

The disruptive potential of the Massive Open Online Course

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Introduction

Massive open online courses (MOOCs) first appeared on the horizon of higher education in 2008, with the launch of Connectivism and Connective Knowledge (CCK08) facilitated by George Siemens and Stephen Downes (Downes, 2008). However, a number of open online courses were available before this date (Rodriguez, 2012). The term 'MOOC' is generally attributed to David Cormier, and was used by both Siemens and Cormier to describe an online course with large enrolments that was open not only in terms of enrolment, but also in terms of content, design, points of access, ways of application, and definitions of success (Weller, Siemens, & Cormier, 2012). In the years following CCK08, a number of MOOCs, which became known as cMOOCs, were based on this connectivist philosophy. They included CCK09, Personal Learning Environments, Networks and Knowledge (PLENK2010) and eduMOOC in 2011 (Rodriguez, 2012).

A watershed occurred in 2011 with the launch of CS221: Introduction to Artificial Intelligence, facilitated by Sebastian Thrun. This online course, which was a simultaneously run online version of Thrun's conventional Stanford face-to-face class, attracted online enrolments of over 160,000 students. Of these online students, 20,000 completed the course. In addition, of the 200 students enrolled in the conventional class, only 30 were attending lectures by the end of the course, with the rest opting to use the online resources instead (Thrun, 2012). This MOOC format, based on a more traditional didactic or transmission model of teaching, later became known as the xMOOC, a term that refers to the nature of the content, which 'extends' a traditional curriculum (Downes, 2013).

The large numbers of enrolments on CS221 and two subsequent Stanford MOOCs (Machine learning and Introduction to databases), the effect of the online offering on Thrun's classroom students, and the feedback from the online students, attracted the attention of academics, educators, and university business and policy managers (Rodriguez, 2012). Thrun himself was so convinced of the potential of MOOCs that he resigned his Stanford tenure to form the startup MOOC provider, UDACITY (Thrun, 2012). Interest in MOOCs escalated so quickly that the *New York Times* declared 2012 'The Year of the MOOC' (Boyd & Kasraie, 2013). Both UDACITY and a second startup, Coursera (also formed by ex-Stanford professors), were started with venture capital. In the same year, EdX, a self-funded non-profit provider, was formed by Harvard and the Massachusetts Institute of Technology. Since then, a number of universities around the world have entered into partnerships with these or other, newer consortia (The attack of the MOOCs, 2013).

The MOOC phenomenon has been a topic of frequent debate, not only in academia, but also in the mainstream press and in social media, and a number of issues are being discussed. Key aspects include the impact of MOOCs on university teaching practice, quality assurance, accreditation, and business models; MOOC types and taxonomies; the concept of openness; definitions of success and completion; and the role and development of learning analytics. Common to all of these issues is a discussion of the potential of the MOOC to disrupt the way higher education is organised and delivered.

MOOC taxonomies and theoretical foundations

MOOCs are usually categorised in two main groups: cMOOCs (connectivist MOOCs), which are based on principles of connectivism, openness, and participatory teaching; and xMOOCs (extended MOOCs), which tend to focus on pre-set course content with a more behaviourist approach to teaching (Conole, 2013; Downes, 2013).

The first cMOOC is generally regarded to be CCK08, which was launched in September 2008 and was designed according to connectivist principles. These principles state that learning is an immersive process that takes place in the creation, formation, and removal of connections (Downes, 2012) between individuals and groups, rather than within individuals alone. Early cMOOCs used the internet and online technologies to increase access to information and reduce content whilst increasing the role of learning through connection (Weller, Siemens, & Cormier, 2012).

A number of online courses existed before CCK08. However, Downes and Weller both argue that the transformation from online course to MOOC took place when they used the affordances of the web to create an effective distributed system based on the principles of autonomy, diversity, openness, and interactivity (Downes, 2012; Weller, Siemens, & Cormier, 2012). Downes proposes two things that separate the cMOOC from earlier online courses. Firstly, distributed technology means that there is not a central cMOOC site—the course takes place across a network of differently connected sites and services. Secondly, distributed knowledge means that participants create and learn in a system in which knowledge flows via a series of connected networks both to and from the individual, rather than being taught one fact after another (Downes, 2012).

Openness

Openness is a critical factor in the cMOOC. Although the subject of openness is a research topic in itself, it is worth noting briefly as it is a key point of difference between the cMOOC and the xMOOC. Proponents of the cMOOC discuss openness in broad categories, including transparency of design, content, and curriculum; open delivery; and ways of access and application (Weller, Siemens, & Cormier, 2012). These authors also present a strong case for open definitions of success and completion, arguing that success can simply be defined as a point at which a participant has gained what they wanted from the course, and completion can be measured by assessments designed by the participants themselves, rather than by the completion of a specific number of tasks or enrolment for a specific period of time (Weller, Siemens, & Cormier, 2012). This argument for open assessment has the potential to be particularly disruptive for universities, where assessment is traditionally strictly regulated and monitored, and programme funding can depend on pass rates.

Downes (2012) explores three categories of openness: content, instruction, and assessment. Open content refers to information that is freely shared through peer-to-peer networks, rather than through conventional publication and copyright. Information is not regarded as a commodity. Open instruction refers not only to completely open access to the course, but also to learning activities designed by the learners themselves. Open assessment refers to task suggestions and rubrics that are published without restrictions on use or copyright, so they are available for any external agency that wishes to use them to credential students seeking credit. No single method of assessment is defined by the course itself (Downes, 2012).

The democratisation of education that takes place in the cMOOC has the potential to be enormously disruptive to higher education. Changing the models of access and de-commercialising knowledge means that the cMOOC meets Christensen et al.'s (2011) disruption criteria by transforming the expensive and inaccessible higher education sector into one that is open, accessible, and affordable.

The fact that these qualities align with those of the Open Education Resources (OER) movement that is gaining momentum at some universities such as the University of Otago, adds strength to the disruptive potential of the cMOOC. The rush by the global tertiary sector to deliver MOOCs, and the mass of industry opinion pieces and grey literature available on the subject, suggests that the principles of open content, instruction, and assessment have caused the higher education sector to re-evaluate both processes and products in ways that had not previously been considered.

There is, however, one key area in which the cMOOC could be argued to fail to meet the criteria of a disruptive innovation: simplicity. Christensen et al. (2011) argue that simplicity is a critical element of a disruptive innovation. One of the criticisms levelled at the cMOOC is the complexity of the unstructured networks that develop, and the challenges that this poses, especially for novice learners. These learners may find the range of topics, platforms, conversations, and assessment options distracting, and may require more careful scaffolding (Kop, Fournier, & Sui Fai Mak, 2011). It should be noted that Rodriguez identifies two forms of cMOOC (Rodriguez, 2012). He describes these as Format A courses (such as CCK08), which are conducted on a range of sites and networks as determined by the participants, and Format B courses (such as eduMOOC). Format B is a more centralised version of the cMOOC as the course is conducted from a single web or wiki page. Although these Format B cMOOCs still generate a large network, it could be argued that the simpler format makes these cMOOCs more likely to meet Christensen et al.'s (2011) criteria of a disruptive innovation.

Unlike the cMOOC, the xMOOC evolved almost by accident when Sebastian Thrun's online version of a Stanford course, which had an expected enrolment of 500, attracted over 160,000 participants. Possibly because of its slightly unplanned origins and the fact that Thrun's area of speciality is artificial intelligence, the xMOOC is significantly more techno-centric in its design, structure and philosophy. Thrun (2012) acknowledges that the unexpected interest in the course meant that he had to find quick, techno-centric solutions to meet the demand. The solution involved videos of experts explaining a concept, followed by a quiz to test the participant's understanding. Thrun describes this as flipping the way they taught in order to "empower students to learn new skills" (Thrun, 2012). This reviewer, however, would argue that the flipped classroom concept involves more than an online version of the transmission model.

The xMOOC model is behaviourist and cognitivist in approach (Conole, 2013; Kop, 2011). Participants receive knowledge via prepared modules (video tutorials, quizzes, etc.) developed by experts in the field. Although large peer-to-peer teaching groups develop spontaneously on many xMOOCs, the course design itself is individualist (Conole, 2013).

Thrun's basic model has served as the template for a number of subsequent MOOCs run by UDACITY, as well as other organisations such as Coursera and EdX. Critics of the model argue that it simply replicates traditional didactic university teaching; the only difference being the automation of teaching and testing. Siemens argues that the xMOOC "duplicates the structural constraints of classroom" and, in so doing, produces learners designed for the current education structures and exclusive models of expertise (Weller, Siemens, & Cormier, 2012). This would suggest that, rather than disrupting the existing model of higher education, the MOOC has been co-opted to ensure its continuance.

Unlike the cMOOC's broad definition of openness, many of the providers of xMOOCs have much more restrictive terms. Rodriguez (2013) identifies some key differences in the xMOOC terms of use: custom copyright licences that prevent sharing, remixing, or reuse; and the explicit prevention of MOOC-wrapping (the institutional reuse of a MOOC as part of that institution's for-credit programme) (Coursera, 2013; EdX, 2013). In addition, Rodriguez notes that the xMOOC design

model means that neither instruction nor assessment is open. Instruction is by “world class professors” (Coursera, 2013) and assessment is only through stipulated tasks credited (at a cost to the participant) by the providing institution (Coursera, 2013; Rodriguez, 2013).

In the most recent addition to the taxonomy discussion, Conole (2013) argues that, instead of attempting to assign distinct categories, MOOCs should be measured against twelve dimensions: the degree of openness, the scale of participation (massification), the amount of use of multimedia, the amount of communication, the extent to which collaboration is included, the type of learner pathway (from learner centred to teacher-centred and highly structured), the level of quality assurance, the extent to which reflection is encouraged, the level of assessment, how informal or formal it is, autonomy, and diversity.” (Conole, 2013, p. 11)

The impact of MOOCs on teaching and learning

A discussion of teaching and learning in any MOOC should recognise that neat definitions may be undermined by what happens on the course itself. Stewart (2013) notes that no matter what the design ethos of the MOOC, the online interaction of large numbers of people has what she calls a “Trojan horse effect” (Stewart, 2013, p. 229) on the development of digital literacies. Whether this happens by design in a cMOOC, or by accident in the large-scale forum discussions that characterise many xMOOCs is, she argues, less important than the fact that it does happen. This argument suggests that, no matter whether the MOOC is behaviourist/cognitivist in approach, the increasing numbers of digitally literate participants will nevertheless create a distributed, participatory, and inclusive (connectivist) environment. Stewart goes further, arguing that despite any course design intention, the massive nature of the MOOC means that it is simply impossible for the focus to remain on the course facilitator. This decentralisation of the teacher’s role as expert may lead to participants recognising their own expertise and shifting toward a more networked approach to learning (Stewart, 2013). If this happens, the potential of the MOOC to disrupt higher education is much greater.

Cormier expresses concerns about the effect of features such as automated exercise generation or assessment developing in response to massification. He describes these features as ‘robograde’ (Weller, Siemens, & Cormier, 2012). However, others are attracted to the potential such technologies offer for subjects such as computer modelling and mathematics (Sadigh, Seshia, & Gupta, 2012), where repetition is central to improving skills. Sadigh et al. (2012) also acknowledge the potential of technological solutions to provide customised feedback for students. Others argue that what is being described as customised feedback is nothing of the sort, because automated or computer-generated feedback is not individualised and offers no encouragement or support (Bates, 2012; Pisutova, 2012). The potential of the MOOC to disrupt teaching in higher education will depend, to some extent, on which side of this particular discussion proves to be more important.

The open nature of MOOCs could offer some unique opportunities for pedagogical change. Sharples et al. (2012) note the influence of a lack of course fees on pedagogy, arguing that this changes the contract between learner and provider, and creates space for experimentation and innovation. In addition, the online ‘cloud’-based nature of MOOCs means that institutions can experiment with strategies without disrupting their existing courses (Marshall, 2013). Using open education resources in MOOCs could also create a wider pool of education resources, and the exposure to teachers from different institutions can provide students with access to better teaching (Daniel, 2012). There seems to be little doubt that the cMOOC model has a transformative effect on both learning and teaching, because participants adapt to and interact within a complex network (Waite, et al., 2013; Weller, 2011). However, some argue that despite their providers’ marketing, xMOOCs do not

represent innovation at all, but instead make use of an outdated transmission model of teaching and automated, computer-marked assessment (Bates, 2012).

One of the major marketing approaches used by the xMOOC providers is the potential of the MOOC to transform learning by providing students in developing countries with access to higher education (Koller, 2012). However, whilst access to the MOOC and the information it contains might be open, students who seek certification for completion have to pay for it. In addition, very few MOOCs are currently recognised for credit by the offering institutions (Coursera, 2013; EdX, 2013; Pisutova, 2012). Some critics of the MOOC also cite the very low participation and completion rates as evidence that they are not fulfilling their potential to improve access to disadvantaged students (Rodriguez, 2012; Waite, Mackness, & Roberts, 2013). In addition to these concerns, Siemens also raises the issue that the xMOOC transmission model of teaching represents a form of knowledge colonisation. He notes that universities in many developing countries are joining MOOC consortia and operating within imposed structures, missing the opportunity to create their own innovation structures (Weller, Siemens, & Cormier, 2012).

At the time of writing this review, there is a scarcity of published scholarly literature documenting the experiences of students who participate in MOOCs. However, Zutshi, O'Hare, and Rodafinos's (2013) analysis of blog postings by MOOC participants shows that students have mixed responses to their MOOC experience, and they suggest that managing the workload is one of the biggest challenges for students. This finding is supported by Mazoue (2013), who suggests that the MOOC format favours the more advanced student over the novice.

The impact of MOOCs on university business models

The widespread coverage of MOOCs and the enthusiasm with which universities around the world are entering into agreements with MOOCs belies the important fact that there appears to be little clarity about how the MOOC will earn money (Dellarocas & Van Alstyne, 2013) and no consistency in the business approach. (EdX is a non-profit organisation funded by contributions from the member institutions; Coursera and UDACITY are both for-profit organisations founded with venture capital.) Although there is not yet a confirmed business model, proposals for earning income include advertising, selling student information to employers, payment for assessment or certification, payment for access to discussion forums, and course fees (Yuan & Powell, 2013).

Marshall (2013) uses Porter's Five Forces model to evaluate the potential of the MOOC to change the way universities conduct business. The model looks at the threat of new market entrants, substitute products or services, rivalry among competitors, and the bargaining powers of suppliers and buyers to an established market. Viewed against this model, it is clear that the MOOC has a high potential to influence the business of higher education. Coursera and UDACITY are relatively new entrants to the higher education market and, judging by their enrolments, they offer an attractive substitute product that is easier to access than the existing higher education model. However, despite the significant rivalry within the competitive higher education market, the speed with which many institutions have joined together to establish MOOC consortia indicates a degree of collaboration (Marshall, 2013) which may undermine the potential of the MOOC to change the university business model. There may be little competitive edge to be gained when everyone is doing the same thing.

'Buyers' (in the university context these are students) and 'suppliers' have significant bargaining power in the modern business model of the university. The power of the supplier might not be fully recognised by many institutions, but vendors such as Blackboard, Google, and Pearson are essential to the operation of many universities (Marshall, 2013). Although their role in MOOCs is still

developing, their interest is clear. Pearson has already partnered with both EdX and UDACITY to support the assessment processes of MOOCs (Guthrie, Burritt, & Evans, 2013). Google collaborated with EdX to produce the experimental platform, Course Builder, in 2012, and entered into a partnership with UDACITY to form The Open Education Alliance, with the aim of increasing technology education (Open Education Alliance, 2013). On September 10, 2013, Google also announced the launch of MOOC.org (Google, 2013). The ramifications of this development remain to be seen, but it is unlikely that the results of for-profit companies of this scale entering the higher education market will go unnoticed. Their increasingly active involvement in the online learning environment significantly increases the risk of knowledge colonisation (Weller, Siemens, & Cormier, 2012) referred to earlier, and the potential for disruption is significant.

Edited from Jacoby, J. (2014). *The disruptive potential of the Massive Open Online Course: A literature review. Journal of Open, Flexible and Distance Learning, 18*(1), [73–85.].