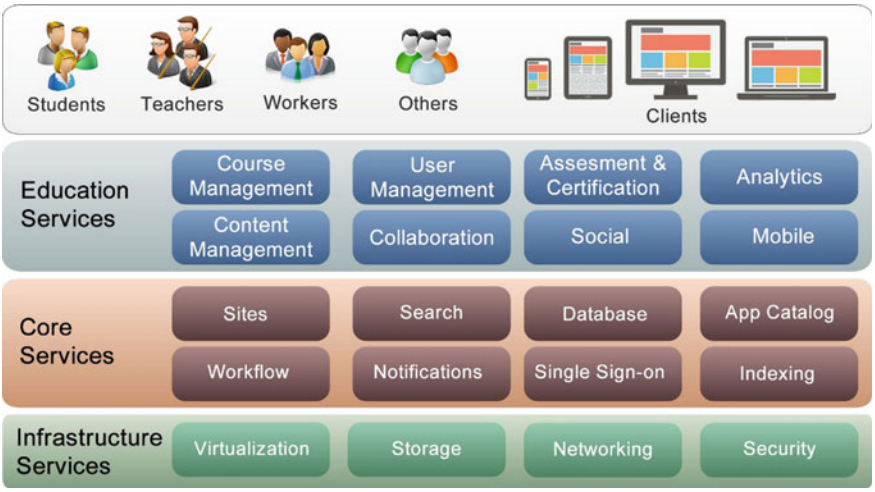


Fig. 17.2 OER 2.0 platform architecture

Storage services provide the flexibility to store and retrieve large amounts of structured, as well as unstructured data, such as documents (i.e. course materials) and media files (i.e. video lectures).

Database services are based on SQL Azure and include services for data storage, processing and security. Database servers store all the structured data associated with the system—configuration settings, administration information, service applications data and user content. This approach facilitates data integration, improves data consistency, availability, security, and makes backup/restore jobs easier. Azure Blob (Binary Large Object) Storage is used for storing unstructured data, such as documents, labs and media files.

Security services provide identity and access management with a robust set of capabilities to manage users and groups and help secure access to on-premises and cloud OER systems. These services are realized through Azure Active Directory services. With SSO (Single Sign-On) support, it is possible to integrate various services and third-party systems without requiring users to authenticate with each system. This enables integration/synchronization of on-premises identities systems from different companies, faculties and other institutions thus providing seamless user experience and application integration.

Web front-end services are based on the SharePoint platform which is used as the foundation for designing OER 2.0 service applications, sites, apps and modules. OER 2.0 architecture is modular and service-oriented which enables composition of flexible, powerful and customized solutions according to specific business needs. Core services are specialized and independent services, which can be shared across sites or even across servers. They can be mapped to web applications, allowing for a more scalable configuration. Each web application can select only the services it needs.

Site services provide functionalities like site creation, management and taxonomy. Sites can have a range of features and functionalities depending on the specific educational requirements (course, team, analytical sites, wikis, blogs, etc.). Each site can use specific core services and contain specific modules, pages and web parts. Web parts are the basic composition blocks of each web page; they are stored in the system database and available through the online gallery.

Each user can introduce himself via a personal *MySite* that shows his skills, interests, area of expertise, current projects, documents and colleague relationships. Users can see all the projects/documents they are working on in a single place and share them with others.

Such modular structure enables customization and design of composite learning environments which blend course materials, user data, documents, collaboration tools and workflows in a more creative and useful way by assembling, connecting and configuring the basic building blocks of functionality available in OER 2.0 web system.

Existing sites can be saved as templates and used for creating new sites. This way, new OER sites/courses can be quickly created and customized if needed. Together with the taxonomy support, these functionalities enable creation of various hierarchical site collections that reflect particular organizational structure (both for the schools and companies) and learning processes.

Notification services provide management and delivery of alerts via email or SMS (Short Message Service). Users can subscribe to modules (i.e. courses) or items (i.e. presentations) in order to receive alerts about certain actions (new content, updates, comments, news, announcements, etc.).

Indexing services provide content indexing (structured, unstructured, internal and external data sources and services) that is used for searching.

On top of the core services, are the specialized educational services that support many of the learning and training activities. Having both content management and learning management system integrated within one system makes uploading training material that much easier. Version control and approval workflows also ensure a better managed compliance system.

Being based on the established cloud platform, OER 2.0 ensures compliance with different global and national requirements such as ISO/IEC 27001 and ISO/IEC 27018, FedRAMP, EU Model Clauses and so on. In addition, OER 2.0 portal and email services support archiving, retention, auditing and case management.

Course management services provide course overviews, target audiences, search tags, training timeframes and learning goals. They also support inclusion of standard student (Sharable Content Object Reference Model) based courses and content. It is possible to specify course categories, make courses mandatory and decide which courses to publish into the online course catalogue. This catalogue gives learners an efficient, dynamic way to find the education that's most relevant to their needs.

Having in mind the increasing demand for collaboration and coordination of activities related to learning management, collaboration service layer is added to OER 2.0 architecture. Collaboration and social services connect and empower teachers and learners to better coordinate their activities through the blogs, communities, wikis, RSS feeds, notes and group discussion boards. Collaboration features enable users to share information and work together on documents, projects and other contents.

User management and assessment services enable enrolment, assessment, grading and learning path management. This way, learners can join courses, take tests and quizzes, and track their personal performance and learning activities.

Real-time analytics and reporting services deliver a clear picture of learner performance and programme effectiveness. This includes personal progress dashboards, management tracking dashboards for learners, groups, and courses, SCORM completion tracking, event participation, task execution and so on.

Mobile services deliver a mobile experience, which allows users to easily access content from any mobile device. This broadens the accessibility of content and social networking tools beyond the capabilities of traditional desktop-based websites.

The presented OER 2.0 architecture is multilayered and seamlessly combines various services and technologies that enable creation of integrated and feature-rich open educational solutions. The following section presents a real-world OER system and describes main features.

17.4 Oer 2.0 Case Study

OER 2.0 web system is based on the presented architecture model and utilizes various cloud services and features. It represents a composite web application consisted of different structural elements. These elements can be viewed at four levels: presentation, collaboration, business logic and data (Stefanovic et al. 2015). The central component of OER 2.0 web system is the web portal. It is modular, which means that each module can be customized and personalized, and existing or new modules can be combined thus assembling composite applications that suit the learner's specific needs.

Structure, modules and services are designed and composed in a way which supports most of the activities related to education and learning.

In order to overcome the shortcomings of the existing OER systems, we have designed a specialized web portal enabling users to find, learn, teach, assess, collaborate and analyze educational activities.

The central component is the course management system that contains several learning management apps: include course catalogue, assignments, grading, SCORM player, language (translations), certificates and reports. These apps are built on top of the OER 2.0 core services, so learners can benefit from the standard collaborative features.

Course catalogue provides learners an efficient, dynamic way to find the education that is most relevant to their specific needs. Courses can be browsed by category or searched by several course attributes. Figure 17.3 shows the course creation form.

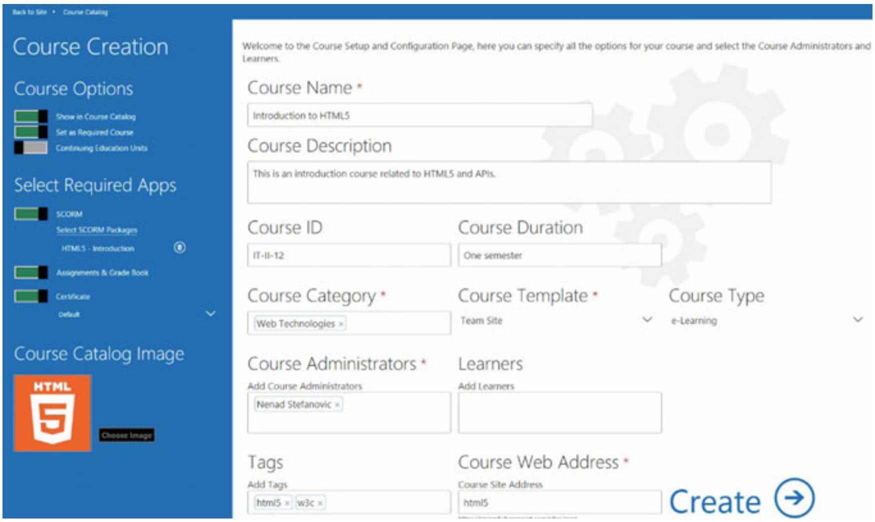


Fig. 17.3 Course creator

It is also possible to upload SCORM packages to instantly create formalized courses, enable enrolment and take advantage of OER 2.0 web portal collaborative features.

After the course creation, teachers can define grading scales, assign tasks to students and maintain the grade book, as presented in Fig. 17.4.

Besides grading and assignments, teacher can also manage students' accounts and analyze their performance with various reports (Fig. 17.5).

For the purpose of more efficient and effective learning management, we have designed a specialized web portal for course management, document management and collaboration. Web portal is saved as a template and it can be easily reused for new courses. It is also extensible so it can be customized to suit specific course needs.

Figure 17.6 shows an example of the course web portal with a range of modules and features. It consists of several specialized document management modules with support for document creation, editing, versioning, sharing, workflows and retention. These include lectures, exercises, additional materials, students' homework, etc.

The Notebook app enables teachers to create course notebooks with preassigned classroom permissions. Class notebook is organized into three sections:

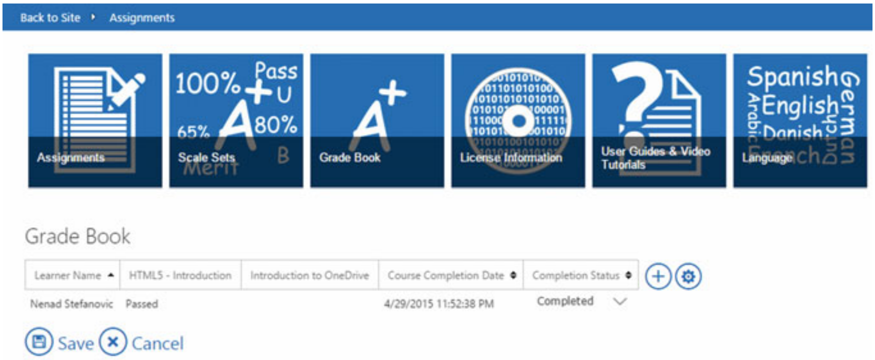


Fig. 17.4 Grade book and assignment module

Fig. 17.5 Reporting and course management module

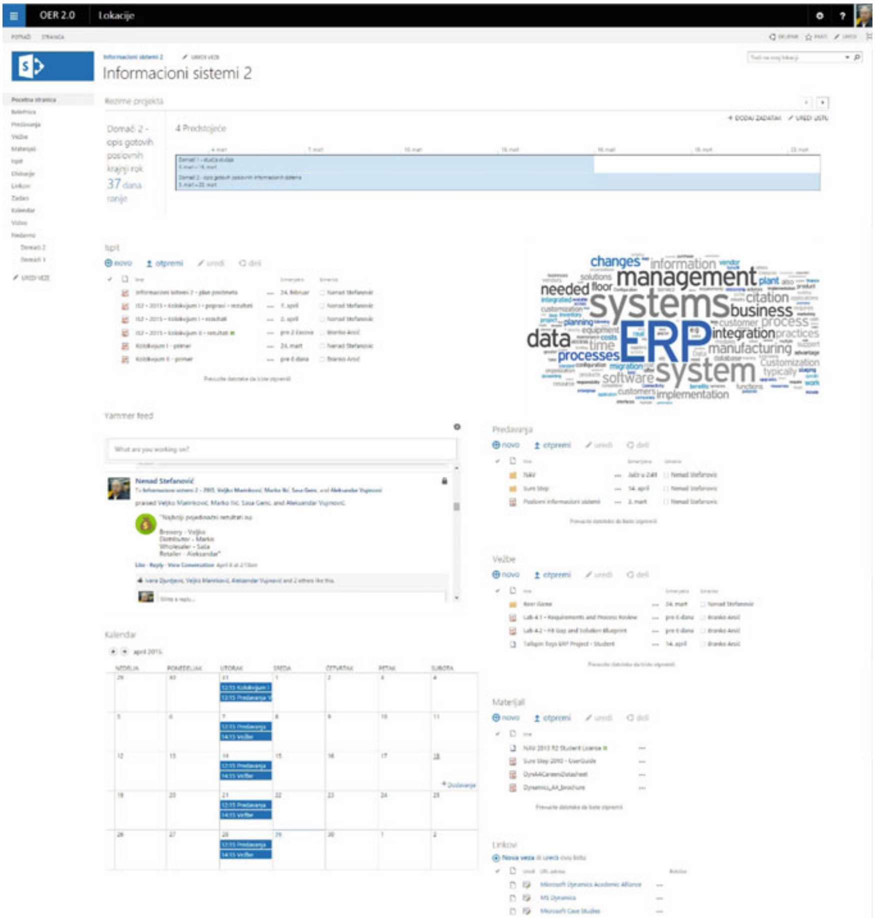


Fig. 17.6 Example of the course web portal

- Student Notebooks—Private notebooks that are shared between the teacher and each individual student.
- Content Library—A place where teachers can distribute course materials to students.
- Collaboration Space—A space for any course member to share, organize and collaborate.

Another important feature is a task management. Here, teacher can create task for students (with due dates, priority, description, etc.) and track visually realization of these tasks. Students are notified automatically if certain task is assigned to them and can see all their tasks in a special My Tasks view.

Course web portal also includes a calendar app, which enables creating events with attendees. The meetings can be scheduled in a classic way (i.e. classrooms) or as online meetings. All the invited students/learners can accept invitation (or propose alternative time) and join the online meeting (with chat, audio and video support). Conferencing services are based on Lync/Skype for Business server and provide powerful audio/video online lectures or consultations between instructors and students. This service is also integrated with the OER 2.0 web portal by providing the presence indicators for each user. This way, students can see presence status of other students and instructors, chat with them or make a conference call, directly from the portal. These features add additional level of interactivity to a great extent replace traditional face-to-face learning. All these services can be used on any platform (desktop, tablet or phones). Lectures or discussions can be saved and uploaded online to the specialized video service for on-demand viewing.

OER 2.0 video is a specialized video and streaming service that allows users to consume, share and manage video content such as lectures, tutorials, training sessions, etc. It also handles metadata and search for videos. Technical delivery services, such as transcoding, thumbnails and secure streaming, are provided via Azure cloud media services. Figure 17.7 shows a video channel of the particular course.

Having in mind the importance of communication between teacher and students and among peers, we have included a specialized module that is connected to a Yammer business social network. This way, all the participants can stay in touch with the latest news. They can use various social networking features, such as personal profiles, messaging, discussions, chatting, file exchange, tagging, searching, and following colleagues. It is possible to create private or public user groups such as those for courses, student projects or companies. Also, these services are available from any device and platform.

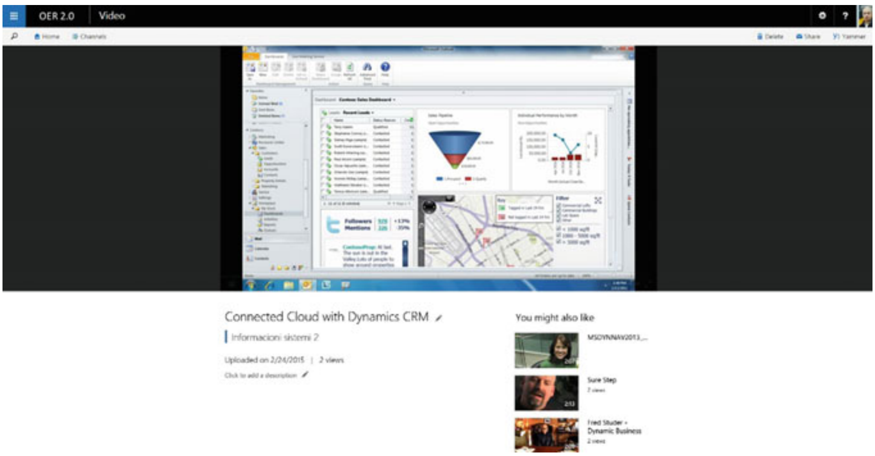


Fig. 17.7 OER 2.0 video service

Finding quickly the right information or document is very important for the successful online educational system. OER 2.0 web portal includes a search functionality, which is built upon the search core service. Besides standard search capabilities, it contains advanced features, such as thumbnail previews, click-through relevance, and automatic metadata tagging. Search can be carried out by many criteria such as by site, author or language.

OER 2.0 also support multilingual features since users can be from different language speaking areas of the world. Multilingual capabilities are built into the system architecture and realized through the web front-end portals. They include support both for user interface translation and content translation.

Additional important aspects of OER 2.0 web system are security features and authentication models. The security model is realized through managed accounts, core service applications such as Single Sign-On (SSO), authentication mechanisms (like Multi-Factor Authentication or claims-based authentication) and fine-grained authorization. Faculties and companies can integrate their own user accounting system for authentication, or individuals can use their own social networks accounts (i.e. Facebook, LinkedIn, etc.). This enables integration of various services within the OER 2.0 system, but also to seamlessly integrate external services and content.

On the other hand, authorization mechanism supports access management at different levels—servers, services (storage, video, social network, email, etc.), sites, applications (modules) and items (i.e. documents and other files) both for users and groups. This enables realization of various educational scenarios tailored according to specific needs of users.

OER 2.0 has been successfully implemented and tested at the university level (two faculties), and also involved one industry partner. User accounts are created in the cloud Active Directory (for the faculties) and also synchronized with the on-premise identity service from the industry partner. With the help of SSO capability, OER 2.0 has been integrated with three existing learning and content management systems (Moodle, Joomla and edX) so the users can access all those systems using a single account, synchronize calendar data, use OER 2.0 file storage, submit assignments, etc. This shows that OER 2.0 system not only can replace traditional LMS, but also to integrate and complement them with its features and services.

As a pilot project, during the 1-year period, ten courses has been developed and published. After opening accounts, user groups are created and user have been added to appropriate groups (i.e. faculty/company groups, department groups, teacher groups, student groups per year and department, course groups, team project groups, etc.). Website templates were used for easy and fast creation of course portals. Thanks to the modular structure, some of the course portals are customized and/or extended with specific apps available from the online app gallery. This speeds up the set up process significantly through component reuse and customizations.

Guidelines and how-tos are available both for teachers and students in order to shorten the learning curve and to ensure efficient and effective use of OER 2.0 services.

Teachers and instructors from companies can register (or approve requests) their students, and publish various learning content (documents, presentations, wiki pages, videos, etc.). They can submit assignments for students, track their progress and provide feedback in several forms: within documents or digital notebooks, through discussion modules or directly via video sessions. Video services also allow live lectures with possibility to record them and publish on the video portal for on-demand viewing.

End users are also provided with additional self-service capabilities which allow them to create their own groups for team work, content editing, document exchange, social networking and communication. By fulfilling their profiles (interests, expertize, etc.) users can more easily connect with each other thus strengthening and extending relationships and collaboration. Students not only have chance to connect with their peers, but also to connect with employees and access learning materials published by industry partners. The benefits of collaboration between academia and industry are twofold. First, students can access additional learning materials and acquire knowledge better suited to the needs of companies. On the other hand, companies can gain access to powerful education and learning platform as well as access to contemporary materials and knowledge bases. Companies can also provide valuable feedback and suggestions for improving OER 2.0 services and content.

After the first year, analysis has been carried out based on the data available from the OER 2.0 system and user surveys. The initial results are quite promising. The main conclusions that can be derived are as follows:

- Better efficiency—both teacher and students have reported significant improvements in terms of time and efficiency. As main reasons, they stated seamless integration of services (73 %), search capabilities (45 %) and better user experience (81 %).
- There has been a substantial cost reduction—no server hardware is needed, lower licencing costs (faculty members and students get all the licences for free) and lower maintenance costs (less people needed to administer the system).
- More intense collaboration—69 % of students have reported stronger connections with teachers and peers due to available collaboration and communication tools.
- Users highly value mobile services—76 % of users have accessed some of the services via mobile devices and 45 % have installed one of the mobile apps.
- Availability of the system is increased to 99.99 %, compared to from 93 % of the existing on-premises LMS.

Even though OER 2.0 is quite functional and the results are encouraging, there are several directions for future improvements. Primarily, these include developing additional guidelines and best practices related to teaching, learning, assessment, capacity building and leadership, as well as improvement of the OER 2.0 platform and extension with new educational services and applications.

17.5 Conclusion

As the world becoming increasingly "flat", competitiveness increases not only in terms of technology, know-how and resources, but above all in terms of individual skills and knowledge. To be competitive, companies must not only provide the best workforce, but also provide support for continuous learning and for ongoing creation of new ideas and skills.

In order to achieve this goal, all participants in this process (educational institutions, companies, government and individuals) have to be involved and work jointly to create a knowledge-based ecosystem that is based on innovative learning, teaching and knowledge transfer framework that is supported by the latest information technologies.

Initiatives for open education such as OER and MOOC are the main drivers towards more flexible, adaptable, and cost-effective educational system. These initiatives aim to remove technical barriers (communication and collaboration), price barriers (subscriptions, licencing fees, pay-per-view fees), geographical barriers (different languages and culture) and legal barriers (copyright and licencing restrictions) for the end-user.

However, most of the existing OER and learning management systems failed to answer the challenges of today's education. They do not incorporate current pedagogical principles and best practice, and have certain technological constrains. Main issues with existing OER approaches include disconnection and separation of regular and organizational learning. On the other hand, OER software solutions are typically rigid, difficult to customize or extend, and they do not support the whole suite of educational activities, thus reducing the positive effect of OER approach and not making the most out of available capacities.

This paper introduces a novel OER web platform capable to support demands of the current and future educational needs. Its architecture is open, service-based, multilayered, scalable and modular, which enables composition of feature-rich learning environments tailored according to specific users' needs.

The presented OER software architecture is multilayered and seamlessly combines various services and technologies that enable creation of integrated and feature-rich open educational environments. It is a flexible, customizable and extensible software environment that can support various OER scenarios. The new application model and software solution are architected and designed in such a way to provide the following advancements in terms of: alignment, agility, adaptivity, manageability, functionality, interoperability, performance and security. Such approach enables establishing flexible, adaptable, cost-effective and sustainable OER environment where individuals, educational institutions, companies and government collaborate, create, share and discover learning resources and knowledge. This should ultimately open the road towards next-generation educational systems.

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