Looking to the edges: future perspectives

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Introduction

MOOCs (massive open online courses) commanded significant public attention from 2011–2012 when two Stanford University academics, using the Internet, opened their course on Artificial Intelligence to students around the world. 160,000 students from 190 countries signed up and a “MOOC movement was born” [1], spreading from the U.S.A. to Europe and beyond. Yet the term ‘MOOC’ had already been coined in 2008 to describe a pedagogically distinct open online course at the University of Manitoba. The Stanford MOOC (an xMOOC) grabbed media attention in ways that the Manitoba (cMOOC) [2] did not, and this contrast highlights several perspectives of relevance when considering future directions for teaching and learning.

The first perspective concerns continuity and change, drawing on the insights of French historian Ferdinand Braudel [3], who distinguished between short- or medium-term perturbations that may create surface changes for organizations or people and deeper structural changes that have long-term impact and consequences for societies and their way of life. Clayton Christensen’s [4] concept of disruptive innovation and the forces that drive disruption in whole sectors and industries is also relevant, raising questions about whether MOOCs represent threats or opportunities for the future of HE (higher education).

MOOC developments rely on advances in ICTs (information and communication technologies) which are themselves part of a wider context of change. Hence a second perspective involves the interaction between technological developments and economic and demographic drivers of change. A third perspective focuses on three potential domains of disruption: assessment and credentialing, knowledge resources, and personalized student pathways. Within each domain, different examples of experiments and innovations are offered, some connected and some independent of MOOCs.

Continuity and change

The above mentioned cMOOCs and xMOOCs are philosophically different. The ‘c’ descriptor signals a connectivist pedagogy and collaborative peer-learning...
approach whereby participants are as much a part of the online learning experience as the educational developers. The platforms used are open source and the purpose of cMOOCs is to extend the understanding and practice of open and distance learning, informed by modern educational theory. Contrastingly, xMOOCs typically follow a traditional instructional format of lecture, video, discussion, quizzes and testing, online. Courses are delivered on proprietary software platforms and involve contractual arrangements between universities as content developers and technology providers. The earliest examples involved non-profit edX and for-profit Coursera and Udacity ventures.

Debate about the revolutionary or evolutionary power of MOOCs continues in the media, through conferences and in the expanding academic literature. Promises of revolution rest on openness claims to reach new and underserved students at undergraduate level on a massive global scale, thus increasing access, democratizing HE and reducing costs. The shadow side of this promised revolution is that most MOOC developments emanate from elite universities, hence strong ‘MOOC performers’ could put non-performers (locally and in the developing world) out of business. Evolutionary arguments point to MOOCs as the next stage of development in online learning, where the focus is on designing high-quality learning experiences for a diversity of learners, making use of OER (open educational resources) and the power of peer learning and research. The shadow side here is that student cohorts are not massive, and business models to support quality course development remain costly.

MOOC developments to date show that early expectations of breaking the iron triangle of ‘quality, access and cost’ of HE at undergraduate level [5] have yet to be realized, not least because most MOOC ‘students’ already have degrees. However, there are positive indicators in other directions. Benefits include: widespread interest in pedagogical development linked to MOOCs accompanied by a raising of the status of teaching and learning in institutions developing MOOCs; development of complementary modes of higher learning on and off campus targeted at different kinds of students and study motivations; and an opportunity to address CPD (continuing professional development) at scale in a variety of industries and sectors including HE. Knotty issues remain including linking MOOCs with academic credit and accreditation approval, and developing sustainable business models. Both sets of issues are being addressed with a variety of solutions emerging. The combined interest in MOOCs from a variety of stakeholders beyond individual academics – governments, institutions, technology and media companies, equity investors – suggests both that MOOCs will become part of the future HE landscape and that there may be more disruptive times ahead as early developments feed further innovations.

**Drivers of change**

Although MOOCs may be important signals towards future changes in teaching and learning, they are not the only ones. The OECD (Organisation for Economic Co-operation and Development) suggests that global demand for HE continues to grow, from 28 million in 1970 to 164.7 million in 2009, with a predicted forecast of
262 million by 2025 [6]. Campus-based HE, whether public or privately funded, more traditional distance learning and MOOCs are as yet unable to cater for this level of demand, not least when the costs of traditional forms of HE continue to escalate for public and private investors. The economics of demand highlight the shortfall in supply, but also market opportunities available: a U.K. government report [7] estimated the global tertiary education market value at US$2.5 trillion in 2005 and global education expenditure from public and private sources as US$44.5 trillion in 2012. Economic opportunities to capitalize on such demand lie in a variety of directions given the heterogeneity of ‘students’ and their educational choices. Full-time undergraduates, part-time workers, professionals, overseas students and lifelong learners seek a variety of learning outcomes; providers and routes to provision are becoming equally diverse to meet their varied needs.

Changing demographics, changing demand and associated shifts in the economics of tertiary education form one set of change drivers. Equally important are advances in a range of technologies and the economics associated with these developments. There are two technological ‘meta developments’ that are potentially of major significance for HE: first, the unbundling of processes, and, secondly, the convergence and integration of technologies.

The unbundling of processes
The first significant change is the ability to ‘unbundle’ formerly seamless processes such as admission to and delivery of university undergraduate education. In a report on developments in ‘borderless education’ [8] published in 2000, the potential for disruption caused by ‘unbundling’ was highlighted as parts of the undergraduate experience could be outsourced to other providers, or new providers could competitively offer parts of this experience more flexibly, at lower cost or with faster routes to diploma success. Since 2000, unbundling has accelerated both through universities re-examining their core business and cost structures and deciding to outsource aspects of provision and through new products and services offered to institutions. One example in the U.K. involves the growth of private providers offering pathways to undergraduate or Masters level programmes for international students [9]. ‘Unbundling’ can be useful to universities, prompting them to analyse their business to seek efficiencies, decide what is core or non-core, and what could be delivered better in partnership. Unbundling of processes, products and services also offers the potential to re-bundle in new ways to create enhanced services.

However, unbundling may prove disruptive as educational services are offered direct to students or academics. For example, StraighterLine started by providing tutoring and academic support to students as well as courses that are eligible for U.S. college credits through a variety of for-profit partner colleges. Now, StraighterLine credits can be transferred to one or more than 1800 colleges and universities that partner with ACE Credit (American Council on Education’s Credit Recommendation Service). In 2012, StraighterLine introduced a new service, ‘Professor Direct’, an eBay for professors that enables academics to offer short courses on the StraighterLine platform, earning income from course fees and the number of students attracted to, and remaining on, the course [1]. Universities are also making use of these new services: Pearson provides online assessment and feedback packages for tutors and students in a number of subjects as well as proctored examination 

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facilities for MOOC providers such as FutureLearn. Global market forecasts for ICT industries are instructive and should alert HEIs (higher education institutions) to the economics of ‘unbundling’ and their role in fuelling these markets. As technology enables universities to outsource, third-party service providers seek to assist institutions to manage their online services creating a billion-dollar market, predicted to grow from US$43.06 billion in 2013 to US$65.83 billion in 2019 [10].

**Convergence and integration of technologies**

A second meta development with significant disruptive potential is convergence of technologies and, closely linked to this, integration of technologies. Everyday examples include the integration of technologies in particular devices, from televisions to computers to smartphones to watches, and in connecting social, mobile and other technologies to offer new products and services linked to the Internet. Universities are creating courses that can be delivered on different electronic devices and are embracing the trend to ‘bring your own device to college’. In addition, some are experimenting with new devices such as ‘smartwatches’ which will enable researchers to gather insights into student motivations on online courses (in this case, linked to monitoring physical fitness) [11]. Wearable technology is part of the larger development of ‘the Internet of things’ where devices of all kinds can connect to the World Wide Web and where data from users’ interactions can be collected and combined to enable increasingly personalized functions and services.

Monitoring technology developments is a strategic necessity for HEIs, both to keep up with student expectations and to monitor different potential domains of disruption. Annual reports published by the NMC (New Media Consortium) are useful in pointing to three-year trends; technology developments that are emerging in the short-term, mid-term and longer-term of five years or more. Tracking reports in 2013 [12], 2014 [13] and 2015 [14] highlights the speed at which technological innovations are emerging, and also the institutional barriers to adaptation and embedding of new patterns of teaching and learning that are signalled by these developments. Institutional barriers to change can offer opportunities to new providers to innovate and enter the HE market. Across the 2013–2015 NMC reports, those technology developments that are already visible inside and outside institutions include tablet computing, learning analytics, 3D printing, wearable technology and widespread use of social media. Thanks to these technologies, there is the potential to integrate online, hybrid and collaborative learning modes (and this is already part of the reported strategy of elite universities such as the University of Edinburgh); there is a rise in data-driven learning and assessment; an increasing use of blended learning; and proliferation of OER. Looking forward, an important debate, if not battleground, will lie between the proponents of ‘open source’ and ‘free education’ on the one hand and proprietary and for-profit educational provision on the other, and both academics and their institutions will be involved in this struggle.

**Domains of disruption**

Innovations that will have significant impact on HE may be linked to the heart of teaching and learning processes, may emerge from changes in professional or
Advances in bibliometric analysis: research performance assessment and science mapping

vocational practices or broader trends in the automation of work, or may emerge ‘leftfield’ from developments in other sectors such as IT, media or publishing. The domains of disruption in this section – assessment and credentialing; the collection, storage and access to knowledge resources; and personalized student pathways – provide some insights into sources of innovation and their potential impact. Although the specific examples may not prove to be game-changing, the domains may nonetheless be ones to watch in relation to future directions for teaching and learning.

Assessment and credentialing

In an IPPR (Institute for Public Policy Research) report [15], the authors point to four potential areas of disruption to current forms of assessment and credentialing: new education businesses and corporate universities as competing degree providers; increasing acceptance of non-degree credentials such as industry-specific certification; alternative experiences being valued over undergraduate degrees such as incubator and accelerator programmes or apprenticeships; and the possibility, due to the emergence of LinkedIn and other professional social networks, that individuals will be able to assemble a profile of skills, experience and recommendations with associated evidence for which, in the past, the degree was a proxy. Leading educators, including Sebastian Thrun, founder of Udacity, argue that the standard credentialing system in HE is archaic and fails to meet the needs of a 21st Century workforce [16]. In the U.S.A., both the federal Department of Education and the Lumina Foundation are showing increasing interest in new forms of competency-based education, personalized learning pathways and associated credentials that recognize the skills and experience gained [17]. The development of ‘open digital badges’ offers a new assessment route and form of credential linked to competences.

Mozilla, a free software community driven by an open source philosophy and run as a not-for-profit business, has created a digital accreditation infrastructure including technical standards to enable any organization to create, issue, manage and verify badges [18]. The badges can be seen and displayed on a website or social networking platform and contain metadata, hard-coded into the badge itself that provides information about the badge issuer, the criteria for the badge, the evidence of skills and achievements, and other relevant detail. Several organizations have developed and issued badges, and there are live development projects in countries such as the U.K. Universities in different parts of the world are experimenting with badges, for example, Deakin University in Australia integrates open credit into its MOOC; the Open University in the UK is introducing ‘Badged Open Credits’ into its MOOCs; and the University of Michigan in the U.S.A. is recognizing co-curricular learning outcomes using digital badges in Engineering and STEM (Science, Technology, Engineering and Mathematics) Academies. In these examples, badges (and also e-portfolios) are being used as supplements and complements to degree certificates and diplomas. However, in some industry sectors such as ICT, would-be programmers can upload examples of their coding work to a community of practice network on the Mozilla platform for judgement of individual skills and competence by leading practitioners. Individuals can be awarded badges which can then be displayed to potential employers. There are
echoes here of a “parallel post-secondary universe” [19] of alternatives to degree credentials in the ICT sector. In 2000, the alternatives included industry certification at different levels, whereas today an alternative may include skills verified by communities of practice and presented directly to the labour market as evidence of competence in particular fields. This may be one route for some individuals with strong vocational goals. For others, e-portfolios that bring together academic and professional credentials with evidence of personal skills and experience, verified through badges, may offer a desirable alternative. Learners may also in future seek to ‘credit bundle’ MOOCs towards a degree, joining up courses from several providers.

The development of alternative forms of ‘unbundled’ assessment and credentials should alert traditional HE providers to potential challenges for their own credentials in terms of their value to users (students and employers), the nature of the evidence that degrees and diplomas present, the levels and domains of attainment that these credentials signify and cost benefits of following traditional lengthy routes through HE compared with faster and cheaper alternatives. With greater attention being paid to learning outcomes, graduate attributes, high-level skills and competence, employability and lifelong learning, we may expect further disruption in this domain in future.

**The collection, storage and access to knowledge resources**

The convergence of information technology, telecommunications and media is changing the way information is collected, stored and accessed. This revolution is having effects on the development and organization of information and artefact repositories such as libraries and museums [20], hence there could be significant implications for institutions in future. The digitization and accessibility of knowledge resources raises questions about the purpose of libraries as repositories, as services to students and researchers, and as promoters of information literacy in a digital age. More threateningly, new sources, accessibility and ubiquity of information, new modes of storing and sharing information through cloud computing, new search engines, search techniques and search habits of learners could make traditional libraries and librarians redundant.

Universities and colleges are already reconfiguring physical libraries into a variety of learning spaces to suit different learning needs [21]. Some prestigious universities including Harvard, Stanford, Michigan and Oxford are also involved in digital projects, for example, partnering with Google in a large-scale initiative to store digital copies of all of the world’s library collections. If all of the world’s books were available online free of charge, then radical possibilities for opening up knowledge and education could emerge. The reality of the Google Books project is still far from this vision; most books that have been scanned are no longer in print or commercially available, only a few books are available in full view as opposed to sections, the search function has been criticized as being prone to errors, and copyright barriers have been encountered. Google has also entered into a commercial deal with the company Barnes and Noble to sell digital books, and this has compromised open access aspirations of some university partners. Nonetheless, offshoot developments from the main project raise new possibilities; for example, a partnership between Oxford and Michigan to make early English
books available online put 25,000 texts into the public domain, and in a March 2015 linked ‘Hackfest’ celebration, students and researchers from all disciplines and the general public submitted joint projects to be developed further [22]. Another example of collaboration with the public involves a pilot project between edX and the City of Boston to create BostonX, an initiative to make online courses available through internet-connected Boston neighbourhood community centres, high schools and libraries. The project’s intention is to offer Boston residents access to courses, internships, job training and placement services, and locations for edX students to gather, socialize and deepen learning [1].

Large publishing and media companies are deeply engaged in searching for new business opportunities, in partnership or potentially in competition with institutions. Cengage Learning and Elsevier are providing students on some MOOCs with free online access to the course textbook, enabling these publishers to see how thousands of students taking the same course engage with their content. Cengage Learning is also offering instructional design services to edX to migrate print pedagogy from the textbook into the online course. A step beyond this would see publishers offering services direct to students taking free courses with the opportunity to upgrade to access additional facilities, just as some universities are experimenting with replacing textbooks with MOOCs for introductory courses. Publishers will also be able to offer course creation services to a variety of client, institutions and industries, or offer courses direct to particular markets, perhaps utilizing Udemy’s strategy of recruiting diverse instructors including CEOs, celebrities and Ivy League professors to deliver short courses on specific topics [1].

Pearson has been engaged in a range of acquisitions to position it in different education markets, supported by three research centres on schools, HE and professional learning. It publishes textbooks, runs testing and examination services (including providing examination supervising services for MOOC providers) and operates entire institutions. Pearson has gradually shifted its business from selling educational products to selling educational services and, most recently, to focusing on learning and learning outcomes as a key strategy and measure of business success. Pearson’s rationale is that learning technologies, properly applied, have the potential to transform education both through personalizing learning and by delivering improved learning outcomes at scale [23]. In another example, Europe’s largest media group, Bertelsmann, has taken a controlling stake in U.S.-based Alliant International University to expand into the business of operating universities, aiming to build a network of universities that deliver innovative programmes in health and human sciences, initially in North and South America. Bertelsmann already controls a broadcasting company, RTL, co-owns book publishers Penguin Random House and has bought an e-learning business, Relias Learning. Responding to the trillion dollar global market, education is reportedly Bertelsmann’s top investment priority [24].

**Personalized student pathways**

A combination of educational aspirations (student-centred and flexible learning, student engagement and success), technological possibilities (unbundling, digitization, convergence and integration) and commercial interests (creating value
for customers, creating new businesses and entering new markets) is generating increasing emphasis on personalized learning experiences. In a recent EDUCAUSE research paper [25] on the next generation of digital learning environments, personalization was one of five necessary domains of core functionality. The other four were interoperability and integration; analytics, advising and learning assessment; collaboration; and accessibility and universal design. The rise of learning analytics is highlighted as a trend in the NMC Horizon reports cited above [12–14] and in a recent report for the EC (European Commission), the authors argue that more and better data will allow for a more personalized learning experience for each student with the ability to track students’ progress and increase retention and success [26].

HEIs, education and media businesses and technology providers are all involved in efforts to make educational interventions more flexible and targeted to the needs and learning goals of different students. IBM is running a major project on ‘Smarter Education’ associated with which the company has launched a series of products and services marketed together as offering “the Exceptional Student Experience” [27]. Individual institutions can purchase one or more of the four key components that address each aspect of a student’s journey through and beyond HE. The packages integrate data capture and analytics, cloud computing, and social and mobile technologies to create a “personalized student pathway”. The first package, ‘Recruitment with Digital Marketing’, triggers an individual response to a student’s first enquiry to a university, based on search terms used by the individual linked to other digital information available on social media. The second package, ‘Access via Personalized Portal’, provides news and updates of events, learning materials and relevant group or employer opportunities, accessible on any device, anywhere. The third package, ‘Pedagogy with Social Collaboration’, facilitates the creation of social learning environments, bringing together communities of interest. The fourth package, ‘Retention with Predictive Analytics’, enables each student to monitor their own performance through presentation of detailed metrics of how they are performing in different areas with suggested actions to improve performance; institutional responses and resources can also be targeted to individuals’ needs. The claim is that individual students, the institution they join, and teachers and advisers can all be “empowered through information” so that action can be taken to improve retention and success and students can gain more socially and educationally from their HE experience.

Whereas personalization may bring benefits to individuals and institutions, it also raises a number of questions about privacy and ethics as personal data is being integrated and shared. The NMC Horizon reports [12–14] note that more work is needed on policies to protect students. Similar issues arise in relation to digital marketing and to learning analytics where big data is being aggregated and analysed, often without the individual’s permission. More subtle questions concern whether personalization reduces pro-active approaches to learning and self-management of students’ educational experiences and whether increasingly digitized approaches also threaten personal contact between students and teachers? Furthermore, how might student performance data acquired through learning analytics be used in judgements of teaching performance? These are serious issues that need to be addressed by institutional and academic leaders.
Conclusions

This chapter has sought to ‘look to the edges’ of teaching and learning processes and beyond HE to consider potential drivers and domains of disruption, the balance between continuity and change, as well as risks and benefits for institutions, teachers and learners. A number of conclusions can be drawn from the analysis. First, although we cannot predict the exact shape of the future HE landscape, there are many pointers to disruption that suggest it will be very different from that in the past. Secondly, the combination of technology developments and the economics of global education services point to accelerating and more disruptive changes ahead that will affect the functions and business models of traditional HEIs and the nature of academic work. Thirdly, traditional HEIs, their leaders and individual professors are deeply implicated in the changes that are taking place. It is incumbent on them to be cognisant, careful and strategic if they are not to sleepwalk into undermining their own values and valued practices.

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