A Comparative Analysis of MOOC (Massive Open Online Course) Platforms

Maria CONACHE, Ramona DIMA, Andreea MUTU
Bucharest University of Economic Studies, Romania
m.conache@gmail.com, dimaramona14@gmail.com, andreea.mutu3@gmail.com

The MOOC platforms have known a considerable development in recent years due to the enlargement of online space and the shifting between traditional to virtual activities. These platforms made it possible for people almost everywhere to take online academic courses offered by top universities via open access to web and with unlimited participation. Thus, it came naturally to us to address the question what makes them so successful? The purpose of this paper is to report comparatively MOOC platforms in terms of features, based on the user's implication and demands. First, we chose four relevant lifelong learning platforms and then we structured three main categories for the platforms' qualification, depending on which we built our theory regarding the comparison between them. Our analysis consists of three sets of criteria: business model, course design and popularity among online users. Starting from this perspective, we built a range of representative factors for which we highlighted the major aspects for each platform in our comparative research.
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1 Introduction

The rapid development of technology has influenced many aspects of our lives, especially related to studying and education. Electronic devices, software, learning platforms and internet have made learning easier and faster and also their quality seems to be improved by these new technologies. A recent development in higher education and distance learning is the Massive Open Online Course (MOOC) that offers free access and interactive participation to learners all around the globe through internet and other technologies. The purpose of MOOC platforms is to reinvigorate teaching and learning and to create a brand new virtual space for educational interaction. Furthermore, this approach of online learning is a great opportunity to both sides: consumers and providers, for consumers it is represented by the variety and the prestige of courses to be chosen from; for the providers it is about being free of obligation regarding the success of the course completion.

What is a MOOC?

A MOOC (Massive Open Online Course) is an online educational environment that allows a large number of students from anywhere in the world to follow online courses in any field of study. The instructors come from elite universities and teach using videos and presentations. At the same time, people who enroll in these courses are able to connect with a community of instructors and learners with similar interests. At the end of the course, students who graduate may obtain a certification.[1]

MOOCs began as a development of the OER (Open Education Resources) movement that encourages free learning, teaching and research materials. The first MOOC took place in 2008; it was called "Connectivism and Connective Knowledge" and was led by George Siemens and Stephen Downes in front of 25 tuition-paying students and over 2200 online students. Online students had free access to the course content through RSS feeds, blog posts, online discussions and meetings. [2]

Based on the education models, study authors split MOOCs in two categories: cMOOCs centered on George Siemens's connectivism theory and xMOOCs that look a lot like traditional courses. xMOOCs are criticized by cMOOCs co-founder Stephen Downes for the reason that they are not different by much from digital textbooks or television shows with an online quiz component.[3]

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As Stephen Downes explains in a 2011 Huffington Education article, the connectivist approach is not about transmitting and memorizing course content, but about forming neuron connections as a result of experience, through interaction with a community of fellow learners. He identifies four main activities in connectivist MOOCs: aggregation of content as each participant should select what seems important from the material, remixing by associating materials they read, repurposing concepts or ideas they learned about and feeding forward which means sharing one's work with the world. [4]

Alternatively, xMOOCs are based on traditional learning methods: they are organized around short video lectures followed by assessments in the form of quizzes. xMOOCs are usually provided by higher education institutions or for-profit companies rather than a group of individuals with a passion for a specific area of study. The first xMOOC took place in 2011 when 160 000 students registered for "Introduction to Artificial Intelligence" course led by Sebastian Thrun and Peter Norvig from Stanford University, thus increasing MOOC's popularity.[5]

Lifelong learners

Knowledge acquiring is unavoidable and prepares us for real life experience in the world around us. This is the motivation of lifelong learners for self-development, both personal and professional. Lifelong Learning Platforms are designed for every person, no matter the stage of his/her life or the level of knowledge. Lifelong learners are self-motivated individuals driven by their actions to move forward with the same speed that technology does. This deliberate and voluntary act needs to be supported with up to date information and unlimited access to it.[6] Porter [7] also states that MOOCs participants are learners that want to be in control of their own learning, that are actively involved in the learning process and take part in a group of students with specific intentions and strong motivation to study.

Benefits of MOOCs

The main benefit of MOOCs is that you can learn at your own pace, following your own schedule, in any location in the world. Courses may have deadlines for tests, quizzes and assessments, but the learner can choose when to take them. As the traditional learning, MOOCs also encourage collaboration between people using forums and discussion groups. They can use social networking to help each other understand the material and assignments and get immediate feedback from the instructors. [8] This idea of online learning empowers the students with a great responsibility of self-preparation and also the selection of what best fits for his progress.

MOOCs providers

Nowadays, the challenge of MOOC platforms is to improve the quality and the interactivity of the material in order to increase the number of enrolments. Coursera and EdX are the some of the most notable providers of MOOCs, followed by Udacity, Udemy and Khan Academy. Among the European providers, iversity.org is worth mentioning. Each provider of MOOCs has specific features and course content that play a part in determining the best fit for self-development. As part of the MOOC Quality Project [9], Grainne Conole developed a classification system for MOOCs that consists of 12 dimensions: level of openness, degree of massiveness, the amount of use of multimedia, the use of communication tools, the degree of collaborative learning, the type of learner pathway (learner-centered learning against teacher-centered learning), quality assurance, amount of reflection, assessment strategies, learning model (formal or informal), autonomy, and diversity.

The ranking of the top MOOC providers assembled by [10] is based on the total number of offered courses at the time of the study and shows Coursera (1,563 courses from 140 partners across 28 countries) as the most popular provider, surpassing EdX (894 courses) and Udacity. Another comparison that takes into account 5 key factors: website user experience, quality of instruction and course materials, amount and depth of content, community

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interaction and special features ranks EdX as the best online course provider, followed by Coursera, Udacity and KhanAcademy. [11]

Coursera is one of the top most visited websites which has the main destination online learning and is a well-known MOOC platform. It was founded in 2012 by engineering professors Andrew Ng and Daphne Koller from Stanford University as a for-profit venture capital educational organization. Both professors offered free online versions of their courses before starting Coursera and since then the company added more courses from top universities.[12]

Udacity is also one of the top for-profit educational organizations that offer MOOCs. Like Coursera, it started as a Stanford University experiment in which professors Sebastian Thrun and Peter Norvig offered their course online for free. Students from 190 countries participated in the 2011 course and soon after, in February 2012, Udacity was founded with the help of a venture capital firm (Charles River Ventures) and $200 000 of Thrun's money. [13]

Udemy is a different kind of consortium that allows anyone to teach and participate in online video classes. Launched in early 2010, Udemy was founded by Eren Bali, Oktay Caglar and Gagan Biyani using venture capital as well which was raised in many rounds. [14]

Another popular MOOC provider is *EdX* created in 2012 by The Massachusetts Institute of Technology and Harvard University. Apart from educational purposes, EdX is also used to collect and analyze learners' data in order to research learning and distance education. [15]

In this paper, we want to identify what makes the most popular MOOC platforms among lifelong learners successful. The research is based on a comparative analysis using qualitative and quantitative criteria between four platforms: Coursera and EdX which are focused on university-style courses and Udacity and Udemy that host courses oriented mostly on developing job-related skills.

2 Methods

As the popularity of these platforms and the number of courses increase, more universities tend to participate in this form of online teaching and the areas of interest start to diversify. At the same time, this variety of options in choosing the courses generates a bigger number of attendants determined by the curiosity or by the benefit of the course context. We think that there is a connection between the diversity of the courses, the increasing number of students and the prestige of the university. Between each of these there is a bilateral influence, for example universities are attracted to invest time to record videos because of the large number of participants and also the students enroll in the course because of the well-prepared teacher who offers the support. We heard a lot of people saying that they are showing curiosity about a course because of the binding of the admiration for the university and the area of his interest in that specific field.

In this section we explain the research model we employed along with the qualitative and quantitative data that we collected about LLL platforms. The quantitative approach is based on comparing web traffic data and specific measurements for each platform. The qualitative approach is about describing the characteristics of each platform according to specific criteria.

In order to present comparatively the features of four of the most popular MOOC platforms: Coursera, Udemy, Udacity and EdX we will focus on the following measurements and criteria:

1. by the users criteria:
    - number of visitors
    - student's profile
2. by the interest of each platform to gain more popularity:
    - time spent by a user on the website
    - ratings on mobile apps
    - number of partners
    - number of courses
    - foreign languages support

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In order to describe the similarities and differences between the MOOC providers we identified three main categories of comparison criteria: *the business model*, *the course experience* and *website popularity*. The first category includes the type of the organization, partnerships and course payment. The second category of criteria consists in course design details, catalog size and mobile apps. The third set of criteria, website popularity refers to the number of website users, time spent by a user on the website or the rank in Career and Education category.

Concerning the used datasets, we obtained the data for the first two categories by analyzing each provider's website in depth, and for the third category we used a website traffic analytics tool (SimilarWeb.com, 2016) and a tool that measures desktop and mobile website performance [16] to obtain the data. By reviewing and analyzing the datasets, we obtain comparison tables containing data for each feature and each platform. Additionally, we offer a critical interpretation of the results in the discussion section.

3 Results Analysis

In this section we present a detailed comparison of four MOOC platforms, Coursera, Udemy, Udacity and EdX based on the criteria defined in the methods section: the business model, the course experience and the platform's popularity.

3.1 Business Model

Regarding the business model of the four chosen MOOC platforms, we identified the similarities and differences between them, based on the data provided by each website in the about section. (Table 1)

Table 1. Comparison of MOOC platforms based on business model criteria

Criteria	Coursera	Udemy	Udacity	EdX
Organization type	for-profit	for-profit	for-profit	non-profit
Partnerships	universities, organizations	individual instructors, marketing affiliates	corporations universities	schools, universities, non-profit organizations, corporations
Free courses	✓	✓	✓	✓
Paid courses	✓	✓	✓	✓
Completion certificates	paid verified certificates	depends on the course	only for paid courses	paid verified certificates
Series of courses	Specializations	✘	Nanodegrees	XSeries

- **Organization type**

Coursera and Udacity have both been started by Stanford University professors as for-profit education organizations financed with venture capital. Udemy is a for-profit organization as well, but EdX differs from the other three platforms as it is a non-profit learning platform that runs on open-source software.

- **Partnerships**

One of the reasons why Coursera and EdX provide mostly university-style courses is the partnership with elite universities around the world. Coursera has the largest variety of partners: 143 in 28 countries. The partners are not limited to universities only; in order to develop more advanced and specialized courses, MOOC providers have started to team up with non-profits, corporations and international organizations. Most of the courses from Udacity are provided in collaboration with IT companies like Google, AT&T, Facebook, Twitter, Git, but there are also 2 universities that provide MOOCs: Georgia Institute of Technology that has its own Masters in Computer Science on Udacity and San Jose State University. In contrast to the other three providers,

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Udemy hosts courses from individual instructors and collaborates with affiliates that promote the courses.

- **Free courses and certificates vs. Paid courses and certificates**

All four providers offer both free and paid courses. Some of them allow students to access all course content without paying fees; others limit features like verified certificates or assessments. Verified certificates involve paying a fee and verifying your identity using a webcam, ID and typing sample. In the past, the providers offered unverified certificates called honour code certificates.

Even though Coursera classes are all accessible for free, some course features are limited for students who did not pay a fee. For these courses, quizzes, assessments, peer reviews, final exam and certificate are restricted to non-paying students. Coursera also offers Specializations, paid programs that allow students to develop superior skill in a specific subject. Specializations are multi-course series in popular topics like software development, foundations of teaching, biology and many others. Every Specialization will culminate with a capstone project or exam that allows students to apply what they've learned to relevant, real world scenarios. Students completing the series will receive a Specialization Certificate verifying their completion of a top academic program.

Although Udacity initially offered mostly university-style courses, in 2013 the focus has shifted on offering vocational courses for professionals. Since then, the company has built a collection of free classes, particularly in computer science and programming, and launched paid premium programs which they call Nanodegrees. Like Coursera Specialization program, a Nanodegree is not a single course, but a selection of courses designed for professionals by tech industry leaders. The paid program includes verified certificates, feedback on assignments, instructor support and career coaching. The Nanodegrees include personal evaluation of specifically designed projects and a verified certificate of completion (also known as statements of achievement or SOA's).

Udemy's courses are offered by individual instructors that can choose to charge their students or not. The revenue from the course tuition is split between Udemy and the instructor who creates the course. The instructor revenue share is different based on who attracts the learners. If the instructor's reputation or marketing attracts the student, than he earns 97% of all tuition revenues. If the site attracts the students, Udemy retains 50% of the earnings. The instructor earns just 25% of the fee if Udemy promotional affiliates bring the student to the course. As opposed to Coursera and Udacity, Udemy does not offer certificates for completing series of courses. Instead, it offers another feature, Udemy for business, a place for employee training.

Similar to the other three MOOC providers, EdX also offers several course options: the student can audit the course at no cost, or pay a fee to get an EdX verified certificate upon completion. Another type of certificate is the XSeries Certificate given by EdX for completing a set of two to seven verified courses in a single subject, were each course has its own cost. The XSeries Certificate is the equivalent of Coursera Specializations or Udacity Nanodegrees.

3.2 Course Experience

On the topic of course experience we analyzed the path that students take from the first time that they access the website to the actual course design. (Table 2)

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Table 2. Comparison of MOOC platforms based on course experience

Criteria	Coursera	Udemy	Udacity	EdX
Course catalog	1872	40000+	131	913
Self-paced courses	✓	✓	✓	✓
Scheduled courses	✓	✘	✘	✓
Course materials	video, text, transcripts	video, Power Point, text, zip	video, text, external links	video, text, online textbooks
Discussion forum	✓	✓	✓	✓
Mobile apps (Android, iOS)	✓	✓	✓	✓
Foreign languages	courses in foreign languages, subtitles	courses in foreign languages, subtitles	subtitles	courses in foreign languages, subtitles
Assessment methods	quiz, uploaded assignment, peer review, projects	quiz, coding exercises	quiz, coding exercises, projects	quiz, uploaded assignment, peer review, projects

- **Course catalog**

Each platform has a course catalog to show the courses grouped by categories for which we examined the number of courses and the course categories displayed on each website. Udemy hosts more than 40000 courses, next is Coursera with 1872 courses, followed by EdX with 913 courses and Udacity with 131 courses at the time of this study.

The course categories are diverse, ranging from Computer Science, Business and Management, Health and Medicine to Arts and Design or Personal Development. According to a MOOC aggregator website [17], the category with the biggest number of courses is Computer Science.

- **Self-paced vs. scheduled course model**

Traditional courses have predefined start dates and end dates and are accessible only during that period; also assignments must be finished before the deadlines. This is the scheduled model that most of Coursera and EdX MOOCs follow, with the difference that you can study on your own time, but not at your own pace. On the other side are the self-paced MOOCs offered by Udacity and Udemy that allow the learners to work on the course when they like without having to worry about deadlines.

- **Course materials**

All four MOOC providers strongly rely on the use of multimedia when delivering a course to students. Udemy instructors can upload video, PowerPoint presentations, PDFs, audio and zip files, but like Coursera, EdX and Udacity, most courses are composed of short videos combined with interactive learning exercises, where students can practice the concepts from the videos. The courses often include links to external resources (Udacity), online textbooks (EdX), transcripts (Coursera) and an online discussion forum where students can post and review questions and comments to each other and teaching assistants (all analyzed platforms).

- **Mobile apps**

The considered platforms have all released mobile apps for Android and iOS. The apps contain video players and allow students to

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download the video for offline learning. They also include the quiz and forum features. The Google Play and App Store ratings from the date of this study presented in the table below show that Udemy's mobile apps are the most appreciated. (Table 3)

Table 3. MOOC providers' mobile apps

Criteria	Coursera	Udemy	Udacity	EdX
Android app	✓	✓	✓	✓
Android app rating	4,3/5	4,4/5	4,2/5	4,3/5
iOS app	✓	✓	✓	✓
iOS app rating	4,5/5	4,5/5	4,5/5	2,5/5

- **Course assessment methods**

Assessment methods differ based on the course: for more theoretical classes, multiple-choice machine graded quizzes and text input problems are available for all four platforms. Udacity and Udemy allow the students to complete coding exercises in a proprietary coding editor for programming courses. Courses from Coursera and EdX may require learners to upload and submit their assignments before a deadline. Another feature from Coursera and EdX is peer grading and review, where fellow students anonymously grade up to 5 assignments. Coursera, EdX and Udacity, the platforms that offer series of courses in a specific field, have the possibility of project assessment for this type of courses.

- **Foreign Languages**

EdX offers a lot of courses in languages other than English: Spanish, French, Italian, Portuguese, Korean or Chinese. In addition of these languages, Coursera delivers courses in Arabic or Hebrew and some course materials are translated. Udemy also supports courses in many languages including Russian and Deutsch. Udacity provides only courses produced in English, but video subtitles in foreign languages are available. The other three providers offer subtitles as well.

3.3 Platforms' popularity

Apart from being educational organizations, the MOOC providers are also websites. This is why relevant information may be obtained from the web traffic data analysis. According to SimilarWeb.com [18] for March 2016, Coursera is first in the top of the Career and Education websites, Udemy has the biggest number of visits and Udacity holds the record for the most time spent on site and page views. (Table 4)

Table 4. Traffic data analysis for MOOC providers in March 2016

Criteria	Coursera	Udemy	Udacity	EdX
Global Rank	592	593	2739	1701
Category Rank for Career and Education	4	5	30	47
Total visits	39.2 mil	44.2 mil	8.8mil	18.3mil
Time on Site	00:09:14	00:06:31	00:10:08	00:07:00
Page Views	6,58	5,3	8,12	5,2

- **Platforms' page speed**

The page loading speed for website is an important feature for any online user. For establishing this speed we used an online tool for developers, provided by Google: PageSpeed Insights.[16]

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Table 5. Page Loading Speed for MOOC platforms 2016

Criteria	Coursera	Udemy	Udacity	EdX
Page Speed (Desktop)	81 / 100	82 / 100	64 / 100	71 / 100
Page Speed (Mobile)	65 / 100	62 / 100	53 / 100	52 / 100

As we can observe from Table 5, all MOOC platforms developed the website for the main purpose of desktop users, because the mobile users are redirected to download the specific application from the store (Android, iOS). Coursera and Udemy have the best developed platforms regarding the time for loading the page to the end user.

4 Discussions

All four platforms that can be chosen for online learning, are very popular among people of every continent. It seems that Coursera and Udemy are more visited and, as global ranking, they are in the top 10 of the Category Rank for Career and Education. It's noticeable that Udemy is the most visited website, but is not the best ranked and Udacity has the longest time spent on site by a user.

These platforms offer a great range of courses in many specializations and they are adapted to mobile devices like Android and iOS as well. The features: mobility, diversity and offline learning create an expansion of MOOC users by providing them significant means for self-learning. Regarding the structure of the courses and the deadline for assignments, Coursera and EdX are more oriented to faculty and students, as opposed to Udemy and Udacity which are well-known for employee trainings and increasing the job opportunities. Each platform is best suited for a different kind of self-development.

Concerning the partners of the platforms, they vary from universities (best represented for Coursera and EdX), to individual instructors (Udemy) and corporations (Udacity). So the user profile (student, freelancer, job seeking) will have a powerful influence when deciding to enrol a course. The most valuable asset for each of the above platform is: for EdX the open source approach attracts a lot of developers who will like to share their work, Coursera offers the largest and diverse catalog for online courses from the most prestigious universities, Udemy gives the user the opportunity to share his work as a learner or as an instructor and Udacity proposes a large portfolio of vocational classes.

5 Conclusions

Nowadays, there is a great development in the online world, including the educational and vocational areas. Therefore, a new need emerges in online education: platforms that host different courses globally, free or paid, often with video-based instructional content, provided by prestige universities, instructors or even experienced users. This is the reason why MOOCs are one of the most prominent trends in higher education in the last few years. We gathered the main aspects that outline a MOOC platform. We structured the factors for analysis in three categories: business model, course design and popularity. For a practical analysis, we chose four MOOC platforms: Coursera, Udemy, Udacity and EdX to extract the data for evaluating the major features for this kind of online learning platform. Also, we elaborated a comparison between the four platforms based on the data collected for each one. For each type of feature, we highlighted the advantages and the gaps for the platforms and the suitability for a lifelong user profile.

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Maria CONACHE had graduated the Faculty of Cybernetics, Statistics and Economic Informatics, Economic Informatics specialization, within the Bucharest University of Economic Studies in 2014. She is currently enrolled at the Economic Informatics Master program organized by the Bucharest University of Economic Studies. Her main interest topics are programming languages, data structures, mobile applications and enterprise systems.

Ramona DIMA had graduated the Faculty of Cybernetics, Statistics and Economic Informatics, Economic Informatics specialization, within the Bucharest University of Economic Studies in 2014. She is currently enrolled at the Economic Informatics Master program organized by the Bucharest University of Economic Studies. Her main interest topics are programming languages, data structures, mobile applications and enterprise systems.

Andreea MUTU had graduated the Faculty of Cybernetics, Statistics and Economic Informatics, Economic Informatics specialization, within the Bucharest University of Economic Studies in 2014. She is currently enrolled at the Economic Informatics Master program organized by the Bucharest University of Economic Studies. Her main interest topics are programming languages, data structures, mobile applications and enterprise systems.

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