:: **Refereed Article A5:**

MOOCs as a disruptive force in online education

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Abstract

MOOCs - massive open online courses - have emerged as the dominant topic in online education in New Zealand and elsewhere. MOOCs have been variously described as a tsunami, a paradigm shift and a disruptive force to both place-based and online tertiary education. This paper offers a comprehensive description of MOOCs and discusses key disruptive aspects of MOOC-based education such as university/student disengagement, low completion rates, peer assessment and business models.

Keywords

MOOCs, massive open online courses, online education, disruptive technologies

1. Introduction

The 21st century university originated in the medieval courtyards of Bologna, Paris and Oxford (Thorens, 1996). Much has changed since then: the development of private universities, public universities and, in the last two decades, the for-profit university. Yet much has remained the same - a learned instructor still "professes" knowledge to students keen to learn, almost always in a face-to-face classroom. The chalkboard has been replaced by the PowerPoint slide and the scholar's notes have been replaced by textbooks and learning management systems, but in terms of the instructional process, the Bologna scholar could easily recognise the modern lecture hall.

Online education (OE) is the delivery of education and/or assessment by electronic media. OE includes digital video delivered by CD-ROM or the Internet, computer-based programmed learning, online tests and learning management systems such as Moodle.

Online education 1.0 is what Tushman and Anderson (1986) would call a competence-enhancing innovation. A competence-enhancing innovation introduces productive and positive change into the industry, almost always by the incumbents and to their benefit. In contrast, a competence-destructive innovation changes the industry in radical ways. The innovation usually comes from new entrants and to the detriment of the incumbents in the industry.

In OE 1.0, 50-minute lectures are recorded for viewing later, course materials are distributed by .pdf files and in online tests students tick boxes on computer screens rather than a mark-sensing card. Education is still mostly a one-way, one-to-many communication between a professor and students. Competence is enhanced because distance learning becomes easier, learning is more convenient and asynchronous and universities realise some cost savings. The only mildly disruptive impact of online education 1.0 is to increase competition in the industry. A key example of this is the increase in number and enrolments of the for-profit institutions in the United States, but online education was not the only or even the major reason for this growth (Lucas, 2012).

Online education 2.0 is just beginning and follows characteristics of Web 2.0 - learning takes place in many-to-many learning activities (students learn from each other in discussion forums and peer assessment), textbooks are replaced by the open education resources (OER) found on the World Wide Web and video lectures are 6-12 minutes long with embedded questions to enhance interactivity.

MOOCs (massive open online courses) are the first emergent forms of OE 2.0. This is especially true for cMOOCs, in which "participants in the course act as both teachers and students, sharing information and engaging in a joint teaching and learning experience through intense interaction facilitated by technology" (DegreeofFreedom, 2013). But other forms of OE 2.0 also exist, including new types of universities (e.g., Minerva University, Professor Direct, Saylor.org, entreversity.com).

In November 2012, the New York Times declared 2012 as "the year of the MOOC" (Pappano, 2012). A few months before Stanford President described MOOC-based education as a tsunami (Auletta, 2012) and since then MOOCs have been called a paradigm shift (Srikrishna, 2013) and a disruptive force to traditional university education (e.g., Gallagher & Garrett, 2013; Lucas, 2013; Mazoue, 2013).

This paper examines the key characteristics of MOOC-based education with an emphasis on the factors that make MOOCS a disruptive force in online education, including disintermediation of the university, peer-based assessment, low completion rates and the MOOC business model.

2. Massive Open Online Courses

A massive open online course tends to be self-descriptive in its name: massive open online course. This section describes a MOOC through its name, beginning with Table 1 that compares traditional placed-based university education with the MOOC model.

Table 1. What is Different about a MOOC?

Traditional course	Massive open online course
• Closed participation	• Open participation
• Formal setting	• Informal setting
• 50-minute lectures	• 6-12 minute interactive videos
• Content pre-prepared	• Content emerges (cMOOC)
• Lecture (one-to-many)	• Conversation (many-to-many)
• Paper-based textbook	• Internet resources
• Required assignments	• Assignments optional
• Teacher marks assignments	• Students or computers mark assignments
• For credit	• Credit optional
• Structured learning	• Connectivism learning

2.1. Massive

MOOCs tend to enrol hundreds, thousands and, in some cases, tens of thousands of learners. Of course, why not? MOOCs offer free university education online at the learner's convenience. Enrolling in a MOOC is as easy as opening an account at Coursera, edX, Udacity, Open2Study, FutureLearn or any of the other MOOC providers.

MOOC providers enable massiveness in the breadth of online offerings and learner management. At this early stage of MOOC development, typically a university offers 2-10 MOOCs. It would be prohibitively expensive for a single university to provide the infrastructure to enrol thousands of students, host the course videos and instructional resources, coordinate the assessment and issue certificates of completion for so few courses. Instead, universities partner with a MOOC provider who fulfils these tasks. The MOOC provider also provides a level of uniformity in course format and the learning management system that is used. In most cases, the university partners fund the MOOC provider (e.g., Australian MOOC provider Open2Study is funded by Open Universities Australia), but some providers also receive substantial grants from charitable foundations and venture capitalists (e.g., Coursera Secures, 2013).

One little-recognised aspect of the MOOC provider role is the potential disengagement of the MOOC learner from the university offering the MOOC. When the MOOC provider manages the learner's account, issues the certificate of completion and is well branded across the learning management system, the university/student relationship decreases in importance and the MOOC provider/learner relationship becomes paramount.

The distinguishing characteristic of massive in MOOC is that a MOOC has more learners than the instructor and/or teaching assistants can support in terms of learning guidance and assessment. Instead learner discussion forums replace in-class tutorials and, more controversially, computer-based assessment and peer assessment replace instructor-supervised assessment. This important topic is discussed in more detail later in this paper.

The learners who actually complete a MOOC are much less massive, between 19 and 0.8 per cent with an average completion rate of 6.8 per cent in one study of 29 MOOCs (Parr, 2013). This low completion rate is mostly attributed to the nature of MOOCs. Data analysis of participants in 86 Coursera-based MOOCs (Koller, Ng, Do & Chen, 2013) found 40-50 per cent of students who initially enrol never return to even watch the first video lecture. This large dropout rate is attributed to the curious ("browser learners") and the if-I-have-time learners who click the button

to enrol, but then do not have the time or inclination to return for any instruction.

Another 80-85 per cent of the lecture-watchers never submit an assignment, indicating the MOOC wasn't what they expected or they have achieved a satisfactory outcome by learning something without the need to earn a grade or even create any work ("passive participants"). In these MOOCs, only 5 per cent of students who registered for the courses achieved a certificate of completion. The Coursera-based authors of this study make no apology for this completion rate, concluding that "retention in MOOCs should be considered carefully in the context of learner intent" (Koller et al., 2013).

2.2 Open

Open is the key word in MOOC and it has a number of meetings. First, the most common definition means anyone with an Internet connection is allowed to enrol - open without costs, prerequisites or burdensome admission processes. Second, many MOOCs rely on open education resources (OER) freely available for viewing or downloading, either through formal sources such as the OER Commons or informal sources (e.g., TED talks, white papers). Learners also utilise OER in their discussions or assignments. Third, open means MOOCs typically use open access Web 2.0 resources such as Google Hangout, Twitter, Facebook and blogs.

Critics (e.g., Kolowich, 2012; Koutropoulos, 2013) have pointed out that materials created for or used in the MOOC are restricted for use outside the MOOC. For example: "All content or other material available on the Class Sites or through the Online Courses, including but not limited to on-line lectures, speeches, video lessons, quizzes, presentation materials, homework assignments... are the property of Udacity..... you may not copy, sell, display, reproduce, publish, modify, create derivative works from, transfer, distribute or otherwise commercially exploit in any manner the Class Sites, Online Courses, or any Content" (Terms of Service, n.d.). By a strict definition of these terms, learners turn over any intellectual property generated in assignments or discussion forums to this MOOC provider, Udacity. This is reinforced by the fact that learners are unable to access their own contributions to discussion forums and other course materials when the MOOC closes. MOOCs may use OER as instructional resources, but they don't reciprocate by opening their own resources to the education community. In the MOOC world, open is a one-way street, "we use open, but we don't do open".

Another criticism of most MOOCs is that they are not as open as originally envisioned. Stephen Downes and George Siemens originated the first MOOC as a platform for connectivism - an environment in which "knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks" (Downes, 2012, p. 85). These unstructured, let-the-learning-emerge-through-connections MOOCs are called cMOOCs. In contrast, almost all MOOCs offered through MOOC providers (perhaps 95% of all MOOCs currently on offer) are instructor-led MOOCs that follow the format of a traditional course. These are eXtended MOOCs or xMOOCs, indicating they are or could be extensions of existing in-class courses (Downes, 2013).

A third and significant criticism of the openness of MOOCs is that enrolment and participation is open and free, but verification and college credit for learning is not. The major MOOC providers have schemes (e.g., Coursera's Signature Track) that allow verification of course completion from the MOOC provider and participating institution. This is one of several ways MOOC providers are monetising MOOCs, discussed as a business model in the next section.

College credit is available, but only at institutions that have licensing agreements with MOOC providers, such at Antioch University (Antioch University, 2012), Georgia Institute of Technology (Horn & Counselman, 2013) and Georgia State University (New, 2013).

2.3 Online

All MOOC interactions - video lectures, discussion forums, assignment submissions, grading - are offered entirely on the Internet, thus online.

Not surprisingly, research is revealing that face-to-face interaction in MOOCs benefits learning. In one study, students who met with others enrolled in the course or sought help from an expert scored better than those who did not (Breslow et al., 2013). The researchers conclude "This is a noteworthy finding as it reflects what we know about on-campus instruction: that collaborating with another person, whether novice or expert, strengthens learning" (p. 20). MOOC providers recognise this and they commonly encourage off-line meetings (e.g., www.meetup.com/Coursera/Auckland/) and some MOOCs have online forums specifically for organising offline meetings.

2.4. Course

Like traditional courses, and with rare exceptions, MOOCs have both a starting date and an ending date (of 409 MOOCs on the Coursera Web site on 30 July 2013, only two were self-study). MOOCs

also have online quizzes, assignments and video lectures. These characteristics makes MOOCs more like traditional university courses and less like online education providers who offer lectures and other materials asynchronously on a continuous basis (e.g., MIT's OpenCourseWare, iTunesU, Khan Academy).

Few MOOCs offer learning substantial enough to equate what happens in the classroom. An analysis of 296 MOOCs available at Coursera on 30 July 2013 indicated that MOOCs length varies from 3 weeks to 19 weeks with a mean of 7.5 weeks, a median of 7 weeks and a mode of 6 weeks (another 113 MOOCs were listed as not open and/or course length was not specified). Coursera MOOCs also have a wide range of work requirements - 5-15 hours of work per week (Koller et al., 2013). An estimate of time commitment for an average Coursera MOOC is 75 hours (7.5 weeks at 10 hours per week). Time commitment requirements for for-credit courses vary between 120 and 160 hours (e.g., at Massey University a 15-credit course requires 150 hours). So an average Coursera MOOC is approximately half the time commitment of a typical university in-class course. Some MOOCs are much less. For example, Australia's Open2Study offers "mini-MOOCs" (Hare, 2013): four weeks of study at 2-4 hours per week equals only 8-16 hours of study per MOOC.

3. Disruptive Issues in MOOC-Based Education

As with most disruptive and transformational phenomena, MOOCs are not without controversial issues that are causing considerable discussion in the academic community. A few issues such as university/student disengagement, exceedingly low completion rates and the lack of openness in educational resources have been addressed above. Two issues - MOOC assessment practices and business models - receive more extensive discussion in this section.

3.1. MOOC Assessment

One of the major differences between MOOCs and traditional university courses is the lack of active instructor inclusion in assessment. Because one instructor and a few teaching assistants cannot mark hundreds or thousands of assignments from learners who don't pay fees, MOOCs use multiple-choice questions and peer assessment.

Many MOOCs embed multiple-choice questions (or true/false or fill-in-the-blank questions) in course videos to encourage learner engagement (Koller, 2012, 8m 30s). Many MOOCs also use multiple-choice questions for summative evaluation at key points during the MOOC and especially at the end of the course. A MOOC certificate of completion might be awarded on the basis of, for example, a learner has answered 60% of 50 multiple-choice questions correctly.

Multiple-choice questions are popular in MOOCs because they are easy to write, marked instantly by computer for immediate feedback to the student and produce a vast quantity of information that can improve course delivery (Koller, 2012, 14m 30s) and assessment (Koller, 2012, 9m 40s). Multiple-choice questions also have pedagogical limitations: questions and answers have to be non-ambiguous and they fail to assess key learning outcomes such as analytical thinking, creativity and writing ability.

Peer assessment is, if anything, even more controversial. In a typical peer-grading scheme a student marks 4-5 other assignments according to a simple rubric before he/she can receive a grade on his/her similarly marked assignment. Peer grading can be an effective assessment strategy that produces results similar to instructor-based assessment (Koller, 2012, 11m 18s). In a small-class study, a correlation of $r = 0.91$-0.94 between student-assigned and teacher-assigned grades was achieved with most student marks slightly less than teacher marks (Sadler & Good, 2006).

Considerable work is underway using large MOOC-based data sets to refine peer assessment in large-scale online courses. For example, Coursera is investigating how to assign assessments to peer graders to reduce cultural bias, how to incentivise graders to provide high quality feedback and how to control over grading or under grading (Piech et al., 2013).

3.2. Business Models for MOOCs

Why would any university give away for free what it has traditionally charged tuition?

Marketing is one key motivation. The first-movers in this revolution, such as Harvard, Stanford and Massachusetts Institute of Technology, are American universities attempting to re-brand themselves as global universities, expanding their reach to hundreds of thousands of new students in hundreds of countries. A report on the future of universities in Australia predicts MOOCs and similar trends mean "the likely outcome of the next 10-15 years is the emergence of a small number of elite, truly global university brands" (Ernst & Young, 2012, p. 10).

Marketing is also a key motivation for some institutionally-supported MOOC providers such as Open2Study. Open2Study delivers "taster" MOOCs (Hare, 2013) with explicit links to degrees

offered by Open University Australia members on each course page.

Social altruism is a second reason. Coursera describes itself as a social entrepreneurship company that "envisions a future where everyone has access to a world-class education that has so far been available to a select few" (About Coursera, n.d.). Coursera, edX and their associated universities openly promote stories of MOOC learners in India, Mongolia and The Gaza Strip who are benefiting from a university education, learning which is highly restricted or unavailable in their home countries.

MOOCs are also being monetised in several ways. Most MOOC providers are putting in place processes so that learners who complete the MOOC can pay to receive a verified certificate of completion, although how learners qualify for this certificate varies widely. The key to verification is to be reasonably sure the person who received the certificate is the same person who completed the MOOC's assessments. Coursera's Signature Track, for example, charges US$30-100 for students to receive a verified certificate of course completion. Udacity and edX have signed contracts with Pearson VUE, which has testing centres in 175 countries, for students to sit proctored exams to receive a certificate of completion, at a cost of US$100.

Another income stream is licensing MOOCs to mid-tier universities and polytechnics, and all major MOOC providers have at least one licensing agreement in place. A third source of revenue is charging fees to employers for access to top students and/or charging students for access to job placement services.

Commercial agreements are confidential, but the revenue generated from all of these schemes seems to go to support the MOOC provider, not the institution. With rare exceptions (e.g., the MOOC-based masters in Computer Science degree at the Georgia Institute of Technology (Horn & Counselman, 2013)), universities are providing the money to develop the MOOC, offer it and support the MOOC provider, all without any foreseeable stream of income. Instead intangible outcomes such as marketing potential, prestige building and social altruism are the basis for most business cases for MOOCs at most MOOC-offering institutions.

4. Conclusion

This study has described MOOCs in ways in which MOOCs are massive, open, online and courses; and ways in which they are not. The article has also proposed and discussed several ways in which MOOCs are disrupting online education.

Looking to the future, MOOCs are unlikely to replace traditional place-based education or even on-line education that is offered for degree credit; both are firmly entrenched in universities in New Zealand and the world. Instead, universities are likely to offer their own massive open online courses for marketing purposes and to use MOOCs from other universities as an educational resource (e.g., one New Zealand university already uses several modules from a MOOC on entrepreneurship as part of course delivery).

One continuing opportunity for MOOCs is to offer education in developing countries where higher education opportunities are scarce. An emerging opportunity for MOOCs is in delivery of education for continuing professional development (CPD). One can easily envision a MOOC that is offered by a professional society to its members with CPD credit for successful completion. Many MOOC characteristics - short, interactive videos, blended online and face-to-face discussion and even peer assessment - are ideally suited for this segment of the education market.

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