Future of Online Higher Education

Insights in Engineering Leadership White Paper

Abstract

Massive Open Online Courses (MOOCs) promise to democratize higher education. Their altruistic goal is to deliver high quality education to anyone in the world who wants it, for free. While the industry is fast-growing and in 2013 the enrollment numbers hit five million, the success of MOOCs as measured by course completion is yet to be seen. Furthermore it is unclear if and how MOOCs will be a profitable business. In this paper we follow three major MOOC providers in the higher education segment - Coursera, Udacity, and edX. Each of these companies has a unique focus, and each is testing the market and shifting its strategies to find a road to success and profitability. There is still a lot of uncertainty in the future of MOOCs, but it is an industry with a lot of momentum and many possibilities.

Number: 2014.4.11
Date: April 11, 2014

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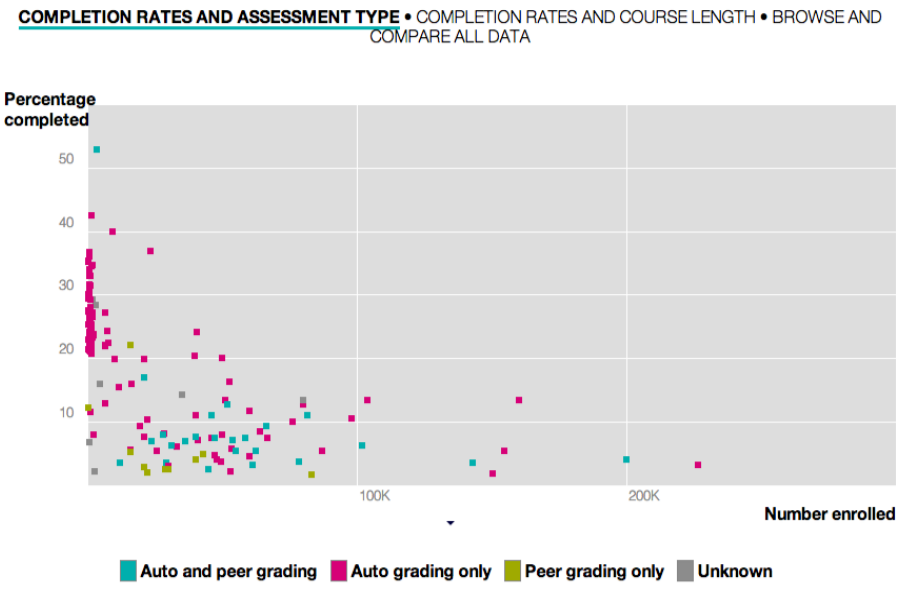
Section I: Introduction

The technology to offer courses online, or free, is not new. MIT OpenCourseWare started offering MIT courses online for free in 2002[1]. However, these courses were unidirectional, and the course material was text only. The professors published slides, lecture notes, and problem sets. The students worked on the homework and there was no interaction with the other students or the professor.

Present day, Massive Open Online Courses (MOOCs) are different. They are high quality education made to scale. Lectures are recorded in specialized studios that maximizes sound and illustration clarity[2]. Students interact with the course and other students in a number of ways, including homework submission, project feedback, peer-to-peer or automatic grading, and student forums. MOOC providers can even virtually proctor exams and issue verified certificates to students who complete the course.

Although the MOOC movement for higher education only started in 2012, it is quickly gaining momentum. The total MOOC enrolment in 2013 is estimated at between 3.6 million and 5 million[3]. Three major companies are emerging as leaders in this sector: Udacity, Coursera, and edX. While they all want to provide high quality higher education to the masses, each has a different focus.



MOOCs face many challenges. One major difficulty is a low course completion rate. A recent study found that only 7% of the students in MOOCs actually finish the course[4]. Another obstacle is in building and sustaining an intellectual community. Due to the lack of in-person interaction between the students and the professor, or among the students, some subjects suffer greatly from the lack of open debate and discussions. (Graph from http://www.katyjordan.com/MOOCproject.html. Each point represents completion rate and enrollment number for a

[1] http://ocw.mit.edu/about/our-history/

[2] http://www.quora.com/Udacity/How-are-Udacity-videos-recorded

[3] ITC Network

[4] FastCompany

unique course.)

University partnership is an integral part of the MOOCs movement. But the model under which MOOCs and universities can best cooperate is still being tested. Regular university courses already heavily use the internet for course administration, correspondence, and even peer-to-peer help forums. Now, universities have the opportunity to lower the cost of offering courses by using MOOCs. However, it is unclear what student population can be best served by this model, and how the role of the professor will change. Furthermore, according to Andrew Kelly, the director of the Center on Higher Education Reform at the American Enterprise Institute, the majority of people who sign up for MOOCs already have a bachelor's degree. "The sort of simplistic suggestion that MOOCs are going to disrupt the entire education system is very premature," he says.

Companies are eager to use MOOCs to deliver training material to their workforce. Corporate training is a big market. Human resources research firm Bersin by Deloitte reports that companies spend anywhere from $200-$3,000 per employee, per year on training. The global market for employee training is valued at $135 billion, or $62 billion in the U.S. alone.[5] In addition to corporate training, companies also want to use MOOCs to establish a reliably high quality hiring pipeline. It stretches beyond the traditional college recruiting and gives firms the ability to source from a more international and geographically diverse candidate pool.

Section II: Existing Market

All MOOCs platforms offer the basic course material for free, but will charge the student for "premium services" such as certification. We will discuss how Udacity, Coursera, and edX are testing the market, and how they will make money.

Udacity

Udacity grew out of Stanford online computer science courses. Udacity is a for-profit organization that focuses on computer science and technology courses.

San Jose University Experiment

In January of 2013, Udacity partnered with San Jose University to pilot five entry-level and remedial courses entirely online for college credit. In this model, Udacity offers a completely online alternative to the university's standard curriculum. State universities are very interested in this setup, because the online model drastically reduces the cost of offering

[5] http://upstart.bizjournals.com/companies/innovation/2013/11/23/coursera-eyes-corporate-education-market.html?page=all

courses. However, the San Jose University partnership was suspended in July of 2013 because in all five courses, more than half of the students failed their final exams. In one class, 75% of the class failed the final exam.[6]

The exact reason for the high failure rate is not clear, but school officials and Sebastian Thrun, Udacity's co-founder, think it's because the students are not academically prepared for this delivery format. "These were students from difficult neighborhoods, without good access to computers, and with all kinds of challenges in their lives," he says. "It's a group for which this medium is not a good fit."[7]

Udacity was initially torn between collaborating with universities and working outside the university system. This experiment helped them understand MOOCs cannot easily replace remedial courses, where students need extra help to stay engaged. In future university partnerships, they focused on a more mature student body (graduate degrees and professionals).

Sponsored-course Model

Starting in late 2012, Udacity partnered with companies like Google, Autodesk, and Nvidia to build curriculums to teach people how to program on their application programming interfaces (APIs). For example, Google wants to attract developers to its chrome and android platforms, and partnering with Udacity is the perfect way to train this workforce. The companies pay to produce the classes, and they pledge to recognize certificates awarded by Udacity for the purpose of employment. "At the end of the day, the true value proposition of education is employment," Thrun said in an interview[8].

A major outgrowth of the sponsored-course model is the recently announced partnership with Georgia Institute of Technology and AT&T. In March of 2014, Udacity announced a partnership with Georgia Institute of Technology to offer a Masters of Science degree for less than $7,000, less than 1/7th of the out-of-state tuition for the same program. In this partnership, Georgia Tech is in charge of admitting students into the program and degree granting. The lectures are produced by Georgia Tech professors. It is the first accredited degree to be awarded by the MOOC delivery platform. AT&T is sponsoring the program by putting up $2 million in seed capital. AT&T sees this partnership as an "AT&T deal" because they plan to send a large number of its employees through the program, as well as tapping into its graduates for a fresh new pool of well-trained engineers.

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6 http://www.slate.com/blogs/future_tense/2013/07/19/san_jose_state_suspends_udacity_online_classes_after_students_fail_final.html

7 http://www.fastcompany.com/3021473/udacity-sebastian-thrun-uphill-climb

8 http://www.fastcompany.com/3021473/udacity-sebastian-thrun-uphill-climb

Monthly Subscription Model

Initially, Udacity charged students $89 for a verified certification at course completion time. However, Udacity recently went to a monthly subscription model and is now charging $150 per course per month. The subscription fee covers certificates, as well as projects, project feedback, code reviews, and coaching. This fee structure should strengthen student engagement, because students are essentially re-committing to the course every month.

Potential Competitors

If Udacity's degree granting program with Georgia Tech succeeds, Udacity will come into direct competition with traditional universities. As it stands, Udacity is already in competition with for-profit online and offline schools such as the University of Phoenix, ITT Tech, and continuing studies and professional education programs such as UC Extension and Stanford Continuing Studies.

Udacity's edge over the traditional university degree programs is its lower cost. Partnership with brand-name universities and companies offers it an edge over the for-profit schools such as University of Phoenix.

Coursera

Coursera is a for-profit company founded by Stanford professors Andrew Ng and Daphne Koller. The company started in April 2012 and initially had four university partners: Stanford, Princeton, University of Michigan, and University of Pennsylvania.

Coursera is a platform company. The course content on Coursera is provided by the universities. Coursera provides participating universities a list of potential ways to generate revenue, including verified certification fees, introducing students to potential employers and recruiters (with student consent), tutoring, sponsorships and tuition fees.

Multidisciplinary

Coursera's focus is on partnering with elite universities around the world and hosting the world's expert knowledge. To date, they have a total of 108 university or institutional partners, 6.3 million students in enrollment, and 600 courses in 13 different languages. Coursera courses cover a very wide range of subjects, including Arts, Economics, Law, Math, Medicine, and Music.

Certification

Similar to Udacity, Coursera also started off with the basic model of offering per-course verified certificates. Coursera offers proctored exams via ProctorU, a live online proctoring service that connects proctors and students via webcam. In September of 2013, they

announced they had earned $1 million in revenue from this program.[9] This signature track model was later expanded to "Specializations" in January 2014. Specializations is a multi-course certification program that combines courses from top institutions in the world. A student can earn a specialization certificate in areas such as Cybersecurity, Systems Biology, and Mobile Cloud Computing with Android.

Global Content, Global Audience

Coursera hosts courses in many different languages. In this way, Coursera offers the top experts in any field anywhere in the world a platform to teach the world. For example, there is a class on ancient Chinese literature class taught by a Chinese scholar, in Chinese. Coursera is also translating the course content into multiple languages via a Global Translation Partners program, which they announced in May of 2013. Coursera's long-term goal is to have their platform localized to global audiences. In October of 2013, Coursera teamed up with the US State Department to create "Learning Hubs" all around the world.[10] Learning Hubs are places students can go to get Internet access to free courses supplemented by weekly in-person class discussions with local teachers or facilitators.

Corporate Partnership

In June 2013 Yahoo! set up a program to sponsor its employees to take class through Coursera. Continued education is important in the technology sector because the pace of innovation is fast. In this partnership, Coursera supplied the content and the platform. Yahoo is using it for corporate employee development.

Potential Competitors

One can say the international reach of expert content is a new market. Thus far, if a person wants to learn a specialized subject where the experts live in a foreign country from oneself, the only option is to basically to learn the language, move to that country, and enroll in the graduate program where the experts are. Most people give up. Coursera enables people to obtain the knowledge wherever they are. If virtual jobs follow, this trend can perhaps alleviate brain drain from parts of the world. On a more local level, Coursera competes with personal enrichment, professional development programs currently offered through outlets like Stanford Continuing Studies and UC Berkeley Extension.

edX

edX started in May 2012 as a non-profit organization funded by Harvard and MIT. They started the platform as a vehicle for research, to explore alternative education models. edX's

[9] http://en.wikipedia.org/wiki/Coursera

[10] http://www.nytimes.com/2013/11/01/education/us-plans-global-network-of-free-online-courses.html?hpw&_r=1&

platform is open-source and hosted on GitHub. The content is supplied by partner universities. The courses are synchronous, meaning it has a fixed start and end date and all students go through the material approximately at the same pace.

Blended Classrooms

edX's focus is on improving learning within the university framework. They use a "blended learning" model, where traditional classes are augmented with an online interactive component. Each week, edX releases a new learning sequence for a given course. The learning sequence is composed of short videos interspersed with exercises where students can practice the concepts immediately. In 2013, edX partnered with San Jose State University (SJSU) to offer 6.00xL Introduction to Computer Science and Programming as a blended course at SJSU. Initial results showed that, compared to previous semesters, fewer students fail. The percentage of students required to retake the course dropped from 41% under the traditional format to 9% for those taking the edX blended format[11].

Certifications

The online version of edX issues verified certificates upon completion of a course but the certificate does not equate to course credit from the course partner university.

Potential Competitors

Since edX is more focused on supplementing traditional university courses, they are likely to compete with traditional course management software like Blackboard and Instructure. These companies currently supply course management, communications, and forums. It doesn't make sense to host course content and administration on two different servers. It will be very natural for edX to take over these markets.

Section III: Technology

MOOCs are pushing the frontier on scaling education. A typical MOOC class has 20,000 students[12]. One MOOC has enrolled as many as 230,000 students at once. While it is relatively easy to deliver lecture videos online, many new components are necessary to make an online classroom work well.

Grading

[11] http://en.wikipedia.org/wiki/EdX

[12] http://www.katyjordan.com/MOOCproject.html

In order for potential employers to trust the degree or certificate granted by an online entity, the student's knowledge on the subject will have to evaluated fairly. This is hard to do when students are not physically present in a room. Most MOOCs either automatically grade homework assignments, or employ a peer-to-peer grading model. At Udacity, programming assignments are graded automatically by executing the student's code in a sandboxed environment on Amazon Web Services[13]. Where automatic grading doesn't work, MOOCs usually ask students to grade one another's homework. This works by first anonymizing the assignment submissions, then asking each student to follow a detailed rubric to assign a score and give feedback on another student's work[14].

Exams

MOOCs are giving rise to exam proctoring software.[15] This is how MOOCs can ensure the coursework is being completed by the student who claims to be taking the course. Most certification granting programs will charge a fee to virtually proctor exams. ProctorU is an example of a company that connects proctors and students to facilitate realtime video proctoring. It charges $60-$90 per exam. Software Secure is another company that solves the proctoring problem by recording the exam, then later have three proctors watch timelapsed videos. By using this optimization, Software Secure lowers the cost of proctoring an exam to $15.

Analytics

Every interaction the student has with the online course is digital and logged, so there is lots of data to mine for meaningful patterns. Each MOOC platform runs its own analytics on student engagement and success metrics. In addition, the ALFA group at MIT offers MOOCdb which provides a platform for analyzing course offering data[16].

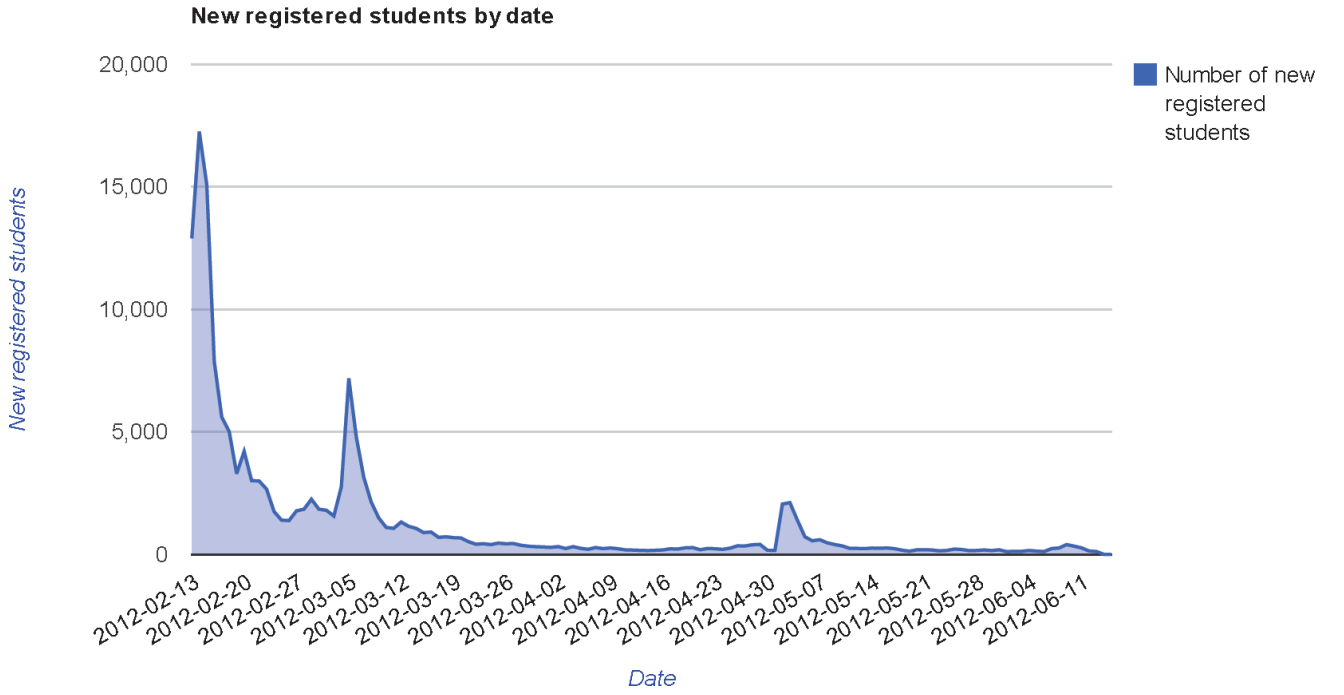
[13] http://www.quora.com/Udacity/What-is-Udacitys-technology-stack

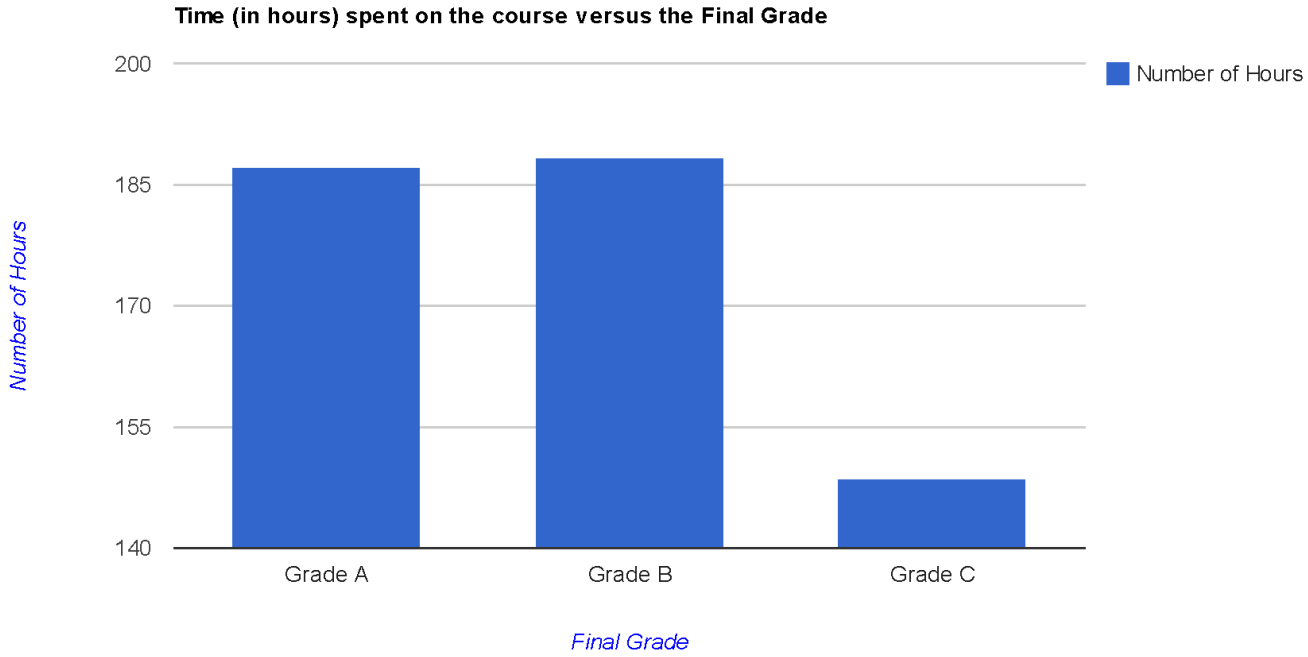
[14] http://help.coursera.org/customer/portal/articles/1163294-how-do-peer-assessments-work-

[15] http://www.nytimes.com/2013/03/03/technology/new-technologies-aim-to-foil-online-course-cheating.html

[16] http://groups.csail.mit.edu/EVO-DesignOpt/groupWebSite/index.php?n=Site.MOOCResearch

Examples of the types of analytics available through MOOCdb. These figures were generated for edX 6.002x: Circuits and Electronics (Spring 2012), which had 154,763 registrants and a final certification count of 7,157.





Section IV: Broad Contextual Factors

The rise of online education is fueled by a number of broader factors:

Rising Costs of College Education

College costs have been rising at roughly 7% per year for decades.[17] College costs have risen much faster than family income. Affording these costs is a severe challenge for a large portion of the U.S. population and is a factor in why only a small fraction of the population receives a college education.

Demand for Job Retraining

From 1990 to 2010, goods-producing industries such as mining, construction, and manufacturing lost 6 million jobs while service-producing industries gained 24 million jobs.[18] From 2010 to 2020, industries such as healthcare and social assistance, professional and business services, and construction are projected to grow rapidly while manufacturing is expected to continue its decline.[19]

The flow of jobs from one sector to another results in a demand for retraining. The needs of the population in this segment tie directly to the prospect of (near-term) employment using the skills gained in the retraining program. Online education offers some particular benefits for this segment of the population - the temporal shifting flexibility and ability to access content ubiquitously makes it possible to intersperse the retraining with other activities such as part-time or full-time work, job search, and the like. The opportunity cost for this group is fairly high and the time-saving aspects of online education are important.

Demand for retraining for women who leave the workforce due to childbirth and child-rearing. Over 25% of women quit work or are let go following a childbirth.[20] While many of these women subsequently return to the workforce within a year, a significant number choose to return to the workforce after a much longer gap. Like other workers needing retraining, the temporal shifting and ubiquitous content access aspects of online education are particularly attractive to this segment.

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[17] http://www.forbes.com/sites/steveodland/2012/03/24/college-costs-are-soaring/

[18] wolframalpha query: “jobs by industry from 1990 to 2010 in the u.s.”

[19] “Industry employment and output projections to 2020,” Richard Henderson, Monthly Labor Review, January 2012, http://www.bls.gov/opub/mlr/2012/01/art4full.pdf

[20] Table 5, “Maternity Leave and Employment Patterns of First-Time Mothers 1961-2008,” Lynda Laughlin, October 2011, U.S. Census Bureau, https://www.census.gov/prod/2011pubs/p70-128.pdf

Global Economy

Vast swathes of rural America are underserved in terms of quality education.
Access to quality education in the developing world is difficult to come by. Online education has the potential to provide students in the developing world with access to skills and mentors.
This will have the effect of growing the global labor pool of qualified talent.

Section V: Today vs. Future

Market Projection

From the U.S. Dept. of Education Digest of Education Statistics 2012

- the gap between the numbers of High School graduates and Bachelor's degrees per year is about 1.6M
- the gap between the numbers of Bachelor's degrees and Masters degrees per year is 1M
- assuming these markets can be served at a cost of $6000 per degree, the total market size is around $15 B

Additionally, corporate training in the US is a $62B market.

If online education has a 10% penetration rate into these markets, that would work out to about $8B per year. Including the global market could double this number.

The Unbundling Of Education

As discussed in a blog post by Aswath Damodaran, in addition to classes and course material, traditional educational institutions "bundle" services such as screening for quality, structured degree programs, student networking opportunities, career placement, entertainment, and life skills.

It is difficult for online education to match traditional universities in many of these aspects in the near or medium-term. For example, replacing the brand-value of education at a top-tier university is not going to be easy. Conversely, traditional educational institutions that provide fewer of these hard-to-replace services are more likely to be disrupted earlier.

Given the broad context of rising costs, flow of jobs between sectors, and global demand for quality education, online education as well as surrounding online and offline entities will continue to evolve to meet these challenges, with blended educational experiences featuring in this continuum of evolution.

Section VI: Summarize and Predict Opportunity

The three major players in higher education MOOCs: Udacity, Coursera, and EdX, have each focused on addressing a different part of the market. Udacity chose to focus on a technical curriculum that has tight corporate partnerships. They're building a channel where certification leads to jobs. Coursera on the other hand is globally-minded and volume driven. They source their content from a wide range of topics and partners. The content is in turn translated and made available to the world. While Coursera is steadily building up their platform and broadening their reach, it is still unclear if they will make money beyond charging for certification. EdX is the university's response to MOOCs. The courses are provided by the university and are synchronized to the university's academic calendar. EdX's aim is to supplement a university education.

MOOCs are a relatively new phenomenon in a field with a vast history. We expect the field to grow and evolve over the next several years, including the potential arrival of new players.

Industry partnership will represent a key element of the evolution of online education. Signs of this trend are already seen in the Udacity pivot.

Developing countries will benefit enormously from MOOCs. Large tracts of the developing world are underserved by quality education providers, and online education is one of the few ways to rapidly scale to meet the demand.

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Berkeley

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