THE OBSERVATORY
on Borderless Higher Education

MOOCs and disruptive innovation: The challenge to HE business models

Individuals adapt to new technologies easily (and seem to welcome the added stress they generate) but institutions need to work out responses in order to retain a competitive edge – or even relevance. All industries have to cope with the disruption of the unfolding digital revolution, and education is no exception.

Universities started making their courses and degrees available online in the 1990s. It is now commonplace,[1] and universities take pains to emphasise that degrees taken online are the same quality as those taken on-campus, and that the diplomas and transcripts contain no references to how they were obtained.

Online is no longer new and the real disruption now is not in the technology *per se.* It is rather in how new technologies are combined and offered, in the consequent experimentation in business models, and in the challenge this poses to centuries-old pedagogical methods.

This multi-faceted disruption can be seen in the new wave of MOOCs. The arrival of 'massive open online courses' appears to be another tectonic shift in the evolution of higher education and HE internationalisation. MOOCs are free of charge, designed for large numbers of people to take them at once, encourage peer-to-peer learning, and award certificates rather than academic course credit. This article, the first of a short series on disruptive innovation in HE, describes three new start-ups – Coursera, edX and Udacity – and explores the challenges they pose to traditional models of delivery in higher education.

Before MOOCs

The MOOCs acronym is fairly new but its precursors arose more than a decade ago at the height of the dotcom boom. They were 'open access' in that they targeted learners beyond the registered student bodies, but they were lower-cost rather than free offerings and were designed explicitly to open new revenue streams for universities. NYUonline, a for-profit 'distance-learning' company owned by New York University, targetted businesses as clients – apparently unsuccessfully, as it spent $25m in three years of operation and folded in 2001.[2] The *Chronicle* reported a number of potential causes: poor market research on what courses companies wanted for their employees, trouble running like a business while being run by a university bureaucracy, a failure to communicate between the sales and production teams, and difficulty in securing venture capital because of the recession. Also closed in the same year were UMUConline, the for-

[1] In the US, 91% of two-year colleges and 60% of private, four-year colleges surveyed by the *Chronicle* in August 2011 said they had some online course provision. See 'College Presidents Are Bullish on Online Education but Face a Skeptical Public', *Chronicle of Higher Education*, 28 August 2011 (chronicle.com/article/College-Presidents-Are-Bullish/128814/)

[2] 'Debating the Demise of NYUonline', *Chronicle of Higher Education*, 14 December 2001 (chronicle.com/article/Debating-the-Demise-of/23290/)

profit arm of University of Maryland University College, and Virtual Temple from Temple University.

The Observatory reported in 2003 on the collapse of Fathom, a high-profile and for-profit e-learning portal launched in 2000 and led by Columbia, with Chicago, Michigan, LSE, Cambridge University Press, the American Film Institute, and other partners including the New York Public Library, British Library and a number of museums in London. Columbia invested $18m initially and a further $7-10m in 2001. It attracted 65,000 students to 2000 online courses in three years, which sounds pretty good. A typical online seminar cost $45 to participate in. Fathom's president said in 2001 that rumours of its death were exaggerated and that two more years were required to show viability. It failed to generate enough revenue and was dissolved in 2003. Its archive of videos was still operating a recently as two weeks ago (www.fathom.com) but has apparently now been taken down.

The Observatory speculated that Fathom had lacked focus by offering provision across a huge range of subjects from a diverse group of partners, providing both credit and non-credit professional and general interest courses, and tried to sell them to everyone from alumni to the retired.

We further noted tensions between Fathom and Columbia and an uncertainty about the viability of the online market, particularly for more prestigious institutions: 'One might say that Fathom, launched in the dying days of the dotcom boom in April 2000, was burdened with unrealistic expectations. At that point, it was assumed that online learning was relatively straightforward, market-ready and would meet consumer demand. Experience has prompted a more cautionary and developmental approach, but the status, investments and sheer expectation surrounding Fathom meant insufficient time to learn those lessons'.[3]

In the UK, about £35m of public money was put into developing a new platform for an ill-fated UK's e-university experiment (UKeU) between 2000 and 2004. Its aim was to recruit thousands of students worldwide to take UK degrees. It took years to be in a position to recruit; it attracted 900 students by the end of 2003 against a target of 5600 and the plug was pulled in 2004 amidst recrimination outlined in a parliamentary report.[4]

The Observatory also reported in 2006 on the collapse of AllLearn, a not-for-profit online collaborative venture of Yale, Oxford, and Stanford, which started in 2001, and which more closely resembled the current MOOCs. The offerings of non-credit courses in general humanities and social sciences were not entirely free, with initial tuition fees of $250. Princeton was initially involved but withdrew because of low enrolments; although there were some 70,000 students, it was apparently not convinced that online's time had come.

[3] 'Fathom, Columbia University's e-learning venture, to close. What went wrong?' The Observatory, January 2003 (www.obhe.ac.uk/documents/view_details?id=589).
[4] See www.immagic.com/eLibrary/ARCHIVES/GENERAL/UK_PARLM/C050221R.pdf and www.educause.edu/ero/article/real-story-behind-failure-uk-euniversity

Online models today

A number of online models currently operate. The California-based University of the People (www.uopeople.org), a not-for-profit and unaccredited institution, opened in 2009. It is not strictly open-access in that it has the entry requirement of high school or equivalent. It is tuition-free but charges admissions and exam processing fees. It offers Associate and Bachelor degrees in Business Administration and Computer Science; there are plans to offer training in nursing, community health and teaching. It is partnered with Yale Law School (for research on online education) and Hewlett-Packard (for internships online), but the eye-catching bit is its agreement with NYU for potential articulation to NYU Abu Dhabi after one year at UoPeople, presumably of interest to students in the Gulf. It has admitted only 1500 students to date from around the world (average age 32); this figure will presumably increase rapidly if UoPeople succeeds in its bid to secure accreditation from an agency recognised by the US Department of Education.

UoPeople is a member of the OpenCourseWare (OCW) Consortium, a one-stop shop for hundreds of online HE providers and associated institutions in 46 countries, some of which, like Japan, Korea and China, have their own OCW consortia. Spain has 40 members in the OCW Consortium, Korea 23, India two, and Germany none.

The best-known OCW initiative is that of MIT, launched in 2002. MIT OCW contains almost all MIT course content online and has had more than 100 million visits. About 60% of traffic to the MIT OCW site originates outside North America, with significant levels from East Asia, Europe and South Asia. Like other OCW schemes, it is an archive only: it leads to neither credits, degrees nor certificates; it requires no registration or enrollment; it provides no teaching or access to academic staff.

There are further online models. Straighterline (www.straighterline.com), an internet HE provider based in Baltimore, delinks provision from accreditation. It offers online courses for $99/month and has some 30 partner colleges that accept the credits toward their qualifications. It is easy to see that if this unbundling of credentials from provision became generalised, the business model on which universities have been built becomes unstuck.

iTunes U and YouTube provide two platforms for online lectures and courses. iTunes U launched in 2007. It hosts some 1000 universities and colleges worldwide, of which half distribute their content publicly on the iTunes Store.[5] About three-quarters are American, and according to Apple, there have been more than 700 million downloads of its content. The Open University has reached 40,000 downloads per day and its total of about 50 million is surpassed only by Stanford. YouTube EDU contains video content from about 500 colleges and universities, and Ivy League universities top the most-viewed list. Promotional and recruitment videos feature as part of the content of both iTunes U and YouTube EDU.

[5] 309 are listed at www.4icu.org/itunesu/index.htm.

MOOCs

MOOCs repackage all of the above approaches and platforms into free courses that require registration, may have some entry requirements, offer interaction with teachers and other students, and provide completion certificates. The University of Manitoba is credited with having offered the first MOOC in 2008 (it was credit-bearing for 24 students at the university and non-credit for 2200 registered for free online)[6] but real disruption came from Stanford in autumn 2011, when a free online course on artificial intelligence by Peter Norvig and Sebastian Thrun attracted more than 160,000 students from every country except North Korea (23,000 completed the course).

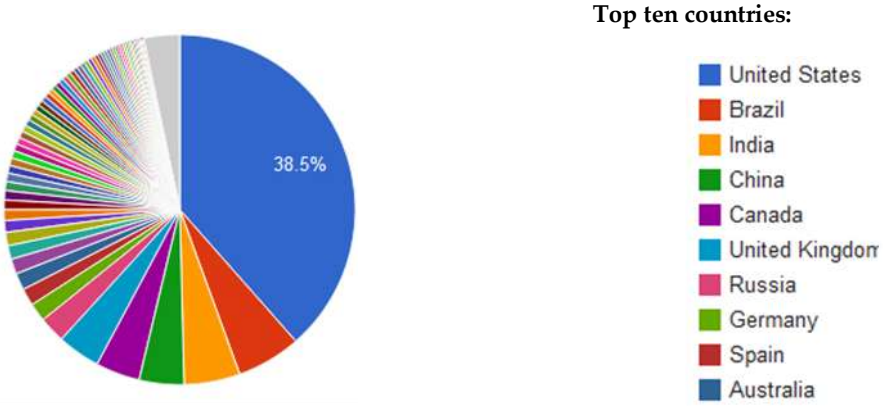
This paper now looks at three MOOC companies that have since developed.

Coursera

Coursera (www.coursera.org) was started in April 2012 by Daphne Koller and Andrew Ng of Stanford, who had developed the university's online platform for Thrun's course. Coursera is for-profit and was developed with $16m in venture capital; a further $6m in cash and equity investment has come from some of its university partners. The first four universities involved were Stanford, Princeton, Michigan, and the University of Pennsylvania. It has taken off quickly: it offers courses (119 and counting) from a consortium of universities (19 and counting) that includes Duke, Caltech, Toronto, Edinburgh, IIT Delhi and EPFL in Switzerland (the last of these teaches in French). Courses include a wide range of subjects, from the expected computer science to the less-expected medicine, poetry, history and 'listening to world music'.

By mid-August 2012, more than 1 million registered for courses through Coursera. More than 1/3 of these were in the US; the next highest numbers, in order, originated in Brazil, India, China, Canada, UK, Russia and Germany. See the chart and table below:

Coursera – Origin of registrations, August 2012



Source: www.coursera.org

[6] www.lancs.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/PDFs/Mackness.pdf

Coursera completion certificates are at the discretion of participating universities but one consortium member, University of Washington, indicates that it will offer formal credit if students 'pay a fee, do extra assignments and work with an instructor'.[7]

Coursera courses are provided for free, and Koller describes it as a 'public-good mission'. It will nonetheless need revenue streams, and one presumes that these will be shared between Coursera and the participating universities according to some contract. One obvious income option would be to charge a modest fee for the completion certificates. Another is to charge a licensing fee to participating institutions. Another, for which there is already evidence elsewhere (see Udacity, below), is to sell CVs or access to a student database for potential employers.

For universities, motivations can be discerned through media coverage of Edinburgh's accession to the consortium. One Vice-Principal indicated that the university wished 'to be in early' on this latest wave of online delivery. The university website describes its first six offerings as 'taster courses' in higher education, which indicates that MOOCs are seen as potential pathways to degree study. Edinburgh also states that its completion certificates should be seen as valuable to employers or universities.

edX

edX (www.edx.org) is a rival consortium platform launched in May 2012. MIT and Harvard each put in $30m in seed funding and MIT also received $1m for edX in June from the Bill & Melinda Gates Foundation (which has also funded UoPeople and other open-access initiatives). Undisclosed funding came from MIT and Harvard alumni, including Jonathan Grayer, former chair and CEO of Kaplan Inc. UC Berkeley joined in July; it apparently lacks the budget to contribute but will serve as the inaugural chair of the 'X University' consortium.

Unlike Coursera, edX is a not-for-profit initiative overseen by an organisation governed by the universities themselves. edX is thus far smaller in scale than Coursera, though its website claims that more than 120 universities from around the world have expressed interest in joining.

MITx (the MIT part of edX) offered its first course in spring 2012 in circuits and electronics. About 155,000 students from 160 countries registered, with an age range of 14 to 74. *MIT News* reported that of this starting cohort, 23,000 tried the first problem set, 9000 passed the midterm, and 7157 passed the course.[8] The majority of the traffic on the MITx site came from the US, India and UK. Colombia was a surprising fourth; the next six were Spain, Pakistan, Canada, Brazil, Greece and Mexico.

The edX platform advertises seven courses for this autumn – in artificial intelligence, computer science, chemistry and electronics. Other subjects will appear in future. The completion certificates will be free at first, though a fee of about $100 (lower for developing countries?) is to be introduced at some point. Another similarity to Coursera's business plan is reported to be that

[7] See 'Universities Reshaping Education on the Web', *New York Times*, 17 July 2012 (www.nytimes.com/2012/07/17/education/consortium-of-colleges-takes-online-education-to-new-level.html)
[8] 'Lessons learned from MITx's prototype course', *MIT News*, 16 July 2012 (web.mit.edu/newsoffice/2012/mitx-edx-first-course-recap-0716.html)

edX may offer employers services for job recruitment. But the *Chronicle* reported in July on a major difference from the for-profits: the edX course software will be open-source and free to use and develop by anybody.[9]

The edX platform has the advantage of the world-class brands already involved, as well as MIT's established position in online education through MIT OCW. But the question is whether edX is more than an extension of the MIT OCW video archive. edX has 'automated quizzes, wiki-style forums, and a tailored assessment of progress'. Students will receive feedback on assignments and interact with peers in a curated forum. Access to academic staff means full labour costs; the issue will be the quality and quantity of such access.

Udacity

Udacity (www.udacity.com) is a more idiosyncratic venture than Coursera or edX. It is a for-profit start-up founded and run by Sebastian Thrun, who left Stanford to do so. He put in $2-300,000 of his own money and secured funding from Charles River Ventures (a backer of Groupon).[10]

Udacity offered its first course on creating an internet search engine to 100,000 students in early 2012 (10,000 apparently completed it, a 10% completion rate which is greater than that of MITx, above). It currently appears to offer 13 courses in computer science, maths, physics, statistics and artificial intelligence and offers no indication yet of extending into other subjects. When it had 112,000 students (there are 739,000 at time of writing), 1/3 were from the US, 1/3 from Brazil, Canada and eight countries in Europe and East Asia, and 1/3 from 185 other countries.

Udacity thus far has no affiliations with universities, which perhaps means it has more capacity to experiment with new ways of generating revenue. One such innovation is to ask students if they wish for their CVs to be handed to 'one of 20 partner companies'. The 20 are not named on the website but the fee would come from them rather than students. The company has also mooted assuming a more active headhunting role by matching its students to technology and engineering companies that pay for the service.[11]

This responds directly to the student debt problem. Josh Hall, Associate Director of the Washington-based Center for College Affordability and Productivity, thinks this is case: 'The ultimate driver of college costs and student debt is that students and families are willing to pay increasing amounts for a college degree. In the US, the federal government contributes to the problem by subsidising student loans. Online education takes advantage of some economies of scale. If enough colleges and universities are able to realise these scale economies, competitive pressure should be able to reduce the tuition cost of colleges.'[12]

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[9] 'Berkeley Joins 'edX' Effort to Offer Free Open Courses', *Chronicle of Higher Education*, 24 July 2012 (chronicle.com/blogs/wiredcampus/uc-berkeley-joins-edx-effort-to-offer-free-open-courses/37969)

[10] Speaking of which, National Louis University, a private, not-for-profit institution in Chicago, offered 60% discounts through Groupon on tuition for a postgraduate course in September 2011. The fine print indicated: 'Limit 1 per person, may buy 1 additional as a gift'.

[11] See 'Massive Courses, Sans Stanford', *Inside Higher Ed*, 24 January 2012. (www.insidehighered.com/news/2012/01/24/stanford-open-course-instructors-spin-profit-company)

[12] Personal communication to the Observatory, 16 August 2012

This could also be the basis for a new business model that allows institutions to generate revenue from employers and recruiters rather than students. In light of new trends in the global job market, most notably recruitment through social networks,[13] one can envisage this being copied, particularly by institutions that specialise in computer-friendly subjects with reliable standardised tests and grading.

As is the case with edX and Coursera, students have the option of certifying their participation. The certificate can be downloaded from the Udacity website for free but the major development here – another move for potential employers as well as a further revenue stream – is Udacity's tie-up with Pearson for final exams. It announced in June that for an $80 fee, students had the option of using Pearson Vue's 4500 testing centres worldwide for additional, supervised final exams.[14] That online learning is wide open to cheating might matter a little less if it is done only for enjoyment and personal knowledge. But for real-world credentials it clearly matters.[15]

Summary comparison of Coursera, edX and Udacity, August 2012

	Coursera	**edX**	**Udacity**
For-profit?	Yes	No	Yes
Partners to date	19 HE institutions, including 5 outside US	Harvard, MIT, UC Berkeley	Pearson Education for exams
Number of Students	1,100,000 +	155,000 + (MITx only)	c.739,000
Number of countries	Almost all	c.160?	Almost all
Origin of students	39% US; then Brazil, India, China, Canada, UK, Russia, Germany	US, India, UK, Colombia, Spain, Pakistan, Canada, Brazil, Greece	1/3 US; 1/3 from Brazil, Canada, Europe, East Asia; 1/3 from 185 countries
Fees	None yet	$100 for completion certificate after autumn 2012 cohort	$80 for Pearson test (optional)
Funding	$16m venture capital; $6m from partners	$30m each from MIT & Harvard; $1m from Gates Fdn; more from private partners	Charles River Ventures, Sebastian Thrun (amounts unknown)
Credit towards degree	No (though 1 partner to do so?)	No (certificate of mastery)	No (certificate)
Subjects	Multidisciplinary, including medicine, arts and humanities	Artificial intelligence, computer science, chemistry, electronics (more to come)	Maths, statistics, computer science, sciences

[13] See 'Log in or drop out', *The European*, 3 May 2012. (www.the-european.eu/story-501/log-in-or-drop-out.html)
[14] udacity.blogspot.co.uk/2012/06/udacity-in-partnership-with-pearson-vue.html
[15] See 'Dozens of Plagiarism Incidents Are Reported in Coursera's Free Online Courses', *Chronicle of Higher Education*, 16 August 2012 (chronicle.com/article/Dozens-of-Plagiarism-Incidents/133697).

Analysis

There is a new game in town: these three rival platforms alone show how quickly the HE landscape is changing. Many early online initiatives failed. Universities were once wary of how online learning could ruin their brands; MIT and a few others were the exceptions. Now that the top universities in the world are piling aboard, the worry is of being left out.

But risk mitigation remains part of the game. Universities are queuing up to work collaboratively. Joining consortia is a rational way for universities to share the cost and reputational risk of online provision. Hedging bets can also be seen in UC Berkeley, for example, signing up for both edX and Coursera, rivals in the new market space.

Udacity, a stand-alone venture, is different. Its success is being wagered on the reputations of individual academics rather than institutional brands, and on the supply of entrepreneurial and unshy academics who wish to increase their exposure by a factor of hundreds. The first paragraph on its website lays it on the line: 'You learn by solving challenging problems and pursuing udacious [help!] projects with world-renowned university instructors (not by watching long, boring lectures).'

The major innovations with MOOCs are not the elements of access to academic staff, peer interaction, wiki-style forums, and automated assessment. These are all part of the online offerings of traditional universities over the last few years. The disruptive innovations are shifting costs from students to institutions, shifting costs from students to future employers, matching students to jobs via a database or individually, and combining these with supervised, in-person exams at locations around the world.

The scale of MOOCs also means that if 1 in 10 students complete a course, a $100 completion certificate fee on a course with 50,000 students brings in $500,000. Udacity co-founder and CEO David Stavens was reported as saying that their overheads on a course with 160,000 students are covered by charging $1 per student. Unlike the degree-granting for-profits, they do not worry about students accessing federal financial aid.[16] The *modus operandi* of the traditional HE sector is taking a lot of money from a controlled number of students. With MOOCs it is charging hundreds of thousands of students a minimum fee.

Koller of Coursera calls it a 'real democratisation' of higher education. Do the low completion rates matter? They are certainly very poor when juxtaposed against traditional sectors. But that may not be relevant in this new world. Thousands more people are expressing interest in higher education and thousands more are learning and completing courses than otherwise would. There also seems to be little doubt that as institutions learn to integrate credits from MOOCs into degree programmes, starting numbers and completion rates will both rise.

Automated grading can be taken only so far and it is doubtful that anyone has yet come up with a way to do it for English composition. Even within the MOOC-friendly STEM subjects, assessing

[16] 'Massive Courses, Sans Stanford', *Inside Higher Ed*, 24 January 2012. (www.insidehighered.com/news/2012/01/24/stanford-open-course-instructors-spin-profit-company)

high-level mathematical analysis requires human experts. If the certificates or qualifications are to convey external value, this poses at least some limits to the scalability of MOOCs.

This leads to a real tension in how MOOCs will develop. They prioritise subjective participation over external arbitration and, as such, are part of our times. But the long-term success of the business model will depend on shifting that balance toward qualifications that are recognised and paid for. It is otherwise hard to see how any innovations in revenue streams will be sustainable.

Whom do MOOCs threaten? Elite institutions with global brands – and those with at least national prominence – will be least affected. They will always have markets for people – domestically and abroad – willing to pay for the elite model of education more taken for granted 10 or 20 years ago. It is also clear that many in this elite club of universities have calculated that there is little to lose in joining. For now, MOOCs extend their reach; for later, they may increase their intake onto degree courses and help to fulfil their widening-participation obligations. Universities could therefore use MOOCs as a way of determining whether disadvantaged groups or those with poorer school results might in fact thrive on their degree courses.

Do MOOCs threaten institutions that specialise in distance learning? The Open University's website says that its LearningSpace (600+ free online courses) is a 'great place to get an idea of what to expect from university study'.[17] This is exactly what MOOC consortium members are saying and no doubt the OU is considering its response.

Rahul Choudaha recently asked whether MOOCs could 'lead to the decline of branch campuses' and concluded that new branch campuses would at least face competition from MOOCs.[18] It is of course early days but it might be better to think of MOOCs and international branch campuses (IBCs) as independent internationalisation strategy options. Edinburgh is a case in point: it explicitly says it has no plans for IBCs but it does have an international online strategy that now includes MOOCs. On the other hand, a look at Coursera's consortium members shows that some (Berkeley, Duke, Johns Hopkins, Georgia Tech, EPFL) are pursuing both MOOCs and IBCs. Stanford also has its research centre at Peking University. While some may choose one or the other, MOOCs and IBCs are not mutually exclusive. Indeed, and as we have seen with NYU's articulation deal with UoPeople for NYU Abu Dhabi, these universities probably see MOOCs as a fresh recruitment pool for their branch campuses.

Flipping the classroom

But the most far-reaching impact of MOOCs may be pedagogical rather than in relation to internationalisation strategies and recruitment. MOOCs offer a scaled consortium model for teaching delivery and there is every reason to believe that such collaboration could be adapted for fee-paying students taking regular undergraduate degrees.

Online discussion forums are full of speculation that MIT and Stanford plan to ditch the big introductory undergraduate lectures for which attendance is low and, at many institutions,

[17] See openlearn.open.ac.uk

[18] *University World News*, 5 August 2012 (www.universityworldnews.com/article.php?story=20120731104930428)

optional. English 100 and Chemistry 101 is taught similarly in lecture theatres in many places, using the same sources. Some American universities have for years substituted video and linked PowerPoint presentations for lectures in introductory computer science courses, so that class time is spent on interaction and problem-solving. This 'flipping the classroom' or 'reverse teaching', as it is called, could conceivably be applied to universities across whole sectors. If introductory lectures were provided online *en masse* to a consortium of subscribing institutions, it would free resources to focus on hands-on seminar and laboratory teaching and learning.

Or indeed it could just mean employing fewer lecturers; as such, it is likely to be resisted by unions. Universities would still need academic expertise but the question is what kind and whether as much.

Some will argue that mass online delivery is not about learning – and they are correct insofar as it is no substitute for the intrigue and stimulation of face-to-face tutorial discussions with the smartest students and world-class teacher-researchers. But MOOCs tap into a thirst for knowledge. Add to that what governments and universities say about the need for widening participation in HE. The challenge will be how they manage to harness what is now available in a way that retains the purpose, value and relevance of higher education.

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