

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technologies



Diploma Thesis

Analysis and design of Massive Online Open Course

Author: Bc. Khazem Al Daken

Supervisor: Ing. Miloš Ulman, Ph.D.

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In Prague on 31.03.2017

Khazem Al-Daken

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Analýza a návrh hromadného otevřeného online kurzu

Souhrn

Tato diplomová práce se zabývá využitím interaktivních materiálů a moderních vzdělávacích technik v rámci vysokých škol. Hlavním tématem je Masivní otevřený online kurz (z anglického Massive Open Online Course, zkratka MOOC). MOOC staví na principech a je součástí Otevřených vzdělávacích zdrojů (anglicky: Open Educational Resources, zkratka OER), takže téma OER bude součástí této diplomové práce, stejně jako téma Otevřených licencí a autorských práv. Předmětem zájmu a cílem analýzy je stav vývoje vysokoškolského vzdělávání kvůli moderním vzdělávacím metodám a vliv MOOC v celosvětovém měřítku, v rámci celé Evropské unie a České republiky. Praktická část je věnovaná návrhu metodiky a tvorbě vysokoškolského MOOC kurzu pro vybranou vysokou školu na základě zvolené MOOC platformy a znalostí získaných během přípravy teoretické části této diplomové práce.

Klíčová slova: MOOC, otevřené vzdělávání, OER, Creative commons, vzdělávání, EU, Česká republika.

Analysis and design of Massive Online Open Course

Summary

This Diploma Thesis is about modern education methods, practices and tools, main topic of the Thesis is Massive Open Online Courses (MOOCs). First MOOC emerged from the open educational resources (OER) movement, so this topic although will be covered, same as definition and importance of Open licenses and copyright for both of movements. The area of interest and the purpose of analysis is description of MOOC's educational sector state and principles worldwide, especially current state in the EU and Czech Republic. Practical part is going to describe the process of MOOC designing and realisation with a help of chosen MOOC platform according to all requirements and steps to build a MOOC.

Keywords: MOOC, open education, OER, Creative commons, university, education, EU, Czech Republic.

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1 Introduction

What drives development of new pedagogy, a new way of teaching? Changes in society, student expectations, and technology are motivating innovative university and college professors and instructors to re-think pedagogy and teaching methods.” (1)

We are living in a digital society. Amount of digitally created information has increased exponentially during the last years, and the friction in creating and disseminating that information is incredible. In addition, many of the governments worldwide and their key infrastructures of society are transforming in to the form of digital data. This inconvenient truth and new Digital Era in the modern history that has come true and society must face the situation and make the best of it.

Without doubt, data is the new raw material of the 21st century: a resource that opens a lot of unimaginable new tools, products and services, that is just waiting to be explored. How to manage this huge amount of information and data is one of the critical questions of our time. National legislations and public officials are not in hurry with updating terms and conditions for data management, same as the capabilities for handling digital data properly.

Education has a history of jumping onto trends, constantly seeking ways to improve teaching and learning. Technology exacerbates the opportunities to discover the next new thing that may solve all of our problems.

Education is an essential tool for individuals and society trying to solve the challenges and problems of the present and seize the opportunities of the future. However, the current provision of education is limited by educational institutions' capacity, consequently, this resource is available to the few, not the many. The digital revolution offers a potential solution to these limitations, giving a global audience unprecedented access to free, open and high-quality educational resources.

With the introduction of MOOCs to higher education - institutions are faced with the challenge of adapting to this not very common innovation that has come to education market because higher education has not changed much throughout the years.

2 Objectives and Methodology

2.1 Objectives

The area of interest and the purpose of analysis is utilisation of Massive Online Open Course (MOOC) in higher education in the Czech Republic.

The partial goals of the thesis are:

- 1) To make an overview of the current state of the art of Open Educational Resources and MOOCs in tertiary education worldwide;
- 2) To create a feasibility study of implementation of MOOC in selected higher education institution;
- 3) To evaluate proposed solution and to formulate recommendations.

2.2 Methodology

Theoretical part of the thesis is based on analysis of specialized information resources, e-literature and communities. Practical part will consist of analysis and design of solution for creation a MOOC for selected university. Based on theoretical knowledge and results of the practical part will be summarized in conclusion of the thesis.

3 Literature Review

3.1 Traditional education

As early as 1997, the business and innovation consultant Peter Drucker forecast that:
“Thirty years from now the big university campuses will be relics. Universities won’t survive. It’s as large a change as when we first got the printed book [...].” (2)

Education is essential in a modern society. It’s how we pass down the wealth of human knowledge and how to prepare the next generation of innovators, leaders and productive members of society. Modern educational systems are built to provide every person the opportunity to build a better life - by turning growing children into citizens, students into teachers, labourers into skilled workers.

Traditional Academic knowledge is a specific form of knowledge that differs it from other kinds of knowledge and from knowledge or beliefs based on personal experience. In summary, academic knowledge is a second-order form of knowledge that seeks abstractions and generalizations based on reasoning and evidence. According to **Dr. Tony Bates**, fundamental components of academic knowledge are:

- *Transparency*
- *Codification*
- *Reproduction*
- *Communicability*

Transparency means that the source of the knowledge can be traced and verified. Codification means that the knowledge can be consistently represented in some form (words, symbols, video) that enables interpretation by someone other than the originator. Knowledge can be reproduced or have multiple copies. Lastly, knowledge must be in a form such that it can be communicated and challenged by others. (3)

The format of lectures supported by small group seminars with final examination on specific topics - remains almost unchallenged as a pedagogic delivery method. Education as a whole can be understood as a wide range of pedagogical and scholar activities, which can take place inside or outside of formal institutions. Education activities can be divided into following parts:

- a) **learning**, whether through instruction, guided activity or self-directed learning;
- b) **teaching** which can include mentoring and all non-instructionist activities around the deliberate
- c) **assessment** - any combination of summative, formative and/or diagnostic;
- d) **accreditation** - recognizing learner or educator accomplishment;
- e) **policymaking** at any level of education or governance where this influences curriculum, funding and procedures in education.
- f) **administration** - recruitment, admissions, retention, progression, graduation.

Mostly, technologies in education have been used to support and improve regular classroom teaching, they also operated in the form of distance education or in specialized departments. However, in the last fifteen years, technology has been increasingly influencing the core teaching activities.

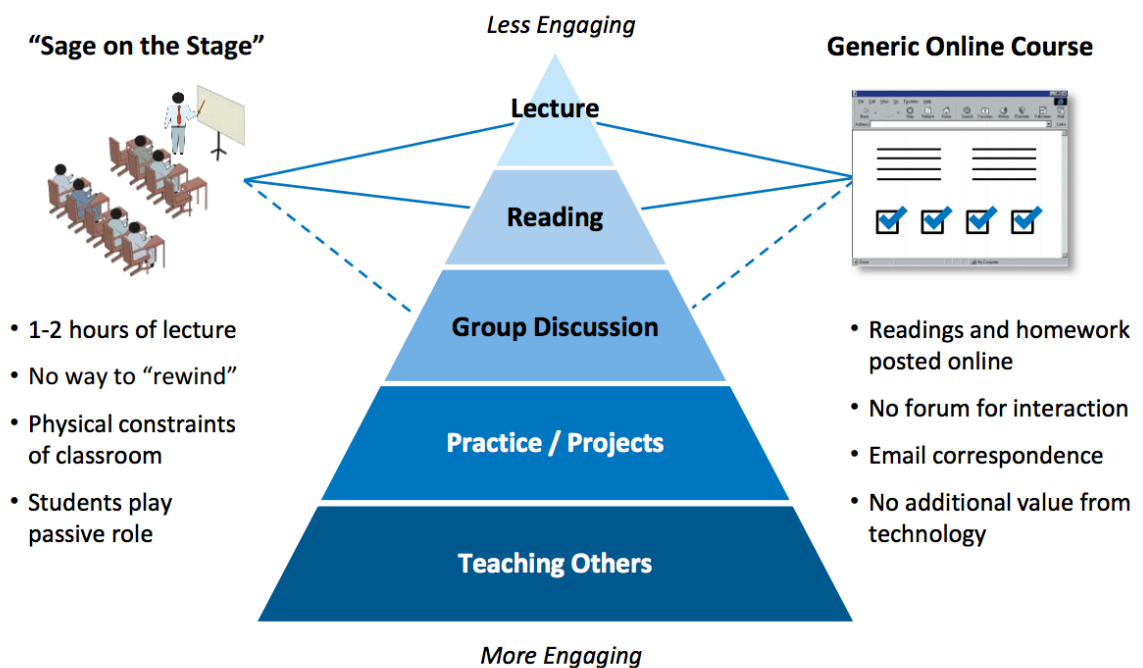


Figure 1. Classroom lectures vs. Online Courses.
 Source: <http://blogs.oregonstate.edu/engage/files/2012/12/Understanding-the-MOOC-Trend.pdf>

3.2 Open education

“For too long, our educational systems have operated with a fundamental disconnect between practices left over from the analog world, and the vast potential of technology and the Internet to support more affordable, effective teaching and learning. The movement for Open Education seeks to close this gap.” (4)

What is 'open' education? According to [Opensource.com](https://opensource.com):

“Open education is a philosophy about the way people should produce, share, and build on knowledge.

Proponents of open education believe everyone in the world should have access to high-quality educational experiences and resources, and they work to eliminate barriers to this goal. Such barriers might include high monetary costs, outdated or obsolete materials, and legal mechanisms that prevent collaboration among scholars and educators.” (5)

Open education (OE) is academic practice in higher education that based on philosophy of free and open sharing of the ideas, knowledge, methods, platforms, tools, approaches and materials used in learning and teaching practices. Through collaborative work and sharing of improvements for resources, materials and techniques - their quality can be enhanced to a measurable degree.

Promoting collaboration is central to open education. As the [Open Education Consortium](#) [says](#)¹: *"sharing is probably the most basic characteristic of education: education is sharing knowledge, insights and information with others, upon which new knowledge, skills, ideas and understanding can be built."* (6)

Open Education encompasses resources, tools and practices that are free of legal, financial and technical barriers and can be fully used, shared and adapted in the digital environment.

Open education can also be referred to as ‘open educational practice’ or simply ‘open practice’. More generally, the open movement covers open source developments in technology, software and standards, open content and knowledge, and it includes open educational practice. The principles underlying all these areas of activity are based on the

¹ The Open Education Consortium is a non-profit organization and global network of educational institutions, individuals and organizations that support an approach to education based on openness, including collaboration, innovation and collective development and use of open educational materials

idea that opening up our work to others' incremental improvements and insights can generate much better materials, technologies and ideas with wider use and application, than in closed environments, where input and use are restricted.

3.2.1 History of open education

Open Education movement covers a wide range of different activities and has a long history. From the public library movement of the 19th century which promoted open universities and state-provided education, when education suddenly became accessible to all, to the setting up of institutions like the Open University in the UK which lowered the boundaries to access.

Peters and Deimann (7) has provided an historical reconstruction of scholastic movement from the Middle Ages. According to their report, we can summarize:

- The late Middle Ages were characterised by different changes that “opened” education. A major factor was the growth of medieval towns and increasing urbanisation of society. Cathedral and monastery open schools grew to institutions of higher learning, then termed “*studium generale*”.
- By the late 1500s access to knowledge and learning had become very difficult, because the higher education institutions were closing or had some restrictions/limitations.
- 1600s has changed education by the invention of the printing press. It was a new beginning to spread knowledge more widely.
- 17th century coffee-houses provided another instance of openness. Here people from different social layers were given possibility and access to the latest news, pamphlets and books. People had possibility to listen and participate in live discussions on different topics, covering science, religion, business, literature and of course the latest gossips.
- The 18th century is characterised by wide popularity of literacy among men. The popular response to Thomas Paine’s 1791 Rights of Man fuelled “literacy from below” as artisans and the new industrial working class taught one another to read and established growing numbers of self-education societies.
- From the late 19th century until the end of the Second World War, miners’ libraries emerged as the thirst for knowledge and rise of interest in self-education coincided with the growth of the coal industry. With few exceptions, every

mining town and village had its own “workmen’s institute”, containing, among other a reading room and a library that would be at the heart of the establishment.

- The 20th century continued to see education “open” as the belief in the people’s right to access society’s knowledge grew. In Argentina for instance, this is particularly visible in the University of Buenos Aires, as shaped by the ideas of the 1918 Cordoba reform.
- Openness was also enabled by further developments in distance learning. Best known example is The Open University (UK) founded in the 1960s, at a time of significant developments in communications technology and mass media.

More recently it has taken on new impetus in a new direction, not disconnected with that history, but not entirely similar in focus.

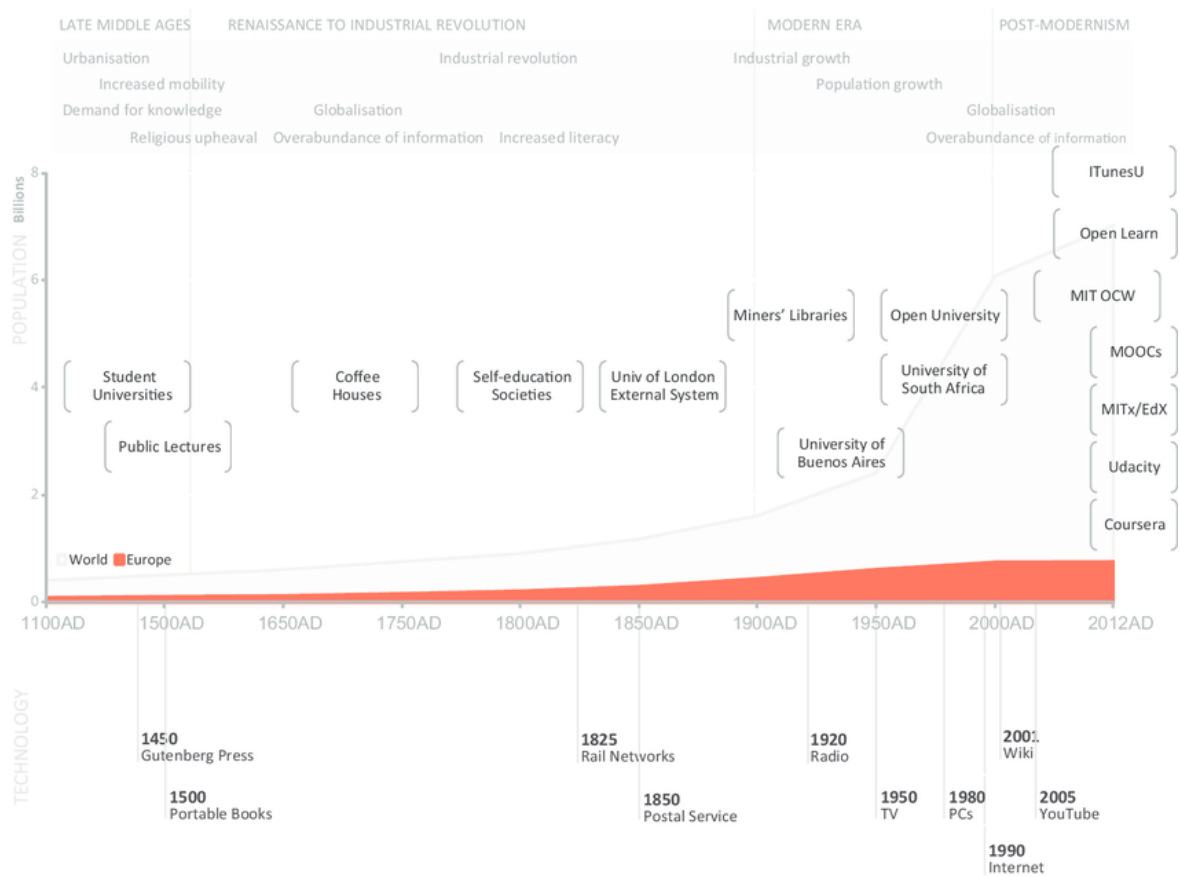


Figure 2. Visualisation of the History of Openness in Education.
 Source: <http://www.openpraxis.org/index.php/OpenPraxis/article/view/23/8>

Technological innovations made biggest contribution to changes in educational practice, but tools are often enablers rather than drivers. Open education is very much the result of a dialectical relationship between technology and human aspirations. There are

three key strands that lead to the current set of open education core concepts: open access education, open source software and WEB 2.0 philosophy.

Martin Weller notes in his book **The Battle for Open**: *"Openness has a long history in higher education. Its foundations lie in one of altruism, and the belief that education is a public good. It has undergone many interpretations and adaptations, moving from a model which had open entry to study as its primary focus, to one that emphasises openly available content and resources. This change in the definition of openness in education has largely been a result of the digital and network revolution."* (8)

3.2.2 Benefits of open education

There are many educational institutions, organisations, groups and individuals, who can potentially benefit from open education and open educational practices.

The OER Research Hub project gathers research on the impact of open educational resources on learning, open education and modern teaching practices. According to *Open Education Handbook* (9) the OER's potential benefits are:

- *Use of OER improves student performance and satisfaction level*
- *People use OER differently from other online materials*
- *OER participation role in education process has increased*
- *Use of OER is an effective method for improving retention for at-risk students*
- *Use of OER leads to critical reflection by educators, with evidence of improvement in their practice*
- *OER adoption brings financial benefits for students/institutions*
- *Informal learners use a variety of (quality) indicators when selecting OER*
- *Informal learners develop their own forms of study support*
- *Open education acts as a bridge to formal education*
- *OER use encourages institutions to change their policies*
- *Informal assessments motivate learners using OER*

Institutions have also benefited from open data and transparency that can lead to better funding and infrastructure.

Openly-licensed learning materials are easy to find and access, encouraging more independent and flexible learning opportunities for students. OER courses allow students to

explore materials before enrolling, making them better prepared before they arrive in the classroom.

Open education has given access to those who previously had no access to educational materials, resources and practices. This means that someone can study using a Massively Open Online Course (MOOC) or OER generally without having to attend a formal learning institution.

3.3 Open education resources

Definition of open educational resources (OER) according to the Hewlett Foundation:

"Open Educational Resources (OER) are teaching, learning, and research materials in any medium that reside in the public domain or have been released under an open license that permits their free use and re-purposing by others." (10)

Otherwise stated - OERs are learning materials that can be modified and enhanced because their authors/creators have given others permission to do so. Some argue that resource must be both free to access and openly licensed or in the public domain, to be an open educational resource. OER can consist of full courses or components of courses, including course materials, lesson plans, textbooks, learning objects, videos, games, tests, software, or any other tool, material, or technique that supports access to knowledge.

The individuals or organizations that create OERs, some (if not all), typically using copyright associated with their works via legal tools like [Creative Commons licenses](#), so others can freely access, reuse, translate, and modify their materials/works.

Over time the term has come to cover not only content, but also learning and content management software, content development tools, standards and licensing tools for publishing digital resources, which allow users to adapt resources in accordance with their cultural, curricular and pedagogical requirements. Figure 3 illustrates the different elements on conceptual map of OER.

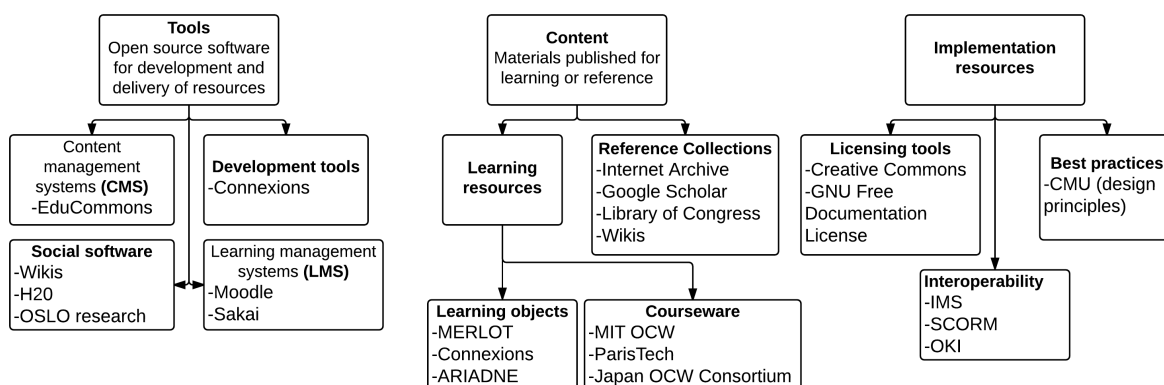


Figure 3. Open educational resources: a conceptual map.
Source: <https://www.oecd.org/edu/ceeri/38654317.pdf>

OER maximize the potential of the Internet to improve teaching and learning practices, and increase access to education. The real power of OER comes in the “5R permissions”, that entitle you to not only access these materials free of charge, but also also to make them better. Modern Open Educational Resources permissions are typically defined in terms of the “The 5Rs Permissions of OER Framework” by **Lumen Learning**²:

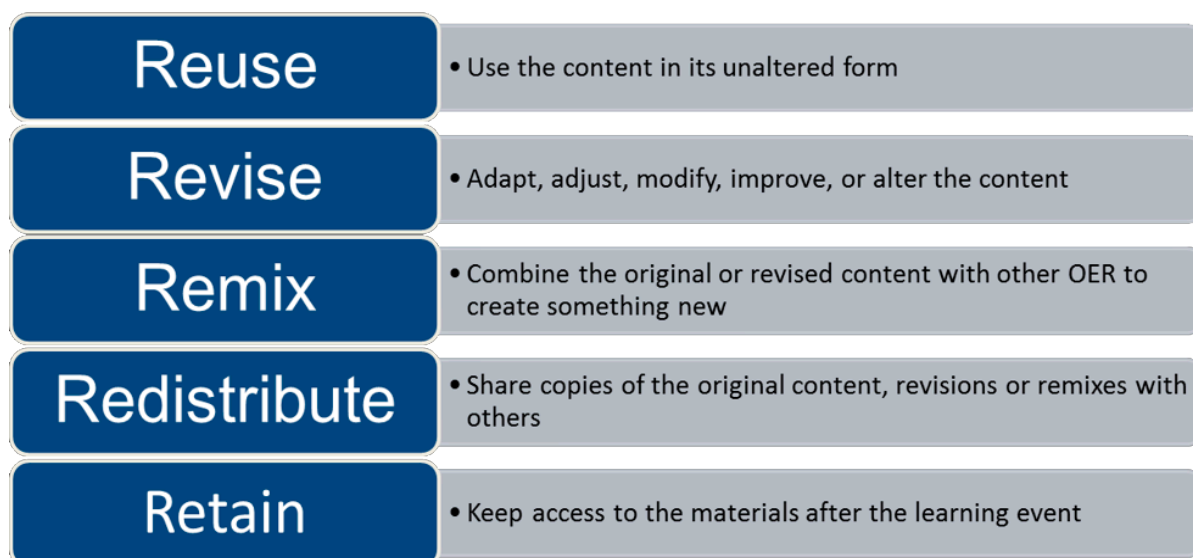


Figure 4. 5Rs Framework
Source: <http://lumenlearning.com/about-oer/>

The primary purpose of the 5Rs framework is to help educators and institutions with effective instructional design guidelines and adoption of courses in classrooms around the

² Lumen Learning creates digital course materials that replace expensive textbooks in high-enrollment college courses and save students millions every term. URL: <http://lumenlearning.com/>

world, to build capacity around how to use open educational resources effectively, not only to eliminate the high cost of commercial textbooks, but also to strengthen student learning. *“For any innovation, establishing common practices for consistency and quality is an essential step on the path to achieving widespread adoption,”* said Cable Green, director of global learning at Creative Commons.

It’s important to underline that OER is not a degree-awarding strategy. No one has suggested that OER take the place of institutionally supported open and distance learning. It was thought of more as a sharing unique and interesting resources with potentially value to others. When OER done correctly - distance learning projects require extensive administrative and academic student support. OER involves sharing of academic resources that an institution chooses, it makes possible worldwide use of electronic resources, created to serve local students.

3.3.1 History of the OER movement

An early ripple in this wave of openness was the decision by MIT, in the late 1990s, to start putting its instructors’ lecture notes on the Web for anyone to see. The term *“Open Educational Resources (OER)”* was first used in July 2002 during a UNESCO workshop on Forum on the Impact of Open Courseware for Higher Education in Developing Countries. Although MIT’s [OCW](#)³ project was represented there, along with different projects from other universities.

At UNESCO’s 2004 Second Global Forum on International Quality Assurance, Accreditation, and the Recognition of Qualifications in Higher Education, a delegate explained, “Open Educational Resources champions the sharing of knowledge worldwide to increase human intellectual capacity.”

According to **Sally M. Johnstone** (11), by 2004 OER was defined to include:

- *Learning resources—courseware, content modules, learning objects, learner-support and assessment tools, online learning communities*
- *Resources to support teachers—tools for teachers and support materials to enable them to create, adapt, and use OER, as well as training materials for teachers and other teaching tools*

³ OCW – OpenCourseWare, course lessons created by universities and published via Internet.

- *Resources to assure the quality of education and educational practices*

Most definitions of the term include content, software tools, licenses, and best practices. OER is a field of practice and exploration as evidenced by the growing number of research studies. There is an emerging research community gaining momentum and focusing on investigating the impact of OER on learning and the education environment.

In September 2007, the **Open Society Institute** (OSI) and the **Shuttleworth Foundation** convened a meeting in Cape Town to gather leading proponents of open education, the meeting gathered participants with many points of view from many nations. The aim of this meeting was to accelerate efforts to promote open resources, technology and teaching practices in education through collaboration.

The outcome of this meeting was the ***Cape Town Open Education Declaration***. *It is at once a statement of principle, a statement of strategy and a statement of commitment. It is meant to spark dialogue, to inspire action and to help the open education movement grow.*

The Declaration has already been signed by hundreds of learners, educators, trainers, authors, schools, colleges, universities, publishers, unions, professional societies, policymakers, governments, foundations and other kindred open education initiatives around the world. (12)

3.3.2 Types of OER

3.3.2.1 OpenCourseWare (OCW)

OpenCourseWare (OCW) - course lessons created by universities and published via Internet.

The OCW movement started in 1999 when the University of Tübingen in Germany published videos of lectures online to their Tübinger Internet Multimedia Server (timms initiative). The OCW movement started to develop much faster with the launch of MIT OpenCourseWare at the Massachusetts Institute of Technology (MIT) in October 2002. Later the movement was reinforced by the launch of similar projects at Yale university, the University of Michigan, and the University of California in Berkeley.

3.3.2.2 Open Online Courses

A Massive Open Online Course (MOOC) is an online course aimed at participation without course capacity limits and with provided open access via the web. MOOCs contain many traditional course materials such as syllabi, videos, lectures, texts, problem sets, quizzes.

MOOCs are a recent development in distance education. The term MOOC was first used in 2008, but MOOCs popularity began to emerge in 2012. MOOCs philosophy emphasizes open access features, such as connectivism and open licensing of content to promote the reuse and remixing of resources. Some newer MOOCs use closed licenses/policies for their course materials.

MOOCs provide interactive communication between students and/or lecturers in form of specialized internal forums/chats that help to build a community for students, professors, and teaching assistants.

3.3.2.3 Open Textbooks

An open textbook is a textbook licensed under an open copyright license. Open textbooks are freely available online to be used by students, teachers and basically by anyone. Mostly open textbooks are distributed in either print, e-book, or audio formats that may be downloaded or purchased at little or available for free.

The defining difference between traditional textbooks and open textbooks is that the copyright permissions on open textbooks allow the public to use, adapt and distribute the materials for free. Open textbooks are released under an open license that grants usage rights to the public so long as the author is attributed.

3.3.3 Why use OER?

The first and most fundamental question anyone arguing for free and open sharing of educational resources has to answer is – Why should anyone give away anything for free? What are the possible gains in doing that? The **OECD**⁴ conducted case studies at institutions

⁴ OECD - The Organisation for Economic Co-operation and Development. URL: <https://www.oecd.org/>

with OER projects and a number of reasons for using and producing OER were presented. These are summarized as follows:

- *Quality of provided content can be improved and the development costs reduced by sharing, reusing and remixing.*
- *The altruistic argument that sharing knowledge is good thing to do, although this kind of sharing is in line with academic traditions.*
- *Personal non-monetary gain, such as publicity, reputation within the open community (egoboost).*
- *Free sharing can be good for economic or commercial reasons, as a way of getting publicity, reaching the market more quickly, gaining the first-mover advantage, etc.*
- *It is good for the university's public relations to have an OER project in as a portfolio for attracting new students. (13)*

Findings from the OECD research revealing motives for lecturers - they wanted to gain access to the best possible resources to have and create more flexible materials for their students.

At the same time, collaborating on OERs allows educators to work together when ensuring consistency among their materials. Public school teachers in the United States, for instance, may wish to share resources they've developed in order to adhere to government-mandated educational standards, like the Common Core State Standards.

Some educators suggest that OERs might help reduce costs associated with producing and distributing course materials in both primary and secondary educational institutions. Teachers can download these materials - often at low costs - for use in their classrooms, but they can also update these materials and share their contributions with others, keeping content timely, relevant, and accurate. In this way, they needn't wait for textbook companies to issue entirely new editions of their (traditionally copyrighted) learning materials.

There are three arguments for governments to support OER projects:

- They expand access to learning for everyone but most of all for non-traditional groups of students and thus widen participation in higher education.
- They can be an efficient way of promoting lifelong learning for both the individual and the government.
- They can bridge the gap between non-formal, informal and formal learning.

Students also benefit from open educational resources when they access these materials to supplement the education they might receive in a classroom. Some students do not have access to a high-quality education, but using OERs affords them opportunities to enhance their knowledge independently—in spite of the barriers preventing them from acquiring the knowledge and skills they seek.

Open educational resources are most useful when educators distribute them in open formats, so teachers and students can use those resources regardless of the particular technical platforms their schools have adopted. Projects like the OER Commons act as repositories for high-quality open educational resources.

3.3.4 OER recommendations, problems and challenges

These rapid developments in educational technologies mean that institutions, universities, faculties and instructors needs a reliable framework for assessing the value of different technologies, new or existing, and for decision making process - how or when these technologies make sense for teachers and their students to use. Online learning, social media and open educational recourses are all developments that are critically important for effective teaching in a digital age.

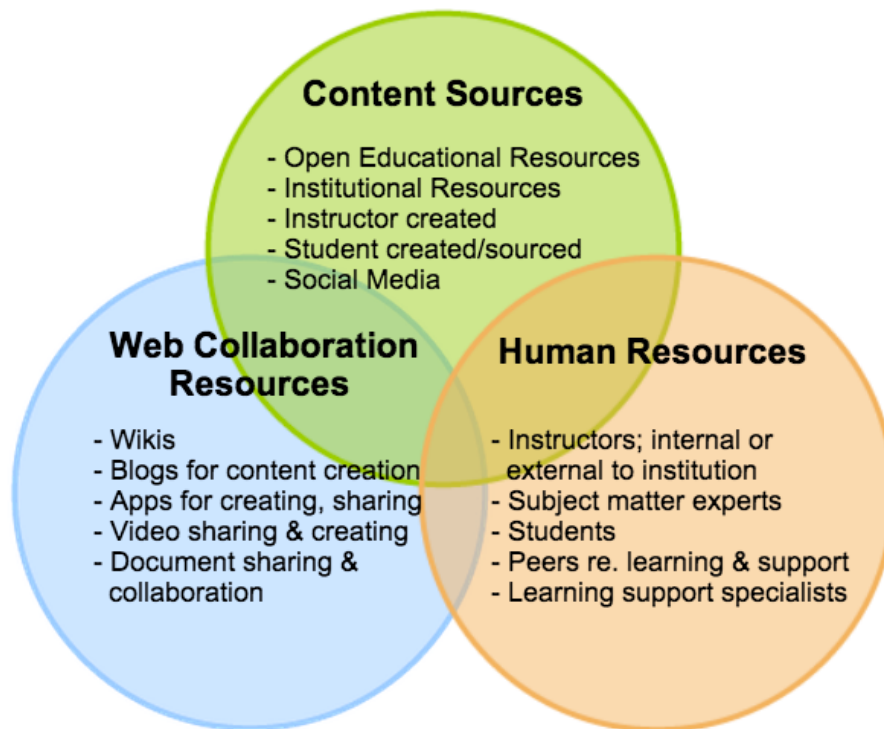


Figure 5. The Learning Design Framework for Educators, by Online Learning Insights
 Source: <https://onlinelearninginsights.wordpress.com/2014/01/28/how-to-create-optimal-learning-experiences-with-a-learning-design-framework/>

The Learning Design Framework is a starting point for educators. It's not intended to be a prescriptive formula, but a tool to guide learning design, and help frame discussions and ideas for creating effective learning experiences for students.

A recent study by *Pirkkalainen, Jokinen & Pawlowski* (14) lists the following barriers to OER adoption:

- *Lack of motivation to share resources or information around those resources*
- *Lack of time for production and localization of OER*
- *Need for Rewards and Acknowledgement*
- *Lack of contextual information for the resources – how can be used or modified*
- *Open content does not fit the scope of the course / curriculum*
- *Lack of trust towards unknown authors or systems where resources retrieved from*
- *“Not invented here” notion; hesitation to receiving knowledge someone else has created*
- *Hard to assess the quality and relevance*

3.4 MOOC (Massive Open Online Course)

MOOC is an abbreviation for Massive Open Online Courses. MOOCs are representing courses of the new digital teaching format, which developing the concepts/ philosophy of e-learning, Web 2.0 and open educational resources. Anybody can take MOOC before, during and after completion of some degree. MOOCs can also be integrated at study programme, course or module in academic teaching. In practice MOOC is a web based platform, available from any place with an internet access, that provides mostly free access to online courses for almost unlimited amount of people without any formal requirements.

Massive refers to the potential of extremely large enrollments; thousands of students from all over the world can register and be a part of MOOC.

Open can be defined from different points. Open enrollment gives anyone, who has Internet connection, possibility to learn. It can also mean that, at least initially, courses were free to anyone interested in enrollment. Although open should refer to the concept of open access, meaning that the content is not only free and available to all, but holds at most a

Creative Commons licensing status so, that the content can be downloaded, saved, used, and even reused for own purposes (with credit to the author/collective).

Online stands for the type of content delivery via Internet.

Course is based on some traditional convention of how a course operates, something like enrollment requirement, a start and end date, content developed and delivered by educator to the learner.

There are some differences between a MOOC and an online course:

MOOC	E-LEARNING COURSE
<ul style="list-style-type: none"> • A technological design that facilitates the dissemination of the activity of participants through one or more platforms. 	<ul style="list-style-type: none"> • Use an e-learning platform (LMS) with a set number of functions and structure designed for interaction with lecturers.
<ul style="list-style-type: none"> • Open environment 	<ul style="list-style-type: none"> • Closed environment
<ul style="list-style-type: none"> • Free access 	<ul style="list-style-type: none"> • Access on payment of registration fee
<ul style="list-style-type: none"> • Massive participation 	<ul style="list-style-type: none"> • Limited group
<ul style="list-style-type: none"> • Support of the community 	<ul style="list-style-type: none"> • Support of the teaching staff
<ul style="list-style-type: none"> • Range of communication tools, use of social networks 	<ul style="list-style-type: none"> • Communication through debate forums
<ul style="list-style-type: none"> • Emphasis on learning process rather than evaluation and accreditation 	<ul style="list-style-type: none"> • Evaluation and accreditation oriented

Table 1. Differences between a MOOC and an online course.

Source: <http://epbe.eu/wp-content/uploads/2016/11/Handbook-EPBE.pdf>

22 of the top 25 US universities in US News World Report rankings are now offering MOOCs.

3.4.1 What type of education do MOOCs offer?

MOOCs are available across different levels of education, including pre-university, undergraduate, masters, professional development, vocational and technical. As there is no filtered admissions process, learners enrolled in a course will have very varied levels of knowledge and understanding of the subject ranging from beginners to experienced professionals. Information regarding any necessary prerequisites can be found on the MOOC description page.

Learning sequences replace in-classroom lectures in online courses. A lecture is often an hour-long exposition and presentation of some concept. Online learning exercises create an interactive experience that allows the student/learner to get immediate feedback on their progress through the material.

MOOCs can offer solutions to different learning goals and motivations. For example, they are a good way for pre-university students to explore possible areas of future study, they allow learners to get a deeper understanding of a subject, or professionals to gain more competencies and skills in their field.

3.4.2 History and trends of MOOCs

The term MOOC was first used in 2008 by Dave Cormier and Bryan Alexander to refer to the first massively enrolled online course (CCK08 - Connectivism and Content Knowledge) offered by Stephen Downes and George Siemens through the University of Manitoba. This course was taken for credit by 25-tuition paying students and an additional 2,300 students who took it at no cost and without earning credit. Downes and Siemens experimented with connectivism in an online course by allowing participants to interact in the form and space of their choice and create a new way of using the Internet for education. Several free online courses followed in the next few years, but wider fascination began in 2011 with media attention over a course on artificial intelligence.

Year	Course Title
2008	<ul style="list-style-type: none"> • Connectivism (Fall 2008) - the first MOOC
2009	<ul style="list-style-type: none"> • Connectivism (Fall 2009) • Connect! Your PLN Lab (Fall 2009)
2010	<ul style="list-style-type: none"> • PLENK - Personal Learning Environments Networks and Knowledge (Fall 2010)
2011	<ul style="list-style-type: none"> • Change.MOOC - Change: Education, Learning, and Technology! (Fall 2011) • eduMOOC - Online Learning Today and Tomorrow (Summer 2011) • DS106 - Digital Storytelling (Summer 2011) • MobiMOOC - Mobile Learning (Spring 2011) • LAK11 - Learning and Knowledge Analytics (Spring 2011) • CCK11 - Connectivism and Connective Knowledge (Spring 2011)
2012	<ul style="list-style-type: none"> • Mobi-MOOC • Games Based Learning MOOC - designed for educators who want to learn more games, simulations and game-like environments for education. • MOOC MOOC: a mini-MOOC, a meta-MOOC, a MOOC about MOOCs. From August 12 - 19th, Hybrid Pedagogy will host a lively, playful scrutiny and consideration of the Massive Open Online Course. MOOC MOOC will explore the pedagogical approach, the sustainability of the form, and alternatives to MOOCs.

Table 2. Partial History of MOOCs.

Source: <http://www.mooc.ca/>

“A few years later MOOCs became much more famous worldwide due to Coursera, Udacity, edX popularization. Quality support from high rated universities and open access ensured success of new approach” (15).

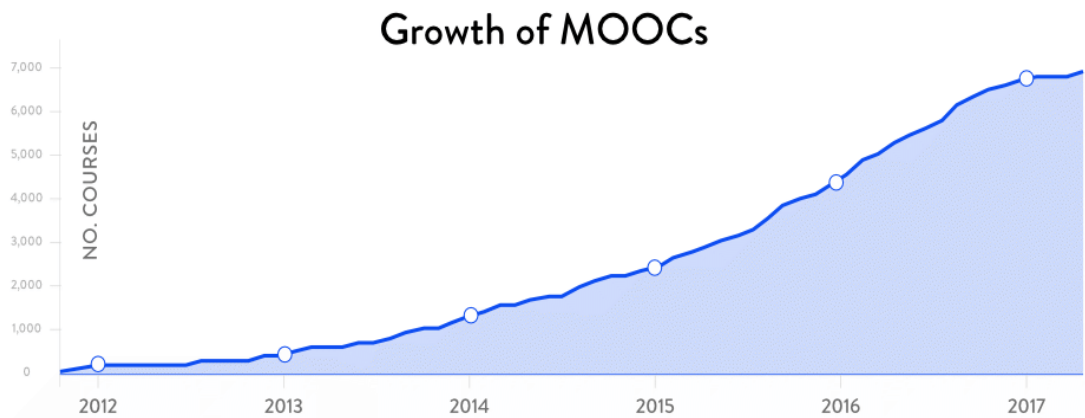


Figure 6. Growth of MOOCs.

Source: <https://www.class-central.com/report/moocs-stats-and-trends-2016/>

New York Times journal named year 2012 “*The year of MOOCs*” (16). As the result in the year 2013 idea and spirit of MOOCs became popular worldwide, especially in Europe and different platforms became available. It started from OpenupEd and developed to regional platforms like FutureLearn, Iversity, Miriada X etc. MOOCs mostly developing in Central and Western Europe.

According to the *European MOOCs Scoreboard* (17) the number of MOOCs on offer worldwide grew by nearly 500% (from 615 to 3,036) between June 2013 and August 2014.

Nowadays universities are supporting MOOCs and are willing to integrate them into traditional education, European universities are even more involved in MOOCs creation than universities in U.S. The modern massive open online course movement, which began in late 2011, is now half a decade old. In that time, MOOC providers have raised over \$400 million dollars and now employ more than a thousand staff.

According to Dhawal Shah in 2016 “...2,600 new courses were announced (up from 1,800 last year), taking the total number of MOOCs to 6,850 from over 700 universities. Even Oxford University, one of the oldest universities in the world, jumped on the MOOC train.” (18).

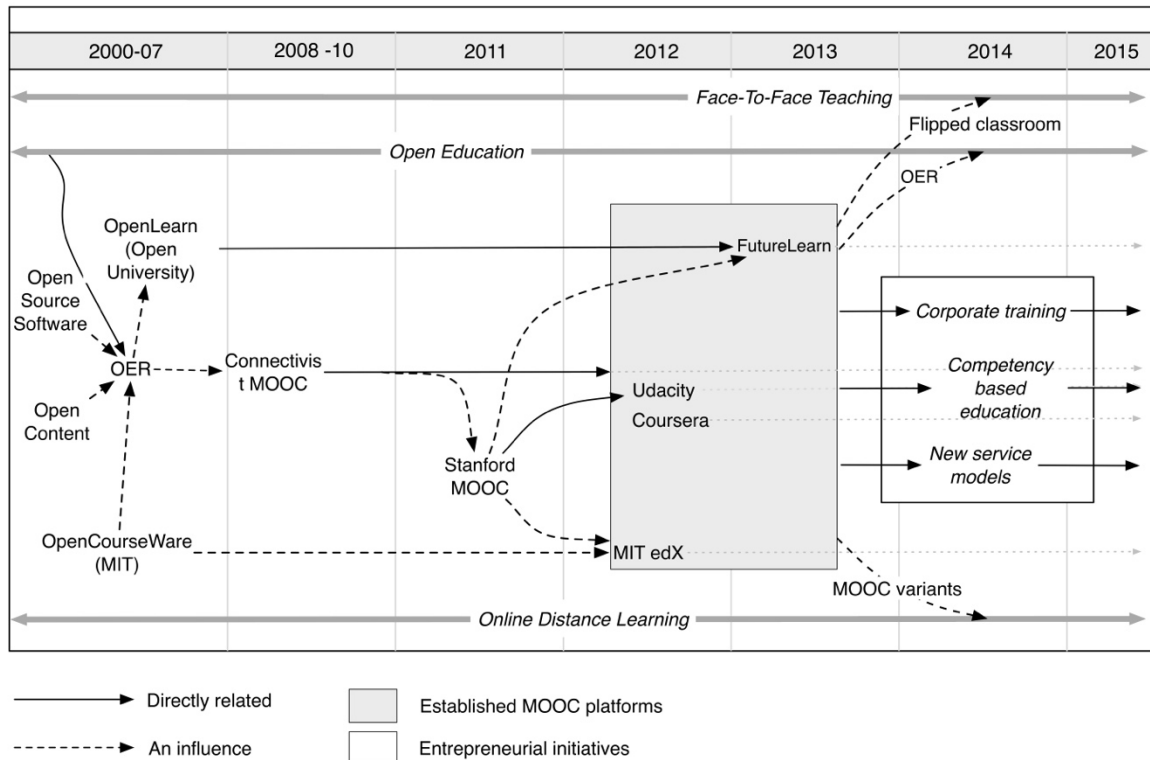


Figure 7. MOOC Timeline. Potential Impact and Trends of MOOC on Education
 Source: <https://thoughtsmostlyaboutlearning.files.wordpress.com/2015/06/mooc-evolution.jpg>

Stephen Powell identified key ideas and trends for **MOOCs**:

1. Most MOOC content is not openly licensed so it cannot be reused in different contexts. However, there is a trend for MOOC to be made available 'on demand' after the course has finished, where they in effect become another source of online content that is openly available for use to support blended learning courses or a flipped classroom approach in face-to-face teaching.
2. New pedagogical experiments in online distance learning can be identified although It is likely that they will evolve to more closely resemble regular online courses with flexible learning pathways. However, a range of paid-for services, including learning support on demand, qualitative feedback on assignments, and certification and credits will develop.
3. The disruptive effect of MOOCs will be felt most significantly in the development of new forms of provision that go beyond the traditional HE market such as professional and corporate training that appeals to employers. these will be backed by awards from recognised institutions.
4. The development of online courses is an evolving model with the market re-working itself to offer a broader range of solutions to deliver services at a range of price

levels to a range of student types. There is great potential for add-on content services and the creation of new revenue models through building partnerships with institutions and other educational service providers. As these trends continue to unfold, we can expect to see even more entrepreneurial innovation and change in the online learning landscape. (19)

3.4.3 MOOC Providers

By registered and enrolled students count, Coursera is still largest MOOC provider in the world with over 23 million learners. According to **MOOC Platform Comparison** (20) by [MooCLab](#), we can see the situation on the MOOC market and 10 most-popular platforms behind it:

Rank 2017	MOOC Platform	Users	N° Courses	Course Language
1	Coursera	23,000,000	1,800+	Multiple
1	EdX	10,000,000	950+	Mostly English
2	FutureLearn	5,300,000	450+	English
3	Udacity	4,000,000	160+	English
4	Saylor Academy	Unknown	100+	English
5	iversity	750,000	45+	English, German
6	Big Data University	400,000	50+	Multiple
7	Open2Study	500,000	70+	English
8	NovoEd	Unknown	35+	English
9	Janux	Unknown	20+	English
10	Canvas Network	Unknown	200+	English

Table 3. MOOC Platform Comparison Table – 2017.

Source: https://www.mooclab.club/pages/mooc_platform_comparison/

With 1800+ active courses, Coursera is still the largest MOOC provider even after *shutting down hundreds of courses because of migration to new platform version* (21). EdX is not far behind with their 950+ courses, followed by FutureLearn with 450+ courses. Detailed pie chart showing course distribution by providers is available in [Appendix](#).

According to *Class-Central MOOC report* (22), in 2015 The MOOC space essentially doubled this year and there was a distinct focus on monetization by MOOC providers. This focus has led to an increase in the percentage of courses focusing on the field of technology and business. The percentage of Computer Science and Programming courses grew more than 10%.

Courses in Business and Technology (Computer Science, Data Science, Programming) form a big chunk of the courses that have been announced so far. Together they make up almost 40 percent of all new courses added last year. This concentration should come as no surprise, given that the paid certificates offered by many MOOC providers focus on business and technology fields. List of most popular MOOCs from year 2016 can be found at [Appendix](#).

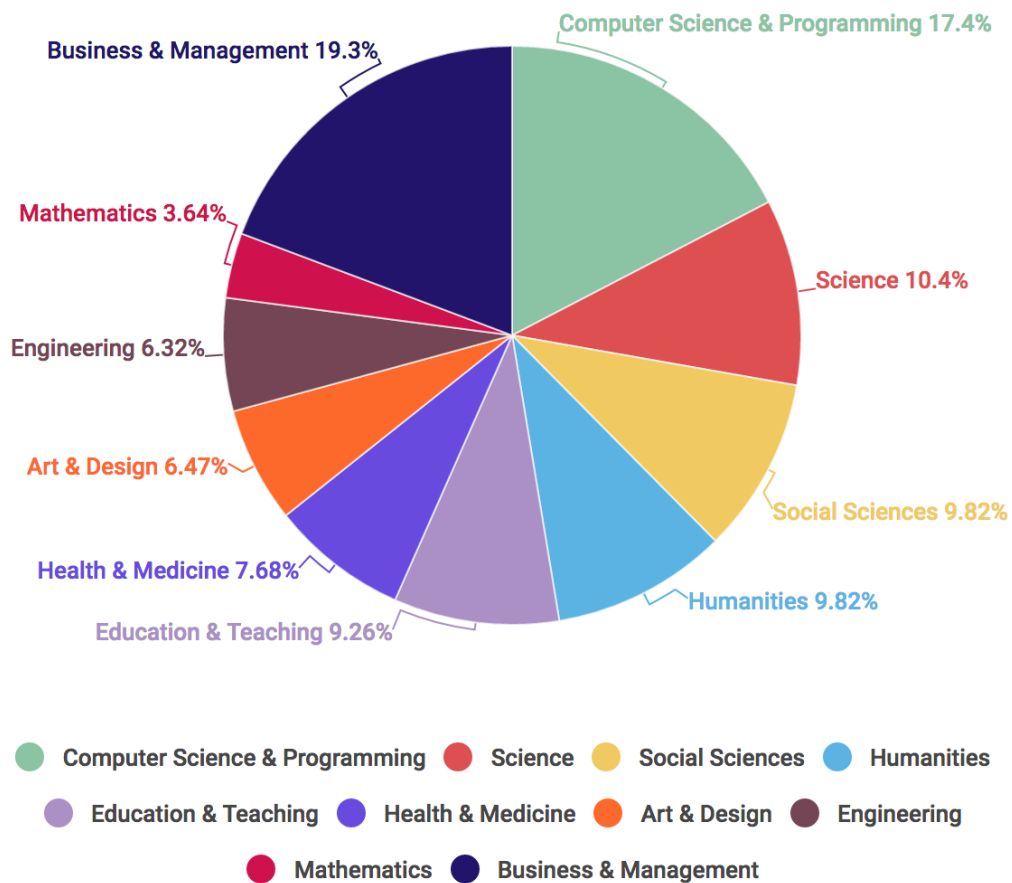


Figure 8. Courses distribution by subjects – 2016.
 Source: <https://www.edsurge.com/news/2016-12-29-monetization-over-massiveness-breaking-down-moocs-by-the-numbers-in-2016>

3.4.3.1 EU MOOC Providers

European Union supporting a 30-month pilot project called *EMMA*⁵ (*The European Multiple MOOC Aggregator*). It aims to showcase excellence in innovative teaching methodologies and learning approaches through the large-scale of MOOCs on different subjects. EMMA provides a system for the delivery of free, open, online courses in multiple languages from different European universities to help preserve Europe's rich cultural, educational and linguistic heritage and to promote real cross-cultural and multilingual learning.

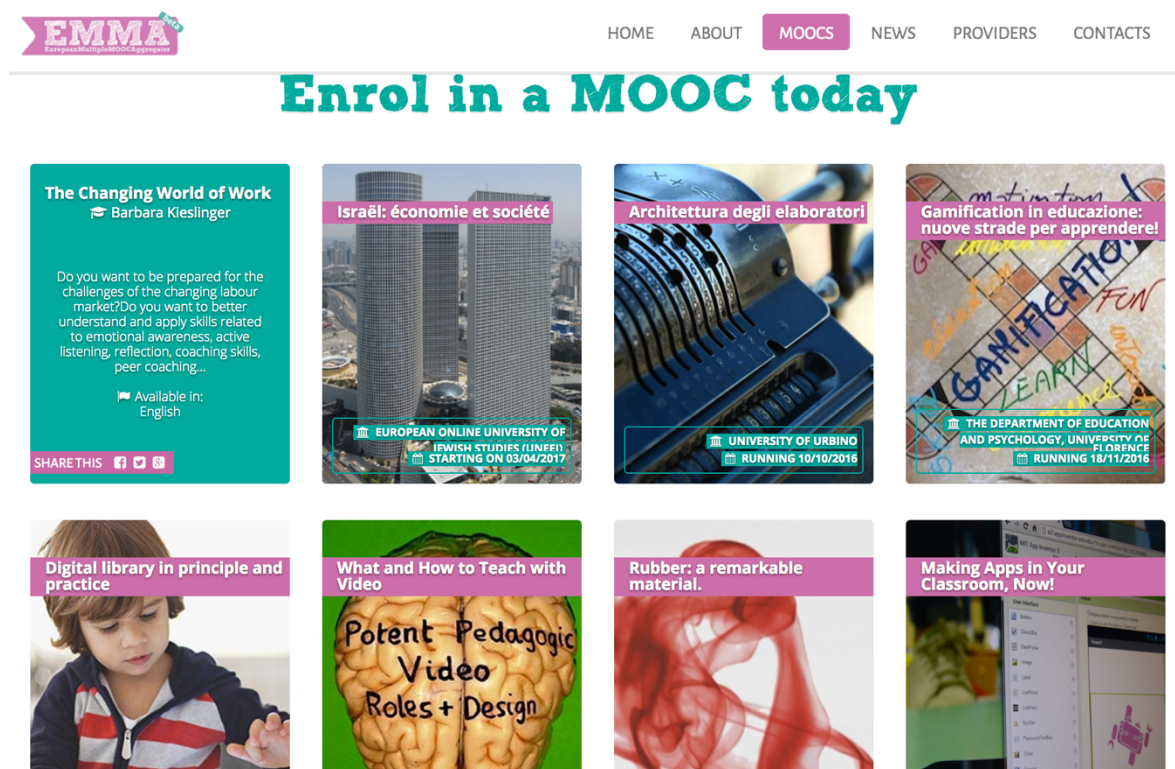


Figure 9. EMMA project Home page
Source: <http://project.europeanmoocs.eu/>

EMMA is funded in part under the *CIP* (*Competitiveness and Innovation Programme*) Framework Programme of the European Union with the rest of the necessary funding is coming from the partners.

According to *EMMA website* (23) there are 11 partners involved in this initiative at the start-up stage. With final release of the EMMA platform and grow of interest, EMMA project they is planning to establish new partners and involve other universities, helping

⁵ EMMA - The European Multiple MOOC Aggregator; URL: <https://platform.europeanmoocs.eu/>

them to make their MOOCs available through the EMMA platform. Pilots run in 7 countries with a total of 16 MOOCs and involve at least 60,000 users. Courses are offered in the language of each country, in English, and the pilot will trial an embryo form of multi-lingual translation by offering courses in Italian and Spanish as well. Advances in learning analytics feature in the analysis and evaluation work and a series of innovative approaches are trialed to make the piloted service sustainable in the medium to long term.

The project is led by the *Federica Web Learning team* at the *University of Naples Federico II in Italy* and involves:

- 3 traditional universities:
 - *Université de Bourgogne in France;*
 - *Tallinn University in Estonia;*
 - *Universitat Politècnica de València in Spain;*
- 3 Open Universities:
 - *Universitat Oberta De Catalunya in Spain;*
 - *Open Universiteit Nederland in Netherlands;*
 - *Universidade Aberta in Portugal;*

These institutions provide MOOCs as well as e-learning, learning analytics and innovative translation technology experience. *CSP – Innovazione Nelle ICT S.C.A R.L., Italy* is a partner and supports the implementation of the platform, while *ATOS* in Spain leads on the exploitation work. *IPSOS srl, Italy* takes care of market analysis on users and contributors, and *ATiT* in Belgium is responsible for dissemination.

EMMA operates in two main modes: as an MOOC aggregator and hosting system of courses produced by European universities. EMMA provides learners possibility to construct their own courses using “building blocks”. The EMMA provides multi-lingual, multi-cultural approach to learning by offering inbuilt translation and transcription services for courses hosted on the platform.

EMMA benefits:

- Easy access to MOOCs from different parts of Europe
- range of different subjects
- multilingual approach (transcriptions and translation of courseware in multiple languages).
- opportunity for students to create their own courses

There is another excellent service called *The European MOOC scoreboard* by *OpenEducationEuropa*⁶, it provides a database where information about MOOCs can be obtained throughout Europe.

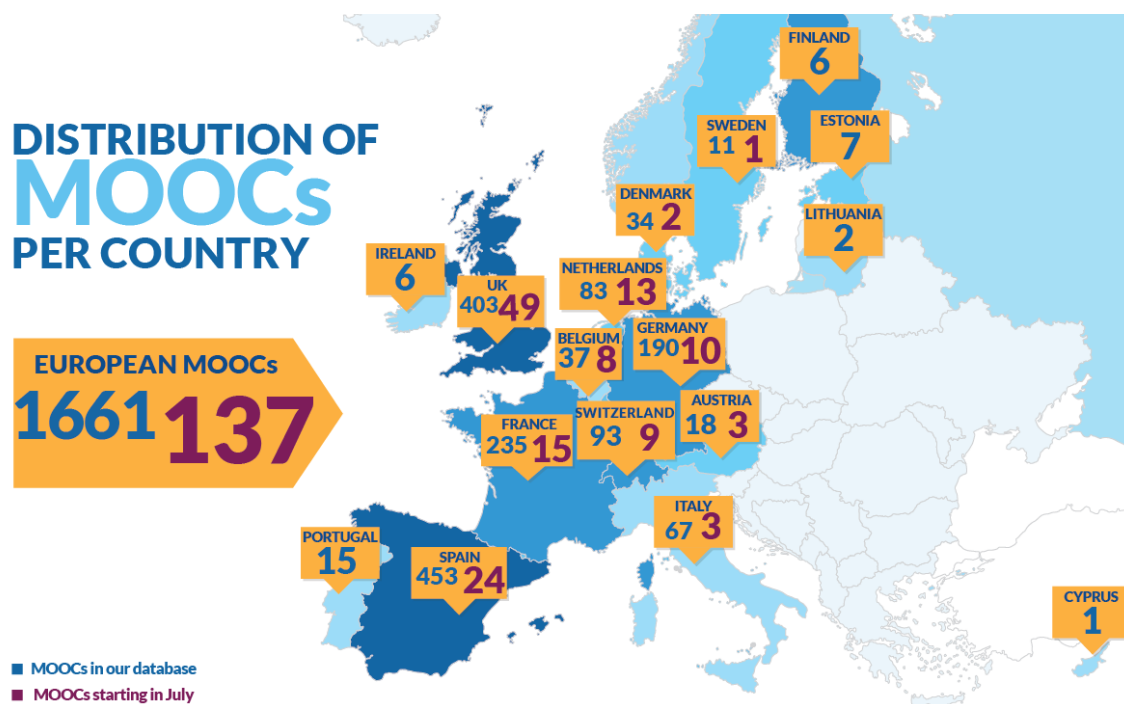


Figure 10. The European MOOCs Scoreboard - 2015.
Source: <https://www.openeducationeuropa.eu/en/news/almost-1700-courses-listed-new-european-moocs-scoreboard>

Actually, in year 2016 more than 1800 MOOCs are running across whole EU. This is not a comprehensive list of the MOOC providers, but only a mention to some of the most notorious ones. Around 25% of the new learners that were added to MOOCs in 2015 were attracted by regional MOOC providers, which are focused on certain geographical areas and are generally non-english speaking.

3.4.3.2 Czech MOOC Providers

Actually, there is only one for-profit MOOC provider in Czech Republic, this is Seduo.cz by *LMC company*⁷ and they are providing 97 courses in fields of Business, Design, Languages, Marketing, Office tools and software and Personal development. Seduo courses

⁶ Open Education Europa – Europe’s community for innovative education; An initiative of the European Commission

⁷ LMC family includes: Jobs.cz, Prace.cz, Práce za rohem, Seduo.cz, Teamio, Jobote, VysokéŠkoly.cz, Easytask.cz

are mostly paid, fees are in range 250-1800 Kč. Important to notice that Sedou do not provide courses from any of Czech Republic universities.

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Jiří Krátký
Projektový manažer, trenér a poradce

490 Kč

Figure 11. Seduo Home page.
 Source: <https://www.seduo.cz/>

3.4.4 MOOCs types

MOOCs of all types are considered to provide new models for learning at a time when traditional school learning is widening the rift between learners' experiences in and of the world and their experiences in formal school settings.

There are MOOCs of different types: cMOOC is based on distributed learning and connectivism, a theory of learning, whereas more popular xMOOCs lean towards

Behaviorism and use more conventional teacher/instructor-centered delivery methods with objective assessment and automated grading.

3.4.4.1 cMOOCs and Their Theoretical Basis

Connectivist MOOCs (cMOOCs) are distributed in the sense that they do not run on a single website or with a centralized core of content; the content in cMOOCs is networked. Participants are encouraged to meet in locations of their choosing and organise themselves. xMOOCs are convened on a designated platform; they may offer alternative sites such as Facebook or Twitter, but the course runs principally on the main platform, where interaction takes place in discussion forums. Blogs, for example, are not a big feature of xMOOCs.

According to George Siemens, co-creator of first MOOC, cMOOCs are *“based on the idea that learning happens within a network, where learners use digital platforms such as blogs, wikis, social media platforms to make connections with content, learning communities and other learners to create and construct knowledge.”* (24)

cMOOCs are designed as massive networks. The idea is that these networks are neither centralized, nor decentralized, but distributed so that the collapse of a given node or set of nodes does not cause the collapse of the entire network. cMOOCs are based on networked cooperation rather than group collaboration.

Key activities in cMOOCs are **remixing and repurposing**, i.e. that content will be created, ideally **co-created**, through interaction with freely available open resources.

The challenge is for each learner to construct a personal learning network (PLN), by eliciting what is personally meaningful from the network of information and interactions. Such learning is *“...highly social. The learning comes from content presented by a lecturer, and then dialog via social media, where the contributions of the participants are shared”*. (25)

3.4.4.2 xMOOCs and Their Theoretical Basis

xMOOC is a concept that has recently greatly influenced the realm of distance education, and is constantly the subject of educational news and publications. It truly has the potential to revolutionize higher education in the future. xMOOCs are most common MOOC type and basically, they are educational platforms in which the course instructor provides his

material in a form of video presentations, while each student follows their coursework at their own learning speed. These courses are from a variety of fields from Social Sciences to Computer Sciences, Medical Training to Educational Sciences are offered on these sites.

The most well-known xMOOCs are sites such as Coursera, edX, Udacity, Udemy, Khan Academy, and Venture Lab. The courses sections of these sites allow participants to take any course they wish, conduct their assignments and quizzes, and complete the course program in a given number of weeks merely by signing up as a member.

xMOOCs designed in accordance with the old-fashioned traditional behaviorist model. The behaviorist model is primarily based on the transfer of information from the teacher to the student. This situation reduces the students to a position in which they merely receive information, preventing their creativity and cognitive development.

According to *MOOC types comparison by Tony Bates* (26), xMOOCs have the following common design features:

- **Specialized MOOC platform for Educators:** xMOOCs use specially designed software platform for MOOC administration, that allows course enrolment/registration of huge number of students, provides possibilities and capacities for the storing of digital materials and streaming on demand, automates assessment and evaluation procedures, provides student performance tracking.
- **Video lectures:** xMOOCs use the standard lecture format, but this type of lectures is delivered online to participants in a form of recorded short video lectures, they are normally available on a weekly basis over a period of 10-13 weeks (like normal academic semester), with possibility to download them on demand. These lectures can be 15-50 minutes long. These days, xMOOC courses, as well as the videos, have a shorter format, some of them lasting only five weeks. Various video production methods have been used, including full studio production, face-to-face recording, computer desktop capture, on-campus lectures recording, storing and streaming them on demand.
- **Computer-marked assignments:** students complete an online quiz/test and immediately their results will be evaluated by the MOOC platform. These tests are usually offered throughout the course for evaluation of gained knowledge or just for participant feedback. Another option is an end of course final test or certificate based exam. Most xMOOC assignments are based on multiple-choice

test questions. Some MOOCs, such as coding in a computer science courses or math, using text, code or formula boxes for participants to enter their answers, but almost in all cases the test results are computer-evaluated.

- **Supporting materials:** presentations, e-books, supplementary audio files, subtitles, links to other resources and some online articles can be included into course and available for downloading by participants.
- **Peer assessment:** some xMOOCs providers have experimented with peer assessment, they randomly assigned students to small groups, especially for more open-ended or more evaluative assignment questions.
- **Comment/discussion social space** where participants can post discussions, questions, comments on the content of the course and ask for any help from community.
- **No heavy-handed moderation on these social spaces:** mostly moderation is directed at all participants rather than to individuals. Moderation of individual comments by the instructor offering the MOOC is almost impossible, because of the very large number of enrolled to the course students, who also participating in discussions and posting some comments. Some instructors offer no moderation at all, so participants can rely only on other participants to get answers to their questions or comments. Some instructors use teaching assistants to analyse discussions and to get feedback from participants, then the instructor or teaching assistants will respond. However, in most cases, participants moderate each other's comments or questions.
- **Credits, badges or certificates:** most xMOOCs providing some award, kind of recognition for successful completion of a course, based on a final computer-marked test, assessment or exam. However, MOOC badges or certificates still have not been recognised for credit or admission purposes even by the institutions offering their own MOOCs, or even when the syllabi and lectures are the same as for normal on-campus students.
- **Learning analytics:** xMOOCs providing great possibilities to gather and analyse learning analytics data. This data may be used to better understand the teaching process and how cognitive development takes place. The xMOOC platforms have the capacity to collect and analyse 'big data' about participants and their

performance, enabling, at least in theory, for immediate feedback to instructors about areas where the content or design needs improving.

So, xMOOCs primarily use a teaching model focused on the transmission of knowledge and information. Learning platform provides high quality content delivery, computer-marked assessment and automation of all key transactions between participants and the instructor. There is almost no direct contact/interaction between an individual course participant and the instructor, who is responsible for the course.

xMOOCs are criticized regarding their dated theoretical basis. **George Siemens** states that *“our MOOC model emphasizes creation, creativity, autonomy, and social networked learning. The Coursera model emphasizes a more traditional learning approach through video presentations and short quizzes and testing. Put another way, cMOOCs focus on knowledge creation and generation whereas xMOOCs focus on knowledge duplication. I’ve spoken with learners from different parts of the world who find xMOOCs extremely beneficial as they don’t have access to learning materials of that quality at their institutions. xMOOCs scale, they have prestigious universities supporting them, and they are well-funded.”* (24)

MOOCs do have many aspects that need development and correction. MOOCs are still vague regarding the execution of any meaningful evaluation. In this regard, advanced learning analytics and peer review approaches have been considered but have yet to achieve any broad application. (27)

3.4.4.3 Clark Taxonomy

Donald Clark proposes (28) eight non-mutually exclusive categories for MOOCs:

- **Transfer MOOCs** - literally when existing normal academic courses are transferred to a MOOC style. **Coursera** courses are great representation of this category.
- **Made MOOCs** - more innovative courses, with more effective and creative approach to video and interactive materials, this kind of MOOCs is more quality driven. **Udacity** take this approach.
- **Synch MOOCs** – courses with fixed start/end date and with fixed deadlines for assignments and assessments. They often around the agricultural, academic calendar. For example, **Coursera** and **Udacity** offer courses on strict start and end dates with

clear deadlines for assignment. People arguing that this helps to motivate yourself and aligns teacher availability.

- **Asynch MOOCs**, without a fixed start and end dates and have more flexible assignment deadlines. Biggest advantage of asynchronous MOOCs is that they can literally be taken anytime, anywhere and without different time zones limits/restrictions. For example, **Coursera** offers a completely open self-study, but without a warranty of getting a certificate of completion. and **Udacity** have relaxed their courses enrol conditions. Some sceptics point towards this as being a tactic to reduce drop-out rates due to missed assignment deadlines.
- **Adaptive MOOCs**, which provide personalised learning experiences, based on dynamic assessment and data gathering on the course. Analytics are also used to change and improve the course in the future. **Cogbooks** is a leading example of this type of MOOC.
- **Group MOOCs**, where the focus is on collaboration in small groups. The aim is to increase student retention. Experts argue that some subjects and courses, such as entrepreneurship and business courses need a more focussed/close approach to groupwork. The participants for groups are selected by software, according to their geography, abilities and type. Groups have own mentors, participants rate progress of each other, also, during the course, groups are dissolved and reformed. Stanford has rolled out **NovoEd** (formerly Venture Lab) which offers different types of MOOCs - closed, limited number, internal courses.
- **Mini MOOCs**, which are much smaller than the traditional massive MOOCs. This type of MOOCs is more typical for commercial e-learning courses, which tend to be more intense experiences that last for hours and days, not weeks. They are more suitable for precise domains and tasks with clear learning objectives.

Being non-mutually exclusive, the same course might belong to one or many of these categories.

3.4.5 MOOC Platforms for Educators

If you are planning to make a MOOC for your organization, you'll first need to determine which tool you will use to build the course. The term "educational platform" is typical for learning services in the digital environment. In most cases, it is a software or

online application that provides tools to support the educational process. Some examples are:

- *Learning management system (LMS)*, that allows to:
 - create and manage online courses;
 - register new users
 - plan the flow of the courses
 - upload learning materials
 - edit and moderate discussion forums and blogs
 - evaluate students' performance.

For example, most popular LMS's - Moodle, Sakai, Docebo and Blackboard CourseSites have been adapted and used for developing and distributing MOOC courses.

- *Virtual learning environment (VLE)* is a tool that supports a student's learning process using Internet and the digital media. Examples are Blackboard, Lotus Learning Space;
- *Personal learning environment (PLE)* is a system that helps learners to manage their learning process, to set the learning goals, to manage their content and communicate with others students.

Further MOOC development depends on the development of educational platforms. At the moment, the variety of the platforms which provide and organize MOOC is quite wide. MOOC providers' market share by a number of offered courses is shown in picture

First MOOCs did not use any specific platform. For example, the MOOC "Connectivism and Connective Knowledge" was based on various blog aggregators. However, these days all MOOC providers use a specific software platform. Actually, any educational institution/university can become a MOOC provider if they will develop their own platform or use some existing open platform. A lot of MOOC platforms have been developed and more are being developed, their goal is to reach a much larger audience than traditional courses can accommodate. Often, MOOCs offer Certificates for a fee which are awarded on successful completion of a course, and in some cases transferable college credit can be provided. Some MOOC platforms also offer skill-based courses, some of which are paid.

The most famous international MOOCs providers with their own platforms are Coursera, Udacity and edX, they were found in 2012. Coursera was founded by Stanford professors Daphne Koller and Andrew Ng. Edx platform was founded in cooperation of MIT and Harvard. Udacity was founded by Sebastian Thrun, David Stavens, and Mike Sokolsky. By cooperation with best universities and successful companies around the World, MOOCs are providing free non-stop access to knowledge, some courses are paid, but basic courses are free. Among those three Coursera might be more popular because there are lot of courses available in different languages, while Udacity and edX has just a few.

Coursera, Udacity and edX have several competitive advantages that make them unique. First of all, long history and popularity around the world supports and increasing their reputation. Secondly, they provide variety of courses from top-universities around the world. Moreover, they developed own strategy of teaching based on learning theoretical materials, practice and social collaboration with groupmates, and testing of gained knowledges at the end of course. And finally, certificates of Coursera, Udacity and edX are becoming recognizable for employers that give them additional benefits. Beyond this, users may receive certificates from courses they have completed through kind of donations or by paying certain fees.

All MOOC providers have some differences in the method of operation. For example, to take a course through Coursera, student must follow according to the pre-determined schedule, while Udemy has no such limitation. In addition, there are for-profit and non-profit MOOCs. edX is non-profit while Coursera is a for-profit organization. Despite being a paid service, Coursera does not charge any fees throughout the trial period and for course access and operates on a venture capital model.

The next biggest competitors are focused in programming. For example, FreeCodeCamp, Codecademy, Treehouse, Code School, Bento provides wide range of courses from field of programming. There are also educational platforms focused on more limited area of coding and web-design that includes HTML, CSS, Javascript and provides an opportunity to practice in browser.

A lot of new platforms that appeared recently and differentiate themselves using different methods. Majority of such platforms aim to teach in an easy way. Distinctive advantage is high quality of learning materials, e.g. video, media quality.

3.4.6 College Credit, Credentials, and Degrees

As new models for access, learning, and certification become more common, institutions and MOOC providers are facing decisions about course credits and degrees. Students already have access to courses from many providers, but just a little part of them are providing possibility to get the credit or count towards a degree. MOOCs are catalyzing exploration of alternative credentialing systems, including certifying prior knowledge. How MOOCs fit in an institution’s degree program is still being subject of discussions.

Most MOOCs are offered as noncredit courses. While some American universities award “badges” or certificates of completion.

Since September 2013, edX launched their XSeries credential program to go beyond single course certificates. The certificate is gained by completing a sequence of courses. Coursera and Udacity launched similar programs in 2014, which are called Specializations and Nanodegrees respectively. The aim of these new type of credentials is to indicate some level of competence for high-demand skills. Of course, these programs are much more expensive than other MOOCs, but price is still being established due to interest. Because of this success, both Udacity and Coursera raised significant new funding in 2015, with the primary aim of creating more of these credentials.

MOOC provider	Credentials	College Credit	Degrees
Coursera	√	√	√
EdX	√	√	x
FutureLearn	√	√	√
Udacity	√	x	√
Kadenze	√	√	x

Table 4. MOOCs College Credit, Credentials, and Degrees trends – 2016.
Source: <https://www.class-central.com/report/biggest-mooc-trends-2016/>

If credit is to be offered for a course, the identity of the student becomes important. While enrolment will be open, the student cannot be anonymous. The use of testing centre’s or other proctoring arrangements is one answer. Technology solutions that model the “fingerprint” of an individual’s online behaviour or monitor the student and surrounding environment are another.

According to *Class-Central service called Credentialing the Credentials* (29), currently there are 128 specializations with credentials available:

- Computer Science (38)
- Business (36)
- Science and Engineering (15)
- Data Science (14)
- Professional Development (13)
- Design and Creativity (12)

These credentials called Nanodegrees, XSeries credentials, FutureLearn Programs, HBX CORE, most of which were created in 2015, and it can be expected that number of credential programs/courses will more than double in few years.

3.4.7 Benefits and challenges of a MOOCs

The one of MOOC pioneers, Sebastian Thrun says: *"The belief that education can be replaced by a computer program is a myth. Human contact and mentoring make a substantial difference in learning outcomes."* (30)

MOOC design and development requires careful planning and a lot more efforts than teaching a traditional course. MOOCs must be developed in a way that integrates technology and sound pedagogy. Mere use of technology does not engage students, and most MOOCs are just as boring for this reason.

The biggest challenge for MOOCs is the credits and degree recognition by universities. But during last few years MOOC providers are making big steps to change this situation, so, in a partnership with universities they are creating some alternatives or possibilities for their students/participants. Open educational resources, MOOC platforms, video streaming, social networks, communities and other technologies including biometric identification are becoming more and more popular these days, it is only a question of time when students will be able complete all exams leading to certifications online.

Another challenge is implementation of courses from fields engineering and science, some of them require experiments and hands-on projects. Live experiments are a real possibility but there is no conclusive data if that can replace actual physical experiment.

It appears that the dropout rate for courses is also quite high. Certain arrangements must be made to ensure that users remain committed to their courses.

Finally, participants that taking MOOCs must have a basic level of digital literacy and they must be able to take responsibility for their own learning.

3.4.8 What to consider before rolling out a MOOCs

Despite the benefits, before deciding to launch first MOOC course, also need to have in mind that MOOCs have received extensive critique. Some believe that they have weak points that cannot be easily surpassed. Let's examine the basic arguments against MOOCs:

- **Incredibly low completion rates.**

This is the strongest argument against MOOCs. Research has shown that *MOOCs completion rates can be as low as 7%* (31), as learners' participation seems to start dropping even from the beginning of the course. Many researchers attribute these low completion rates to lack of special Instructional Design and interaction or to the fact that participants has a low motivation to complete the course. *Mostly completion is not important, because learners usually enter to look for a specific piece of information they need* (32); But the fact is, that there are other studies mentioning that participants who were asked to pay a *small fee had shown higher completion rates.* (33)

- **Lack of motivation.**

It's not a secret that self-study requires commitment and good self-discipline. In most cases, learners may not be motivated enough to keep up with course and content, especially for asynchronous courses. In synchronous eLearning, however, this is part of the MOOC instructor duties.

- **Low perceived value compared to University Degrees.**

Another major reason why MOOCs are not so widely spread yet is because they are considered to be "competitive" to university attendance. MOOCs give everyone the opportunity to access academic materials and even acquire kind of online degree, which raises a series of questions about the real value of university degrees earned online compared

those earned at a college or university campus. Seeing MOOCs under the concept of lifelong learning and advertising them as such, may be the answer to this issue.

- **Competition among MOOC providers and academic institutions.**

The decision to offer MOOCs or not affects the actual way that universities and colleges operate. From an institution's and instructor's point of view, MOOC implementation requires a lot of time and money.

- **Education perceived as a product.**

Mostly, MOOC providers "converts" education into a product, this strategy is used as innovative way to increase their revenue, which is generated by selling the MOOC content they are developing to those who cannot afford classic academic education or just want to improve their knowledge. By no means, it's an innovative new business opportunity, but in the case of knowledge this is little bit unethical; However, people who is willing to pay for MOOCs would expect a "product" of good quality.

- **Multilanguage MOOCs, localization issues.**

Without doubt, MOOCs have a great potential. The biggest challenge, however, to spread this phenomenon globally. The only way to do this is translating of the original MOOC courseware, in order to be offered also in languages different from English. The trend also involves the gradual appearance of non-US MOOC providers from EU and other regional MOOC providers, such as the *Spanish-speaking MOOC platform MirandaX, with over 1 million registered users.* (34)

3.5 Open licences and copyright

When an author creates a licensed work, the law automatically grants them full "copyright" over their work. This means that nobody may copy their work or make changes to it, except with the author's express permission, or in accordance with the user rights granted by the Copyright Act.

In the copyright context, a license is another term for an agreement whereby the copyright owner grants someone else permission to use their work. A license needn't be a

kind of formal looking document prepared by a lawyer and signed by the parties - a license can be contained in an email, or it can be permission given orally.

3.5.1 Intellectual property, rights & licensing

The Internet and associated digital technologies provide an enormous potential for accessing and building information and knowledge networks. Information and knowledge can be communicated in an instant across the globe, cheaply and with good quality, by even the most basic Internet user. In short, recent developments in digital technology have opened up a vast new landscape for knowledge management.

Copyright is a part of what is generally referred to as intellectual property rights. The holder of this legal entitlement is generally entitled to exercise various exclusive rights in relation to the subject matter of the intellectual property. The term intellectual property reflects the idea that this subject matter is the product of the mind or the intellect, and that intellectual property rights may be protected by law in the same way as any other form of property. Intellectual property laws are designed to protect different forms of subject matter, although in some cases there is a degree of overlap.

The five main categories of intellectual property are:

- *Copyright* covers creative and artistic works (*e.g.* books, movies, music, paintings, photographs, software) and gives the copyright holder the exclusive right to control reproduction or adaptation of such works for a certain period of time.
- *Patents* may be granted for a new, useful and non-obvious invention, and give the patent holder an exclusive right to exploit the invention commercially for a certain period of time (typically 20 years from the filing date of a patent application).
- *Trademarks* protect distinctive signs which are used to distinguish the products or services of different businesses.
- *Industrial design* protects the form of appearance, style or design of an industrial object (*e.g.* spare parts, furniture, textiles).
- *Trade secrets* are secret, non-public information concerning the commercial practices or proprietary knowledge of a business, public disclosure of which may sometimes be illegal. They are sometimes either equated with, or a subset of, “confidential information”.

3.5.2 Open licenses

All creative works should be copyrighted to the fullest extent of the law the instant they are created. So, in case if you want to share your lecture notes, videos, textbooks, and other educational materials in the way that allows others to reuse, revise, remix, and redistribute them, you have to apply an open license to your work. The granting of permission is referred to as "licensing." Some copyright holders restrict all rights to their work, and so you have to ask their permission to use their work.

Some licenses are given on a 'unilateral' basis, which means that the copyright owner grants everyone permission to use their work, so long as they agree to certain restrictions. This is what a copyright owner is doing when applying a Creative Commons (CC) license to their work. Open licenses are currently applied to more than 500 million online resources.

If you want to use a work in way that doesn't qualify as a user right, you can only use the work as permitted by the copyright owner. Creative Commons licenses are a prominent example of proactive licensing.

3.5.3 Creative Commons

Creative Commons is a non-profit organization with mandate to make it easier for creators to share their work and/or build upon the works of others consistent with the rules of copyright. They have created worldwide standard with copyright licenses, that easy to use and understand, so basically anybody can apply some of that licenses to their work to allow others to share, remix, or reuse and use the work without having to contact the copyright owner to ask for this permission. There are several different Creative Commons licenses, each with a different level of use restrictions.

Creative Commons licenses are not an alternative or exception to copyright, they are one way for copyright owners to distribute their work within the copyright framework.

Applying open licenses to educational materials allows educators to collaborate when creating materials specifically differentiated for their students. For example, a statistics professor might acquire openly-licensed data or tasks for his students, but he needs to adopt/re-write the exercises to include language that is more geographically specific or demographically relevant. In final, he can share his modified materials with others who may wish to use them.

3.5.3.1 License Terms

Creators or copyright holders who wish to apply a Creative Commons license to their work can choose to allow their work to be copied and reused with any one or more restrictions, or certain combinations of restrictions. The four restrictions are:





Condition	Image	Description
Attribution		You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
Non Commercial		You may not use the material for commercial purposes.
Share Alike		If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.
No Derivatives		If you remix, transform, or build upon the material, you may not distribute the modified material.

Table 5. Creative Commons License Terms.

Source: <http://copyright.ubc.ca/guidelines-and-resources/support-guides/creative-commons/>

3.5.3.2 Different Creative Commons Licenses

Creative Commons offers six different licenses that allow copyright holders to apply different restrictions to how their work may be reused. When using a specific CC-licensed work, it is important to pay attention to the CC license and its restrictions. All Creative Commons licenses require attribution. The specific types of Creative Commons licenses are shown in [Table 6](#).

4 Practical Part

The practical part of this Diploma Thesis includes the methodological, didactical and pedagogical options that can be used in creating MOOCs and dealing with MOOC platforms evaluation and result-based proposal for implementation in CULS.

4.1 Choosing platform for the Case study

4.1.1 MOOC production phases

Whole MOOC production can be divided into five phases, typical to most projects in field of IT is the **ADDIE-model**. This model for e-learning is often used as a waterfall model:

Phase/Duration	Description
<p>Stage 1: Analyse/ 1-2 months</p>	<ul style="list-style-type: none"> • Feasibility study • Target group definition • Learning goals definition • Is there need in blended type of learning (physical attendance)?
<p>Stage 2: Design/ 1-2 months</p>	<p>Didactical concept:</p> <ul style="list-style-type: none"> • Learning objectives • Competency or performance capability for learner. • expectations about the outcome from learners. • Combine the level of performance (Bloom’s taxonomy) with the type of knowledge and skills that must be learned. <p>Didactical model:</p> <p>What is the sequencing method?</p> <p>Does the curriculum start with concrete or simple information and then proceed to abstract or complex concepts?</p> <p>Instructional strategy: <i>G. Reinman-Rothmeier</i> model of three sorts of instructional strategies for e-learning, making distinction between instruction and construction:</p>

	<p>a) E-learning by distributing</p> <p>b) E-learning by interacting</p> <p>c) E-learning by collaborating</p> <p>Delivery strategy</p> <p>Evaluation strategy</p>
<p>Stage 3:</p> <p>Development/</p> <p>2-6 months</p>	<ul style="list-style-type: none"> • Develop content, writing and collecting the required knowledge and information. • Scripting, recording and post-processing of the videos with suitable technology, ideally in a studio environment and by qualified staff. • Other materials (reading, exercise sheets, handouts and so on) must be digitalised and prepared. • The completed teaching materials are uploaded in to the MOOC/LMS and then tested. • Marketing activities, particularly via social media • Capacity and milestones depending on the number of participants planned for the course.
<p>Stage 4:</p> <p>Implementation/</p> <p>1-5 months</p>	<ul style="list-style-type: none"> • MOOCs are typically not as long as a semester; in exceptional cases, they might take three months. • a kick-off event where course goals and the agenda will be introduced • preparing activity • a cycle of learning events (including progress reports - monitoring) • a final assessment • feedback from learners and conclusion • MOOCs are usually broken down into sequential tasks or examination cycles so that the participants must produce proof of their knowledge or achievement at certain points in time, either alone or in a working group.

<p>Stage 5: Evaluation/ 1-3 months</p>	<ul style="list-style-type: none"> • Formative evaluation: courses and products have been evaluated by testing and refining. • Summative evaluation: measuring the effectiveness of education, training and learning during the implementation. • Confirmative evaluation: a certain period after the course has been implemented, an evaluation may be necessary to see if the course is still valid or needs to be updated or modified.
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Table 6. MOOC production phases.

Source: <http://epbe.eu/wp-content/uploads/2016/11/Handbook-EPBE.pdf>

4.1.2 Resources and Cost Structure

The major cost drivers in MOOC production and delivery are: the number of faculty members, administrators, and instructional support personnel participating in the process; the quality of videography; the nature of the delivery platform; technical support for participants; programming for special features such as computer code auto-graders, virtual labs, simulations, or gamification; and analysis of platform data.

MOOCs require investment. Whether the MOOC is self-hosted or offered through a commercial platform, integrated course support is required. Resources requirements include:

- Technical (e.g., videography, editing, graphic design)
- Instructional (e.g., instructional design, teaching assistant support)
- Library (e.g., resource searching, copyrighting)

Institutions intending to self-host MOOCs will need a sophisticated, highly scalable and reliable LMS-like platform, the ability to effectively advertise the courses and the remote technical support.

Phase	Low to Medium Costs	High Costs
<p>Stage 1: Analyse</p>	<ul style="list-style-type: none"> • Institutional interest and rationality of MOOC creation • Budget drafting 	<ul style="list-style-type: none"> • Determining blue-print of course (i.e., content, content)

	<ul style="list-style-type: none"> • Staff recruitment (instructors, editors, programmers, web designer, support staff) • hosting for MOOC/LMS • Accreditation acquiring 	<ul style="list-style-type: none"> • delivery, assessment, course duration) • Lectures drafting and preparation • MOOC SaaS Hosting, partnership fee payment
Stage 2: Design	<ul style="list-style-type: none"> • Content and course structure preparation (for example, using OER) • To rule by methodology 	<ul style="list-style-type: none"> • Instructional design • Content designing from scratch
Stage 3: Development	<ul style="list-style-type: none"> • Revise elements in Design Stage • Revise budget • Registration requirements • Quality Assurance mechanisms 	<ul style="list-style-type: none"> • Revise elements in Design Stage (include video production, editing) • Testing and refinement of LMS • Marketing
Stage 4: Implementation	<ul style="list-style-type: none"> • the number of faculty members, administrators, and instructional support personnel 	<ul style="list-style-type: none"> • Instructor time for teaching, facilitating, marking, administration
Stage 5: Evaluation	<ul style="list-style-type: none"> • Ongoing MOOC hosting costs (may change depending on number of enrolled students) 	<ul style="list-style-type: none"> • Maintenance

Table 7. MOOC cost structure.

Source: <http://epbe.eu/wp-content/uploads/2016/11/Handbook-EPBE.pdf>

According to information from e-learning expert from CULS who is in *ELLS*⁸ E-Learning Support Team, the answer to the question of the monetary cost of producing the MOOC for CULS, is around **€50,000**. This disparity is partly explained by the different

⁸ *ELLS* - Euroleague for Life Sciences

demands that providers make of MOOCs. The amount also depends on whether the university has its own internal infrastructure and service providers for producing MOOCs, which are often not included in the cost calculation. The expenditure, particularly for xMOOCs, is driven by three different factors:

- Platform (fixed costs, variable costs of support) A content management system (CMS) or learning management system (LMS) for registering the participants, publishing the content and moderating the courses is required. For most MOOC concepts, the CMS must offer a sophisticated management system and the effective integration of internal and external social media elements such as forums, blogs, chats, feeds, tweets and video conferences (Facebook, Twitter, Skype, blogs and so on). Given the high cost to the universities of developing their own platforms, various private and commercial providers take the opportunity to make their platform available to the higher education institutions either free of charge or for a fixed fee for hosting the MOOCs, depending on the business model in question. The university may be faced with costs of varying amounts for consulting the provider on the technology or on teaching.
- Content (fixed costs) The video and lecture material available to the course participants must be digitalised and made MOOC-compliant. As a rule, the typical length of a lecture is avoided, with videos lasting five to ten minutes instead. Generally speaking, this requires dedicated technology and appropriately qualified personnel; media training for inexperienced university teachers is a key factor in the quality of the product. The major MOOC platforms usually offer tips and assistance in this area. Copyright and licence legislation must be taken into consideration.
- Teaching capacity (variable costs, depending on number of participants). Depending on the teaching method and the examination procedure chosen (e.g. multiple choice versus submission of essays), sufficient staff to facilitate the course, manage the content, and supervise working groups, given the number of participants must be included in the calculation. Technical support is included as part of the service offered by professional platform providers.

4.1.3 Revenue models

MOOCs represents huge and fast developing online education segment, however, there are particular features and differences for each of them. First of all, it is revenue models.

Possible revenue models are:

- Platform licensing
- Course design and consulting
- Certifications
- Paid examination
- Personalized student profiles
- Paid courses
- Sponsored courses
- Employer-sponsored courses for Corporate Training

Most of MOOCs providers using “freemium” model. There are many examples: Udacity offers additional services on paid base, for example: personal mentoring or personal evaluation and verified certificates. Coursera and edX provides certification on the payment base, this means that students can participate in free courses, but if they want to get verified certificate for this course completion – it’s need to pay for this certification. On the other hand, edX is a non-for-profit provider that also requires a contract. However, edX has published its learning platform as open source software and its freely available to higher education institutions that want to provide their own MOOCs or for other academic purposes.

Best and recommended revenue models for CULS MOOC case study is Employer-sponsored courses for Corporate Training, because corporations are using MOOCs to provide specialized training for their employees. MOOC providers can develop platforms for companies and receive sponsorship in return, or even receive sponsorship for an existing course. For example, Google provided HTML5 game development training via Udacity, to create more trained professionals in the area of game development.

Benefits of Corporate Training in a form of MOOC:

- Employees can access training on a 24/7 basis.
- Boosts employee productivity and profits.

- Improves employee retention rates.
- Ensures that employees are up-to-date with skills and professional knowledge.
- Address real world challenges to improve on-the-job performance.
- Organizations can identify motivated employees who possess desired skill sets.

4.2 Case study: MOOC platform evaluation

4.2.1 Methodology

One e-learning specialist was involved, he was asked to contribute his experience and inquiry to this analysis. Major platforms considered are Coursera, edX, Udacity and Future Learn

Criteria	Description	Weight factor
Number of Courses	Number of courses offered by the MOOC platform using the following criteria: 1 = less than 30 courses 2 = 30 to 49 courses 3 = 50 to 99 courses 4 = 100 to 500 courses 5 = more than 500 courses	1
Partner Institutions	Quality & standing of the partner institutions providing the courses using the following criteria: 1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent	3
Course format	How well the courses are structured to facilitate learning using the following criteria: 1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent	1

Materials	<p>Quality of the materials used to deliver the courses, such as videos, tutorials, e-books etc using the following criteria:</p> <p>1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent</p>	2
Instruction	<p>Quality of the instruction provided (content & delivery) using the following criteria:</p> <p>1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent</p>	3
Assessment	<p>Provision & quality of quizzes, assignments & feedback using the following criteria:</p> <p>1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent</p>	1
Accreditation	<p>awarding & recognition of course certificates/credits using the following criteria:</p> <p>1 = None 2 = Progress Tracking 3 = Statement of Accomplishment 4 = Verified Certificate 5 = Credit</p>	2
Social tools & features:	<p>provision & quality of tools & features to facilitate social interaction with peers and staff using the following criteria:</p> <p>1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent</p>	2

Interface usability:	<p>quality of the interface & ease of navigation around the website using the following criteria:</p> <p>1 = Very poor 2 = Poor 3 = OK 4 = Good 5 = Excellent</p>	1
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Table 8. MOOC platform evaluation methodology.
Source: <https://www.mooclub.club/pages/methodology/>

Overall Rating

- Maximum score is set to 5.0
- Each measure was weighted by a weight factor from 1 to 3.

The overall rating is determined by the weighted average of all the scores.

4.2.2 Evaluation Phase

Platform/ Requirements	edX	Coursera	Udacity	FutureLearn
Number of courses	4	5	4	4
Partner Institutions	5	5	5	5
Course Format	5	5	5	4
Materials	4	4	5	4
Instruction	5	4	5	4
Assessment	4	4	4	4
Accreditation	5	5	4	4
Social Tools & Features	4	5	2	4
Interface usability	5	5	4	4
Overall rating	4.5	4.6	4.2	4.1

Table 9. MOOC platforms evaluation.
Source: Author

4.2.2.1 edX

EdX is an open-source platform offered by (<https://www.edx.org/>). It is the same platform that universities such as Harvard and MIT use to offer courses to 100,000+ students. It was released as open source in March 2013, and the goal was to act as the WordPress for MOOC platforms, allowing users to use plug-ins to expand the core functionality. edX has

a fast, modern feel, with the ability to accommodate large enrollments. The course format includes tools, videos and game-like labs. EdX is based in Cambridge, Massachusetts and is a non-profit initiative created by founding partners Harvard and MIT.

In addition to individual courses, edX also offers Xseries, a series of related modules or courses in a specific subject, and courses and programs with the option to gain college credit.

Tools & Features

- 90+ partner institutions
- Demo course
- Interactive videos
- Downloadable video segments in some courses
- Video transcripts
- XSeries: series of courses in a specific subject
- Learning dashboard
- Peer-to-peer social learning tools
- Course discussion forums
- In-person meet-ups
- Mobile apps - **iOS & Android**

4.2.2.2 Coursera

Coursera (<https://www.coursera.org/>) is a company and MOOC platform launched in 2012 with headquarters in Mountain View, California. It is currently one of the top MOOC platforms. Coursera offers both free and non-free courses.

Coursera is the largest MOOC platform partnering with top universities and organizations to offer online courses for anyone to take. With the most diverse course selection of all the MOOC providers, Coursera currently has over 27 million students and 1,800+ courses from 146 partner institutions across 29 countries.

Coursera also offers a large number of paid specialization programs giving learners a depth

of expertise in a subject through a series of related courses. The cost of specialization programs ranges from \$150 to \$500. However, learners can choose to audit individual courses free of charge gaining access to all the course materials except certificates and graded assignments, or can purchase a single course and gain an ID verified certificate on successful completion of the course.

The course format usually involves short video lectures, interactive quizzes, peer graded assessments, and social connecting with fellow learners and instructors.

Tools & Features

- 146 partner institutions
- Specializations: series of related courses designed to help you deepen your expertise in a subject.
- Capstone Projects: Every Specialization culminates with a unique capstone project or exam that allows students to apply what they've learned
- University credit transfer on some courses
- Site video tour
- Short video lectures, interactive quizzes, peer graded assessments
- Downloadable, pre-recorded videos (downloads don't include quizzes)
- Guaranteed subtitles in a course's main language, and some classes offer subtitles in multiple languages
- User profiles
- Learning dashboard
- Forums where you can discuss course material with fellow learners and instructional staff
- Apps: **iOS** and **Android**

4.2.2.3 Udacity

Udacity offers self-paced online courses focusing mainly on vocational technology courses for professionals, teaching skills that industry employers are looking for. Courses, which can be taken individually or as part of a learning track, are developed in-house with

input from education and industry experts, and are delivered via short videos, exercises, quizzes, hands-on projects and mentoring. All Udacity courses give you free access to course materials, but students can enroll in Nanodegree specialization programs for \$199 month. This gives you access to projects, code-review and feedback, a personal Coach, and verified certificates. Students who graduate within 12 months are awarded a 50% refund on their tuition costs, and for an additional \$100, Udacity now offers the Nanodree Plus program on 4 of its courses offering a job guarantee within 6 months of graduating or 100% tuition refund.

Tools & Features

- 130+ courses
- Free access to course materials
- 14 learning tracks or “Nanodegrees” (\$199/month; 6 to 12 months)
- Self-paced learn by doing approach
- Short videos, exercises, quizzes, hands-on projects
- Downloadable course materials (Videos, transcripts etc)
- Consistent course format
- 1-on-1 mentoring for enrolled students
- 50% refund for students who graduate within 12 months
- Job guarantee on Nanodegree Plus programs
- Discussion forums
- Project portfolio
- Apps: **iOS** and **Android**

4.2.2.4 FutureLearn

FutureLearn is the first UK platform and third largest MOOC provider, offering a diverse selection of free courses from leading universities and internationally renowned organisations from around the world.

In addition to taking individual courses, learners can enrol in Programs to master a subject

in depth with the possibility to earn academic credit or professional accreditation.

Courses are delivered one step at a time via video, audio and reading material, with short quizzes and assignments. It is a private company owned by the Open University, with the benefit of over 40 years of their experience in distance learning and online education.

Tools & Features

- 16 learning pathway programs
- 100+ partner institutions
- Video, audio and reading material, quizzes & tests
- Peer review assignments on some courses
- Transferable university credit on some course programs
- User profiles
- Content-linked discussion forums
- Course dashboard
- Exams available on some courses
- No Mobile apps currently, but the platform is designed to work on smartphones, tablets and desktop computers

According to results of MOOC platform evaluation, the best possible option is Coursera platform, edX is on the second place.

For decision-making, it's important to notice that Czech University of Life Sciences Prague is a member of Euroleague for Life Sciences (ELLS). ELLS is the network of universities that operates in the field of Life Sciences and Agriculture. There are seven European member universities and three non-European partner universities.

ELLS Member Universities	ELLS Partner Universities
BOKU - University of Natural Resources and Life Sciences, Vienna	CAU - China Agricultural University, Beijing
SCIENCE - University of Copenhagen, Faculty of Science	HUJI - Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment
SLU - Swedish University of Agricultural Sciences	LU - Lincoln University, New Zealand

UHOH - University of Hohenheim
WUR - Wageningen University and Research Centre
CULS - Czech University of Life Sciences Prague
WULS-SGGW - Warsaw University of Life Sciences

Table 10. Euroleague for Life Sciences Partner and Member Universities.
Source: <http://www.euroleague-study.org/universities>

Some of member and partner universities are trying to apply innovations in teaching and learning techniques, so they are running their own MOOCs. According to *Class-central MOOC aggregator* (35), 3 of 7 ELLS member universities provide MOOCs:

University of Copenhagen

The University of Copenhagen is the oldest University in Denmark - founded in 1479, and with over 38,000 students and more than 9,000 employees. The purpose of the University is to conduct research and provide education to the highest academic level. Based in Denmark's capital city it is one of the top research institutions in Europe.

Platform	Course subjects	Courses
Coursera	<ul style="list-style-type: none"> • Art & Design (1) • Education & Teaching (1) • Health & Medicine (7) • Humanities (2) • Science (1) • Social Sciences (1) 	<ol style="list-style-type: none"> 1. Academic Information Seeking 2. An Introduction to Global Health 3. An Introduction to Global Health 4. Bacteria and Chronic Infections 5. Constitutional Struggles in the Muslim World 6. Diabetes - a Global Challenge 7. Diabetes – the Essential Facts 8. Innovating Solutions for Aging Populations 9. Measuring Causal Effects in the Social Sciences 10. Origins - Formation of the Universe, Solar System, Earth and Life 11. Scandinavian Film and Television 12. Søren Kierkegaard - Subjectivity, Irony and the Crisis of Modernity 13. The New Nordic Diet - from Gastronomy to Health

Table 11. University of Copenhagen | Free Online Courses.
Source: <https://www.class-central.com/university/ucph>

Wageningen University

Wageningen University and Research Centre is a Dutch public university in Wageningen, Netherlands. It consists of Wageningen University and the former agricultural research institutes of the Dutch Ministry of Agriculture.

Platform	Course subjects	Courses
edX	<ul style="list-style-type: none"> • Business & Management (1) • Engineering (1) • Health & Medicine (4) • Science (11) 	<ol style="list-style-type: none"> 1. Advanced Biobased Conversion 2. Advanced Biorefinery 3. Biobased Principles and Opportunities 4. Biobased Processes and Implementation 5. Biobased Sciences for Sustainability Capstone 6. Circular Economy 7. Food Security and Sustainability: Crop production 8. Food Security and Sustainability: Food Access 9. Food Security and Sustainability: Systems thinking and environmental sustainability 10. FSSCPx: Food Security and Sustainability: Crop production 11. Introduction to Animal Behaviour 12. Nutrition and Health Part 1: Macronutrients and Overnutrition 13. Nutrition and Health Part 2: Micronutrients and Malnutrition 14. Nutrition and Health Part 3: Food Safety 15. Social Welfare Policy and Services 16. Sustainable Soil Management: Soil for life 17. Sustainable Urban Development

Table 12. Wageningen University | Free Online Courses.
Source: <https://www.class-central.com/university/wageningenur>

Hebrew University of Jerusalem

Ranked among the top academic and research institutions worldwide, the Hebrew University of Jerusalem is Israel's leading university and premier research institution. Serving 23,000 students from 70 countries, the Hebrew University produces a third of Israel's civilian research and is ranked 12th worldwide in biotechnology patent filings and commercial development. The Hebrew University was founded in 1918 by visionaries including Albert Einstein, Sigmund Freud, Martin Buber and Chaim Weizmann.

Platform	Course subjects	Courses
Coursera	<ul style="list-style-type: none"> • Computer Science (2) • Humanities (3) • Mathematics (1) • Science (2) • Social Sciences (2) 	<ol style="list-style-type: none"> 1. A Brief History of Humankind 2. Build a Modern Computer from First Principles: From Nand to Tetris (Project-Centered Course) 3. Build a Modern Computer from First Principles: Nand to Tetris Part II (project-centered course) 4. Introduction to Tissue Engineering 5. Invitation to Mathematics 6. Israel State and Society 7. Modern European Mysticism and Psychological Thought 8. Modern Hebrew Poetry 9. Moses' Face: Moses' images as reflected in Jewish literature 10. Synapses, Neurons and Brains

Table 13. Hebrew University of Jerusalem | Free Online Courses.
Source: <https://www.class-central.com/university/huji>

Each of these 3 universities have 10+ MOOC courses, most supported subjects are: Science, Health & Medicine, Humanities. All courses are provided in English language for free, with possibility to get course completion certificate. Interesting to notice that 2 from 3 universities use **Coursera** platform for their MOOCs, this fact will be mentioned at the final evaluation of MOOC educational platforms. At a minimum, in order to implement a successful MOOC, there is a need assistance with technology (including both a hosting platform and ongoing technical support for learners) and marketing.

4.2.3 SWOT analysis for the Case study

A SWOT analysis (or SWOT matrix) is a structured planning method used to evaluate the strengths, weaknesses, opportunities and threats involved in a project or in a business venture. Among them, Strengths are the characteristics of the business or project that give it an advantage over others; Weaknesses are those placing the business or project at a disadvantage relative to others; Opportunities are elements that the project could exploit to its advantage; Threats are those in the environment that could cause trouble for the business or project.

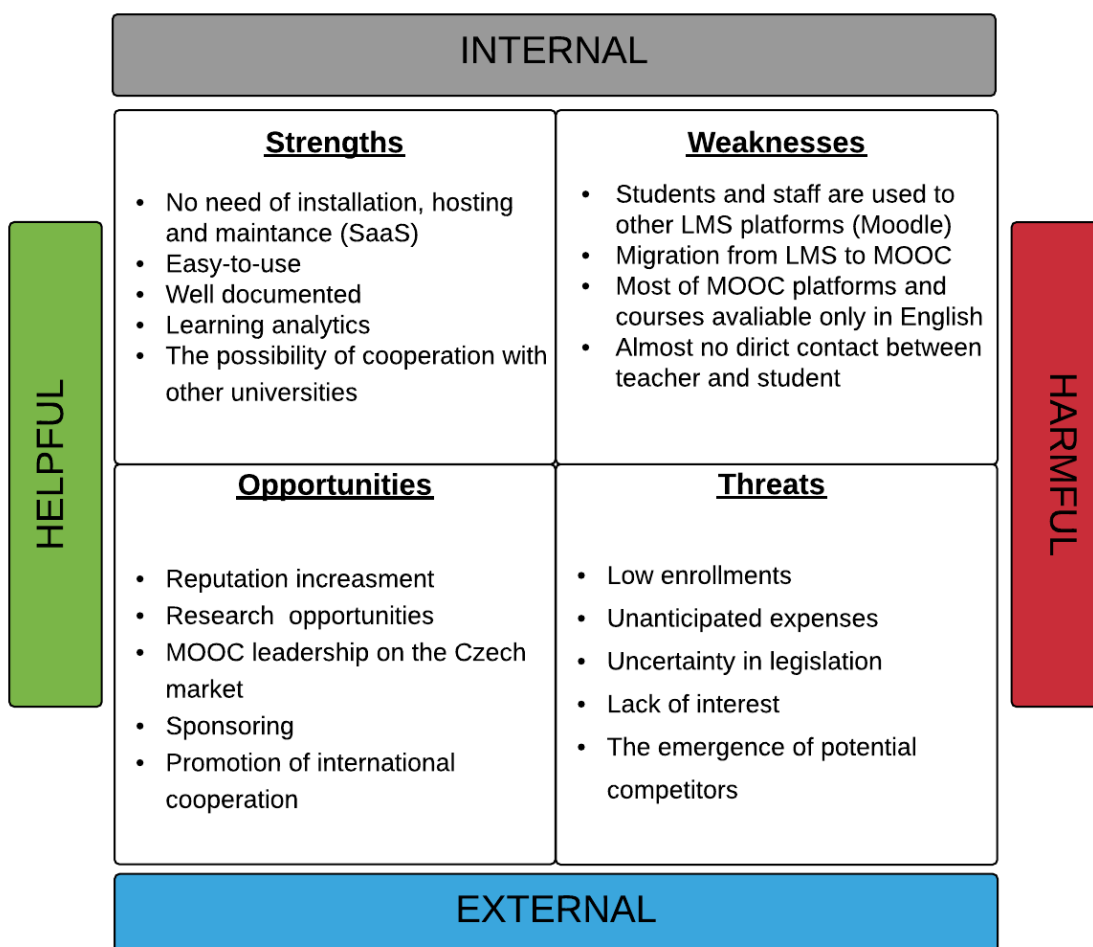


Figure 12. SWOT analysis for CULS MOOC.
Source: Author

Figure 12 summarizes the outcomes of SWOT analysis.

Reputation is a critical factor in the analysis, with reputational issues in play at all levels, from individual faculty to university. On the front end, it influences learner enrollments, and at the conclusion future perceptions of CULS. Although reputational benefits may be assessed at every level, the greatest risks are at the local (e.g., faculty and program) level.

Resources—whether human, technological, or financial—also are highlighted as critical elements of a MOOC; their availability is intertwined with the ability to both develop and host a MOOC. Estimating necessary hosting resources, including facilitation labor, is clearly a challenge, and the risk to reputation rises if insufficient resources are available at this point.

There are potential benefits and drawbacks. A faculty member embarking on a MOOC project would require support and also would need a clear reason for doing the MOOC. Ideally, offering a MOOC would somehow be synergistic with a faculty member's research interests. Should the opportunities be appealing to the faculty member (in this case, most likely in terms of reputation and scholarship) and if the collegial and basic technology support systems are in place, then a MOOC seems like a viable venture. However, if program faculty members are not personally interested and motivated to design and host a MOOC there is no reason to expend the effort.

5 Results and Discussion

5.1 Literature review discussion

Better education means a better future. Education is the key to advancing society's greatest goals, from a building a strong economy to leading healthy lives. By increasing access to education and creating a platform for more effective teaching and learning, Open Education benefits us all.

Nobody knows what will happen to the leading MOOCs contenders in next few years. Enrolments and interest are keep growing. But, people who are benefitting from these courses already have a degree and actually do not need these classes. So, current MOOCs are not reaching the people who it is originally supposed to reach.

Universities are well positioned to offer a blended learning model, which takes advantage of their traditional classroom sessions for discussion (“flipped classrooms”) and assessment while delivering most content online. In addition, universities offer all the advantages of a campus experience.

5.1.1 MOOC barriers

Initially, the leaders of the MOOC phenomena promised the democratization of high quality education: making it available to millions of people that for geographical or financial reasons would never be able to access it otherwise.

5.1.1.1 Internet Barrier

Sometimes it is forgotten, but only around one third of the total population of the world has access to the Internet. Whereas in European countries, in the United States or in Canada, the number of Internet users is above 80%, in countries such as Burundi, Ethiopia, Guinea or Niger is less than 2%. Half of Sub-Saharan African countries have an Internet penetration of less than 10%, and have seen very little grow in recent years. Besides, a broadband Internet connection is still a luxury in many countries

5.1.1.2 Language Barrier

The majority of MOOCs are only offered in English. Students with other native languages can have difficulties related to their proficiency in English: for example, non-

native speakers read at slower speed than native speakers; the speed difference leads to information overload and cognitive issues. Due to this, the language barrier discourages many potential users of MOOCs.

One first solution would be to offer translations of all the documents used in a MOOC in different languages. In addition, videos should also include subtitles in different languages. These features would help not only non-native English speakers but also disabled people, as it is explained in the following section.

5.1.1.3 Cost Barrier

MOOCs were initially free, but nowadays situation is changing and MOOC providers are looking for possibilities to invent or use revenue models for funding and stable grow.

5.1.1.4 Accessibility barrier

MOOCs can eventually become a new global learning method according to the ideals of open education. But to really become open, to really be available to all people, they should guarantee their accessibility so they do not discriminate any person.

Web accessibility is the property of a website to support the same level of effectiveness for people with disabilities as it does for non-disabled people.

If MOOCs are going to really change higher education, they should break some important barriers before. We have highlighted four barriers: Internet barrier, cost barrier, language barrier, and web accessibility barrier.

5.2 Results of Practical part

Building a MOOC is tricky work. It involves writing lecture scripts, rethinking course structure, creating a slew of multiple choice quizzes, adapting grading software, filming lectures and (sometimes) discussion groups, editing footage, and building a course page. Once the course goes live online, someone has to pay for chat feed monitors, glitch repair, and a squad of tutors and administrators. All this for a product that's supposed to resemble a frozen dinner: pre-packaged, simple to prepare, and consumed in front of a screen.

According to defined Methodology for MOOC platforms evaluation, the best option for CULS seems to Coursera MOOC platform, since other ELLS partner universities are

using it. Coursera platform provides literally everything that is need to build a MOOC, according to MOOC design principles and empowered with philosophy of OER.

5.3 Recommendations for CULS MOOC

Recommendations regarding the platform:

- institutional agreements with popular initiatives or with big number of potential learners

Recommendations regarding the Overall Course Structure:

- To study the platform constraints before creating the course structure and learning materials.
- To be aware of the workload required for the creation of the course structure and the upload of learning materials to the platform.
- To define a flexible schedule so that interested latecomers can still enroll in the course.

Recommendations regarding Teaching Staff:

- To have several teachers, which enriches the contents, allows greater heterogeneity of topics and splits the workload, but demands a more complex coordination.
- Enable professional learners to link theory learned in the MOOC with their work practice by setting personal goals, or personalising course goals. The integration of expertise developed through the MOOC with expertise gained through professional practice could lead to improved learning.
- To moderate the participation and awareness of the teaching staff by sending regular e-mails reporting the pending tasks and latest news.

Recommendations regarding Learning Contents:

- To create original video lectures explaining the concepts easily and clearly, with appropriate tone
- To use additional materials that learners can follow easily to complement teachers' speech and study offline (e.g. slides).

- To plan when video lectures need to be ready, leaving enough extra time to add subtitles. Not to underestimate the time required to generate videos.

Recommendations regarding Assetments:

- To define the competences that participants must acquire during the course.
- To define formative and summative assessment activities from the beginning. To inform clearly on assessment policies, and how final scores will be calculated. To provide immediate feedback.

Recommendations regarding Social Support:

- To promote social learning. Giving support to several social tools is burdensome for teachers, but allows people to choose the tools they feel most comfortable with.
- To define from the beginning the degree of teachers' commitment regarding their activity with the social tools, and announce it to participants.

Recommendations regarding Certification:

- To define from the beginning the type of recognition people will get for completing the course, what they will need to obtain such recognition and when they will receive it.

Other recommendations:

- To establish and start the marketing strategy as soon as possible, since registrations steadily increase even after the course begins.

6 Conclusion

Better education means a better future. Education is the key to advancing society's greatest goals, from a building a strong economy to leading healthy lives. By increasing access to education and creating a platform for more effective teaching and learning, Open Education benefits us all.

The challenge with MOOCs describing is that this phenomenon is still developing, expanding and evolving. Due to its early nature, MOOCs are still in their growth phase with a lot of unanswered questions, it cannot be stated that MOOCs will replace entirely higher education institutions, due to the complexity of the current education system.

MOOCs can change and transform higher education as we know it. Some experts are saying that MOOCs is a disruptive technology, but MOOCs definitely can be the turning point for the business model of higher education, affecting not only the revenue sources, but also the role of university/faculty/institution and the way that degrees are constructed and gained. Others are saying that MOOCs are another educational experiment that receives too much attention now as a phenomenon, but the expectations are that the interest and excitement will go down.

MOOCs have played an important role. They promised a lot and did not deliver much. At the same time, MOOCs have unleashed a force that they still cannot control or monetize. The MOOC movement has opened the door for affordable and just-in-time education on demand.

When a university in an emerging country begins to think about MOOCs, there are many points that could prove daunting, from finance to staff workload, however there is also great promise. MOOCs could potentially lead the way to assisting students to gain meaningful qualifications. In doing so this stepping stone into the world of MOOCs could prove a solution to many of the difficulties that potentially obstruct universities developing their own MOOCs. By reviewing and adapting the teaching methods of pre-existing MOOCs to suit their local populations, universities in emerging countries could begin to produce their own MOOCs without falling into pitfalls of technology, pedagogy or finance.

The traditional classroom experience is still the best and most efficient way of imparting knowledge. While new technologies can enhance and augment that experience, while new teaching methods and styles will continue to capture the imaginations of new

generations of students and teachers, the best education, the gold standard by which we evaluate all new technologies and techniques.

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8 Appendix

8.1 Course Distribution by Providers

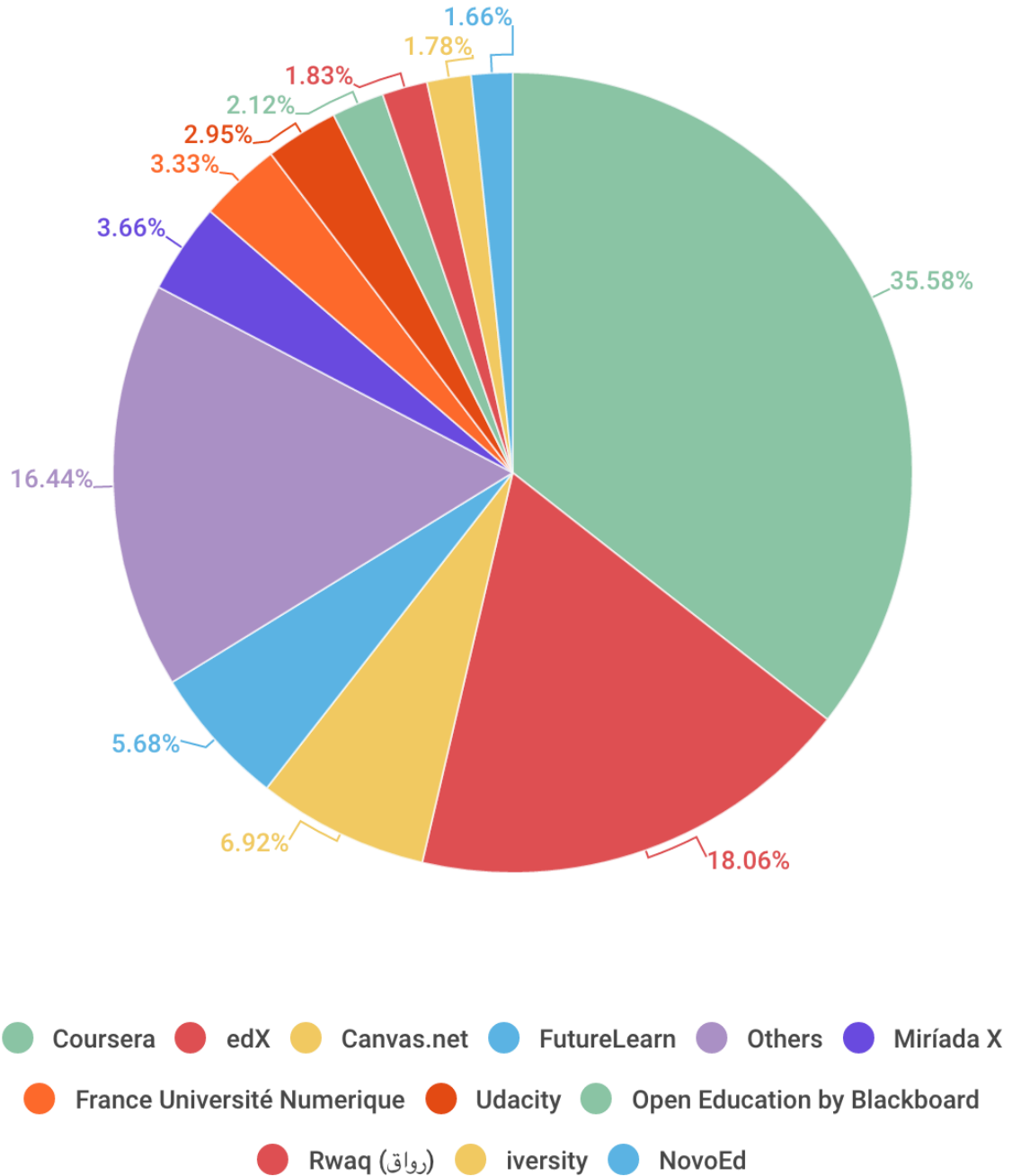


Figure 13. Course Distribution by Providers – 2016.

Source: Class-central URL: <https://www.class-central.com/report/moocs-2015-stats/>

8.2 Most popular free MOOCs of 2016

Around 2,600 courses were offered during year 2016. According to annual report by [Class Central](#), based on more than 8,000 reviews written by users, was created a list of the best free online courses for year 2016:

1. [Coding in your Classroom, Now!](#) from *University of Urbino* via *EMMA*
2. [Tsinghua Chinese: Start Talking with 1.3 Billion People](#) from *Tsinghua University* via *edX*
3. [The Nature of Code](#) from *Processing Foundation* via *Kadenze*
4. [Introduction to Agent-based Modeling](#) from *Santa Fe Institute* via *Complexity Explorer*
5. [The 3D Printing Revolution](#) from *University of Illinois at Urbana-Champaign* via *Coursera*
6. [Becoming a changemaker: Introduction to Social Innovation](#) from *University of Cape Town* via *Coursera*
7. [Preparing to Manage Human Resources](#) from *University of Minnesota* via *Coursera*
8. [Creative Applications of Deep Learning with TensorFlow](#) via *Kadenze*
9. [Teaching for Change: An African Philosophical Approach](#) from *Stellenbosch University* via *FutureLearn*
10. [Stanford Introduction to Food and Health](#) from *Stanford University* via *Coursera*

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