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Broad online learning EdTech and USA universities: symbiotic relationships in a post-MOOC world

Duncan A. Thomas ^a and Maria Nedeva ^{b,c}

^aNordic Institute for Studies in Innovation, Research and Education (NIFU), Oslo, Norway; ^bManchester Institute of Innovation Research, Alliance Manchester Business School, University of Manchester, Manchester, UK; ^cDepartment of Business Administration, University of Lund, Lund, Sweden

ABSTRACT

From 2012 USA universities entered new partnerships with private sector companies including Silicon Valley start-up Coursera. Coursera spearheads a new broad online learning segment of the fast growing global 'educational technology' (EdTech) sector. They offered free 'massive open online courses' (MOOCs) for global, universal learner audiences. Since 2015 several USA universities and Coursera expanded into 'post-MOOC', paid, accredited online modules and full degrees. We frame these post-MOOC developments as shaped by dynamic EdTech/university relationships and argue universities have been actively, and willingly, re-shaping higher education with EdTech; they are not passive victims of a potentially disruptive global 'MOOC phenomenon'. Our argument builds on interviews at six highly committed USA universities and at Coursera. These reveal rationales for post-MOOC developments related to: actions and attitudes of university actors; university resources; differing teaching subject areas; and exclusivity and longevity in relationships. We suggest that post-MOOC EdTech/university relationships are symbiotic, with three possible variants: commensal (neutral); mutualistic (positive); and parasitic (negative). We finally question whether current relationships may yet change from largely mutualistic to parasitic, given the apparent ambitions of Coursera and the wider global EdTech sector.

KEYWORDS

Universities; MOOCs; Coursera; EdTech; symbiotic relationships

1. Introduction

Here we address the, largely unacknowledged, active role of universities in their recent, enthusiastic and potentially far-reaching partnership relationships with a fast growing segment of the global, private 'educational technology' sector (EdTech). A first major wave from 2012 was universities' offering free and universal, so-called 'massive open online courses' (MOOCs) on EdTech platforms. This led to a second major wave of more substantial, paid and accredited, MOOC-inspired courses and full online degrees from around 2015. This joint re-envisioning and re-packaging of higher education we label a move into a 'post-MOOC' world.¹ Here we focus on six universities highly committed to MOOCs, and post-MOOC developments, in the USA's strongly marketized setting. We explore their dynamic relationships primarily with the largest for-profit, global reach, Silicon Valley (USA) start-up company within 'broad online learning' EdTech, Coursera. For these universities, and for differing university actors within them, like senior leaders and academic faculty, we suggest these dynamic

CONTACT Duncan A. Thomas  drduncanthomas@gmail.com

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EdTech/university relationships are symbiotic. They do enable universities to reach and learn about new and larger 'learner' audiences/markets. They may generate revenue for universities and EdTech companies. At the same time, they can lead to important tensions for university missions and individual academic faculty attitudes.

Previous literature has framed MOOCs and the so-called 'MOOC phenomenon' since 2012 (Pappano 2012; UUK 2013; HEA 2014) as a monolithic, external pressure upon higher education worldwide. Universities have been positioned as passive victims facing this potentially disruptive global MOOC phenomenon (see Vardi 2012; Adams et al. 2014; Fischer 2014; Knox 2014; Navarro 2015; Tømte, Fevolden, and Aanstad 2017). MOOCs themselves have typically been the main unit of analysis. We believe that universities' national constraints, and their functioning in a global 'network' or 'knowledge' economy, has afforded EdTech space to act, and led to various university rationales to partner with EdTech. We therefore wish to shift attention towards these rationales and a consequent variety of dynamic EdTech/university relationships regarding post-MOOC developments. To explore these rationales and relationships we conducted an extensive USA fieldwork programme with 34 interviewees at universities and Coursera. These lead us to consider EdTech/university relationships as symbiotic with three apparent variants. We discuss these and some implications for future studies of MOOC-related EdTech/university relationships. We close by considering whether current symbiotic relationships may yet change over time given the apparent ambitions of Coursera and the wider global EdTech sector.

2. Background and context

We begin by asking why might universities be active in MOOC-related developments? Crucially, from 2012 and the first popular attention to the global 'MOOC phenomenon', universities were presented as under threat for their very existence. Universities' previously high cost, highly selective taught materials were being shared online, free-of-charge to a non-selective, universal access, global audience. The days of traditional university fee-based teaching operations were considered numbered. Known as the 'global disruption view' of MOOCs (Tømte, Fevolden, and Aanstad 2017; citing Mazoue 2013; Ng 2013) this narrative typically downplays active roles for universities, viewing instead linear disruption by MOOCs as imposed technology from course platform provider companies (Coursera and others). This view of universities 'disrupted' by MOOCs is complicated by MOOCs not being a homogenous technology. MOOCs are diverse, with scholars locating them in typologies based on pedagogy (e.g. bottom-up connectivist cMOOCs, top-down instructivist xMOOCs), aligning them with various long-standing correspondence, distance and professional educational practices, and rooting them within evolving waves of underpinning information and communications technology (ICT) platforms (see Baggaley 2013, 2014a, 2014b, 2014c; Bates 2014; Moore 2014; Zawacki-Richter and Naidu 2016; Sharma, Palvia, and Kumar 2017; Brown 2018; Peters and Jandrić 2018).

Commentators have critically analysed MOOCs and downplayed them as not as disruptive as initially hyped (Christensen and Horn 2008, 2013; Baggaley 2013; Clarà and Barberà 2013; de Langen and van den Bosch 2013; Knox 2014; Useem 2014; Qayyum 2017; Al-Imarah and Shields 2018). However, there is an absence of characterisations of the 'post-MOOC' landscape that now exists. This is where some first wave, free and universal MOOCs co-exist alongside a second wave of quite different, selective, paid and accredited, revenue-generating MOOC-related offerings that highly resemble traditional campus-based degrees (a format that appears more sustainable for both universities and EdTech).

There is the 'national mediation' view of Tømte, Fevolden, and Aanstad (2017), developed from the more interventionist higher education setting of Norway, predicting that universities might 'adopt and develop MOOCs according to national needs, creating distinct national development paths' over time (212). This is a less disruptive perspective and resonates with seeing universities as inherently constrained 'strategic actors'. Universities pursue their core activities and missions not within a

vacuum but within defined national teaching and research funding and policy landscapes (see Whitley 2008; Nedeva 2013; Paradeise and Thoenig 2015; Gläser and Laudel 2016; Gläser, Laudel, and Lettkemann 2016; Luukkonen and Thomas 2016; Thoenig and Paradeise 2018). They have organisation-specific competencies and multiple constraints, including in adopting technology and being disrupted by it. They cannot do whatever they wish, towards MOOCs or many other things, and cannot necessarily act alone for such activities. This of course affords EdTech partners space to act, as they have with MOOCs. It also means we need to account for dynamics between university actors and EdTech – especially when we realise EdTech is highly ambitious, not only with post-MOOC developments, but in wishing to transform cradle-to-grave education activities, products and services globally.

Universities also exhibit important heterogeneity (Martin 2012). Differences in their missions, resources and so on may affect how they mobilise MOOC-related developments in EdTech/university relationships to overcome their constraints. In the USA landscape – a highly marketized, ‘fast capitalism’, ‘fast education’, ‘network economy’ – this includes constraints like poor affordability and accessibility for many potential higher education students (Márquez-Ramos and Mourelle 2018; Peters and Jandrić 2018). Overall then the EdTech/university ‘relationship’ lens we introduce here provides a midway perspective between ‘global disruption’ and ‘national mediation’, allowing us to explore university rationales for a variety of relationships.

2.1. Revisiting the ‘MOOC phenomenon’ to frame symbiotic post-MOOC developments

The 2012 USA launch of three EdTech companies is considered as the watershed moment – the engine of a so-called ‘MOOC phenomenon’ – that might disrupt and democratise the elite, often unaffordable or debt-laden model of USA higher education in universities (Baggaley 2014a; Porter 2015). For-profit, start-up companies Coursera² and Udacity,³ both spun-out by Stanford University professors, and not-for-profit joint Harvard University/Massachusetts Institute of Technology (MIT) competitor edX,⁴ secured partnerships with prestigious universities in the USA and beyond. Typically agreed with universities’ senior leadership, these partnerships enabled EdTech to leverage universities’ brands, reputations and course materials. In return EdTech made university courses available online on new web-based technology platforms, to reach students at no or very low cost at a global scale previously unthinkable. Coursera, edX, Udacity – and a handful of others like the UK’s FutureLearn⁵ – formed a new ‘broad online learning’ segment of global EdTech.⁶ These EdTech companies built legitimacy by partnering with hundreds of reputable, elite universities, and quickly grew to offer thousands of free courses that reached tens of millions of learners around the world.

This first wave of 2012 era MOOCs was also considered pedagogically problematic. They were perceived as inferior both to campus-based higher education and to decentralised, connectivist online education pedagogy developed by pioneering university professors around 2008 (so-called connectivist ‘cMOOCs’) that are credited with having invented MOOCs in the first place (Baggaley 2013; Clarà and Barberà 2013; Knox 2014). Most EdTech/university MOOCs were top-down, instructivist, ‘extensive’ or ‘xMOOCs’, where academic faculty found themselves under-resourced and logistically unable to interact meaningfully with very high numbers of online students. This left many MOOC ‘learners’ – the world’s educationally un-/under-served, un-/under-employed, career skill builders and lifelong learners – hypothetically empowered but in reality having a learning experience that was a far cry from that of traditional campus-based ‘students’ (Baggaley 2013; Fischer 2014). Second wave, post-MOOC developments aimed to overcome these shortcomings by developing more robust offerings,⁷ albeit thereby often necessitating paid not free entry also to satisfy university and EdTech desires to generate revenues from their increased efforts.

A move into a post-MOOC world was in fact signalled very soon after the ‘year of the MOOC’ in 2012 (Pappano 2012). Harvard business school professors debated whether MOOCs should be embraced or rejected as a ‘disruptive’ innovation for the university business model, and what they meant for university brands and reputations (Christensen and Horn 2013; Useem 2014).⁸ Some

scholars concluded MOOCs were ‘sustaining’ rather than ‘disruptive’ innovations (Al-Imarah and Shields 2018; see also Clarà and Barberà 2013; de Langen and van den Bosch 2013; Qayyum 2017).⁹ This held true so long as post-MOOC developments followed a path of ‘evolution from the massive and free roots of early MOOCs’ into a new ‘hybrid’ era of ‘more traditional online fee-based programs’ that would be a more ‘financially sustainable model’ for universities (Sandeen 2013, 38) and not lead them into bankruptcy from giving away all their content for free. So-called MOOCs 3.0 or ‘hybrid’ MOOCs (Sandeen 2013, 34; Qayyum 2017) then include paid fully online, accredited MOOC-related degree courses, curated sequences of MOOCs building to more advanced final projects and paid completion certificates. Coursera and Udacity exemplified this path by launching fully online Masters degrees with their partner universities. These cumulative, modular, MOOC-like sequences are no longer free but have substantial fees, entry requirements and formal assessments (see Coughlan 2016, 2018) much like traditional, campus-based courses and degrees.

Throughout these developments scholars have also researched the rapid emergence and evolution of MOOCs as inextricably linked to long-standing global higher education trends and pressures (Bates 2018a, 2018b; Peters and Jandrić 2018). This includes the apparent unsustainability of the USA’s costly, campus-based system (Porter 2015). MOOCs have therefore been discussed not only as a technology disruption but also as a response to constraints like decreasing state funding for universities (a USA pattern shared also in many European and OECD countries; see Thoenig and Paradise 2014, 2018), increasing student fees and debt, declining student enrolments due to high fees and specific demographics, high drop-out rates (in the USA), massification of student numbers and yet still unmet demand for lifelong education, and mismatches between universities and labour markets in valuing campus-based higher education in a rapidly shifting, global ‘network economy’ or ‘knowledge society’ (de Langen and van den Bosch 2013; Helberger, Pierson, and Poell 2018). These are also then important features of the post-MOOC landscape, especially in the USA.

Since 2012 the literature around MOOCs has become quite vast. For our purposes however four key weaknesses are worth noting. First, the focus has mainly been on aggregate assessments with MOOCs as the unit of analysis, largely divorced from actors and organisations. Second, the actions and attitudes of EdTech actors and organisations have gone largely unexplored. Third, little has been said about the rationales of university actors to mobilise post-MOOC EdTech/university relationships to address the kinds of constraints and challenges we have just noted. Fourth, MOOCs are generally not framed within the ambitions of a broader, global EdTech parent sector, apart from some attention to the superficial, headline motivations of key players, such as those of Coursera’s founders (e.g. see Coughlan 2016, 2018).

We therefore consider dynamic EdTech/university relationships a new and useful way to frame and study post-MOOC developments and university rationales for them. As both parties have clearly been involved, we also choose to adopt generic terms from Townsend, Harper, and Begon (2000) to label these as symbiotic relationships. First, acknowledging the possibility of some future disruption by MOOC-related developments, we consider the possibility for *parasitic* EdTech/university symbiotic relationships. Here one side may live off the other but not ‘kill’ it, at least not short term; or an overall negative dynamic. Second, there could be *mutualistic* symbiosis, with both sides benefiting sustainably – a positive dynamic, stable in the long run. Third, there could be *commensal* symbiosis, a kind of neutral, non-threatening co-existence, with neither partner affected greatly by the other.

2.2. Features and ambitions of global EdTech, broad online learning EdTech and Coursera

2.2.1. Features of the global EdTech sector and post-MOOC EdTech 3.0 landscape

We have stated EdTech ambitions have been overlooked in existing literature. We therefore introduce what we see as its key features. First, educational technology or ‘EdTech’ itself is defined as the ‘study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources’ (Richey, Silber, and Ely 2008, 24).¹⁰ There is

therefore nothing inherently for-profit in 'educational technology'. However, the private global EdTech sector represents a quite different prospect. The extent and scope of this evolving sector seems primarily to have been addressed in grey literature.¹¹ Similar to scholars' nomenclature for MOOC 1.0/2.0/3.0 types facilitated by the technical features of Web 1.0/2.0/3.0 infrastructures (see Beldarrain 2006; Clarà and Barberà 2013; Sandeen 2013; Fischer 2014; Naidu 2014; Zawacki-Richter and Naidu 2016; Picciano 2017; Sharma, Palvia, and Kumar 2017; Brown 2018; Peters and Jandrić 2018) currently an EdTech 3.0 global landscape has been mapped out.¹²

This EdTech 3.0 landscape encompasses cradle-to-grave enterprises. Companies are involved in education products and services for babies, primary, secondary, tertiary, professional and lifelong education.¹³ Global EdTech is engaged in all facets of education, such as accreditation and learning credentials, analytics of learning and automated prediction and creation of learning pathways, assessment and testing, career planning, curriculum development, student admissions, courseware and learning management systems (LMS), mathematical and scientific literacy initiatives, pedagogy research, educational textbook and research publishing and distribution, student finance and so on.¹⁴ For almost every university-related activity, an EdTech company seems to exist to partner with it. Reviewing this landscape is also a stark reminder that EdTech/university relationships in fact pre-date MOOCs themselves by over a decade. This is due to universities' procurement of learning management systems (LMS) from EdTech companies since around 2000 (e.g. Blackboard, Canvas, Moodle and others; see Brown 2018).¹⁵

The comprehensive EdTech sector fuels investors' speculation about the overall global education 'market' – i.e. not just higher education but its whole array of products and services. It estimates its total long-term value as reaching up to 5 trillion US dollars or '8x the size of the software market and 3x size of the media and entertainment industry', framing universities specifically as unable to serve a growing global population and the coming billions of potential students, extrapolating that 'two universities' would need 'to be built per day, over the next twenty years' to meet demand.¹⁶ New technology from EdTech companies is positioned as being able to resolve this supply/demand imbalance. This is estimated to be a shortfall of 100 million university seats by 2025.¹⁷ The global EdTech sector has also generated significant finance deals, led by USA firms but followed by Asian ones, raising 12 billion US dollars from 2012 to 2017.¹⁸ The overall EdTech sector is large, with 15,000 EdTech firms estimated to be active globally in 2017,¹⁹ 17% annual market growth, and a short-term projected sector valuation of 250 billion US dollars by 2020.²⁰

2.2.2. Features of the MOOC-related 'broad online learning' EdTech segment

The EdTech sector's MOOC-related activities are focused within its so-called 'broad online learning' segment.²¹ Here we find companies developing technology platforms and entering into partnership agreements with universities (and, increasingly, corporate partners). Broad online learning EdTech companies share revenue with university partners. They typically advertise themselves as having social missions to mobilise new technology to transform and improve not only the reach and quality of higher education but also the life and career prospects of EdTech-facilitated learners. For example, Coursera, the largest broad online learning EdTech company with the most global reach, has this vision statement: 'We envision a world where anyone, anywhere can transform their life by accessing the world's best learning experience'.²²

As mentioned, the USA was at the vanguard of broad online learning EdTech with the 2012 launch of three key, globally-focused companies: Udacity (for-profit, started February 2012); Coursera (for-profit, April 2012); and edX (not-for-profit, May 2012) (Baggaley 2013, 368–396). These firms – along with any subsequent new entrants – compete not only for university partners and learners, but also at the technological frontier. They have raced to be first to offer fully online, fully accredited taught masters and undergraduate degrees, for instance.²³ Coursera, edX and Udacity have also explored various means of revenue generation by experimenting, for example, with MOOC-related variants like SMOOCs (small-medium open online courses), SPOCs (small private online courses), so-called 'Specializations' and modular or 'stackable' credentialed micro-degrees (Coursera

'MasterTrack' certificates, edX 'MicroMasters' certificates, Udacity 'Nanodegrees'). Universities for their part have explored what configurations of partnerships with Coursera, edX, Udacity offer the best global 'digital storefront' (Jona and Naidu 2014, 141) for their reputations, brands, course materials and formats.

2.2.3. Ambitions of the most influential broad online learning EdTech company: Coursera

Coursera has arguably been this EdTech segment's most influential actor. By 2018 it had secured over 150 partnership relationships with universities, had around 300 staff and over 31 million learners using its platform, as well as 1000 companies partnering with it for business-to-business education.²⁴ By June 2017, based upon its projected revenue generation and sharing with its university partners, it had raised 210 million US dollars funding²⁵ and been valued at 800 million US dollars.²⁶

Coursera, like many other commercially sensitive Silicon Valley companies, is challenging to study and seems largely unexplored in scholarly literature. Beyond public relations-style output in news media (see Coughlan 2016, 2018) its motives can remain largely opaque. In March 2018 it did release, however, a large tranche of public job advert listings due to it 'changing priorities to focus on degree courses'²⁷ in a post-MOOC scale-up. Here Coursera was about to launch its second batch of fully online MOOC-related taught masters and undergraduate degrees (for late-2018/early-2019)²⁸ following an earlier first batch of online Masters degrees (in 2016/2017). These job ads help to reveal Coursera's aims. Here in its own words Coursera states it wants to become 'the world's leading platform for higher education', 'redefining higher education' via employees that '[e]xhibit a conviction that the world needs Coursera to be wildly successful'.²⁹ Coursera clearly holds a marketized view of higher education. It states it develops courses as 'products' that must 'delight customers'.³⁰ It thinks its technology platform 'redefines the future of higher education and lifelong learning,' anchored in 'key business metrics such as consumer growth'.³¹ Coursera wants to recruit people with 'a track record of game-changing product solutions ... that have transformed companies and even industries'.³² It wants to 'aggressively grow'³³ via 'user acquisition or monetization'.³⁴ Coursera also states here it wants employees that are 'comfortable in speaking the language of business'.³⁵ It considers itself operating in an 'ambiguous'³⁶ 'fast-paced, ever-changing environment' where its staff need '[i]ncredible perseverance and drive' and 'to radiate positivity even while under pressure' and to hold a 'passion' for its 'mission'.³⁷ Coursera describes itself as a place where people 'innovate, productize, and iterate at start-up speed'.³⁸ It also positions itself as 'a social enterprise', pursuing a positive 'education reform' mission – albeit a mission that is 'ultimately defined by customer return on investment'.³⁹

We can therefore read the Coursera side of EdTech/university relationships to be a contentious blend of marketized, for-profit motives 'rooted in the Silicon Valley spirit of innovation' and a 'world-changing' 'universal mission'.⁴⁰ The above phrases may be tailored to investors and indicative of some Silicon Valley hype. Nevertheless, these disruptive, overtly commercial EdTech rationales clearly may create tensions for various university actors within EdTech/university relationships. They may also mean parasitic symbiosis is possible, because of EdTech's 'game-changing', transformative ambitions.

3. Approach

The USA has been at the epicentre of MOOC and post-MOOC developments, with some of its universities highly engaged, and multiple broad online learning EdTech companies having emerged there. We purposively selected our cases to explore EdTech/university relationships within this vast landscape,⁴¹ focusing on Coursera and on several universities most highly committed to MOOC-related EdTech/university relationships, using multiple criteria to register this commitment.⁴² We also purposively selected interviewees involved not only in high demand MOOC-related areas, like business and management, computer and data science, but also lower demand topics.⁴³ We further selected one comparable university working not with Coursera but with the credible, not-for-profit, competitor

platform, edX. We sought views at multiple levels within universities, addressing senior leaders, as well as academic faculty instructors, instructional design teams and others.⁴⁴

This resulted in a three-week interview programme with 34 people, at Coursera and six universities, in five cities across five USA states, during October 2017.⁴⁵ Almost half of our interviewees had some MOOC-related instructor (online teaching) experience, often in parallel with other roles. All six universities were highly research-intensive (R1 under the Carnegie Classification, Doctoral: Highest Research) at the time of our research.⁴⁶ Our interview programme effort is summarised in Table 1.

At the time of writing annual fees for undergraduate study at the four public universities ranged from 10,000 to 15,000 US dollars for in-state students (33–47,000 US dollars out-of-state) to 50,000 US dollars at the two private universities.⁴⁷ All the universities had online education ranging from free MOOCs up to 20,000 US dollars fee, fully accredited, fully online MOOC-related Masters degrees on Coursera. Several of them had other online professional education courses and degrees on non-Coursera platforms.

Our semi-structured interview protocol covered eight themes: reasons for MOOC-related developments; incentives for these; comparison of MOOC- and campus-based pedagogy; innovations in educational technology; dedicated funding and structures for MOOC-related offerings; effects of MOOC-related issues for the academic profession; strategic disruption from MOOCs and the post-MOOC world; and available scope for creativity within EdTech/university relationships. All interviews were recorded with consent then transcribed, except at Coursera where our detailed field notes

Table 1. Overview of organisations, interviews, and MOOC-related features and structures.

Organisation	MOOC-related features, structures
Coursera, Mountain View, CA, USA 5 interviewees	Largest, most global for-profit MOOC-related platform provider since its 2012 launch Reported reach of 30 million learners, 2000 online courses, 180 course sequences (Specializations), 4 fully online degrees (begun in 2016, rising to 10 by 2019), 150 university partners in ~30 countries
Emory University, Atlanta, GA, USA 3 interviewees	Primary platform: Coursera, ~17 MOOCs, 17 instructors Dedicated university teaching and learning units for online education and digital scholarship Private university, modest endowment
Georgia Institute of Technology, Atlanta, GA, USA 4 interviewees 1 studio tour	Multiple platforms: Coursera, with 29 MOOCs, 43 instructors; edX, with 10 MOOCs; Udacity, having in 2013 offered the first fully online Masters in Computer Science from an accredited USA university Dedicated teaching and learning online professional education unit offering 10+ online masters degrees Public university
Stanford University, Stanford, CA, USA 4 interviewees	Multiple platforms: Coursera, with 25 MOOCs, 32 instructors; one very high profile MOOC on Coursera; Stanford Online, on its own platform, Stanford OpenEdX, based on open source edX, ~100 online courses Stanford professors created two EdTech platform provider companies, Coursera and Udacity Dedicated teaching and learning online education units Private university, large endowment
University of Illinois at Urbana-Champaign, Champaign, IL, USA 9 interviewees 1 studio tour	Primary platform: Coursera, ~96 MOOCs, ~67 instructors on Coursera; developed first three of Coursera's four fully online masters degrees in 2017 Dedicated central and college level teaching and learning online education units Public, land-grant university
University of Michigan-Ann Arbor, Ann Arbor, MI, USA 2 interviewees 1 studio tour	Partnership with multiple platforms: Coursera, with ~50 MOOCs, ~40 instructors; high profile instructor on Coursera; edX, ~50 MOOCs Dedicated teaching and learning unit, fund and advisory group around digital education and innovation Public university
University of Texas at Austin, Austin, TX, USA 7 interviewees	Partnered with edX not Coursera: edX, ~17 MOOCs Dedicated teaching and learning unit addressing the future of online higher education Public university

Sources: University websites, Coursera website; MOOC-related details correct as at September 2017, unless otherwise noted.

were later verified.⁴⁸ Our interviews with university staff were open and wide-ranging, typically lasting an hour. With ‘Courserians’ – Coursera employees⁴⁹ – they were more closed.⁵⁰ This may have been due to known Silicon Valley sensitivities⁵¹ and our fieldwork visit coinciding with a round of significant staff cuts (a fact we discovered only later on).⁵²

4. Findings

Our findings first highlight key rationales provided by our interviewees to explain the pace and directions of post-MOOC developments with broad online learning EdTech. These include: importance of university leadership actions and perceived constraints; effects of and for university resources; teaching subject areas involved; academic attitudes towards MOOCs as marketized education; and varying approaches to exclusivity and longevity in EdTech/university relationships. We then consider symbiotic features from interviewees’ accounts of these relationships, and note there are apparent commensal (neutral), mutualistic (positive) and parasitic (negative) variants.

4.1. Rationales for post-MOOC EdTech/university developments

4.1.1. Active but constrained university senior leaders

University senior leader interviewees had often engaged with MOOCs and key platform companies Coursera, edX and Udacity since they launched in 2012. They, or their senior colleagues, had entered these partnership agreements, typically without much consultation that involved regular faculty members. These leaders talked about evolution not disruption. They framed MOOC/post-MOOC developments as sustaining or enhancing their universities’ existing distance, online and professional educational initiatives. Alternatively, they saw them as serving broader university strategies, say for internationalisation and social responsibility. They saw leaders as proactive in mobilising a variety of MOOC-related ‘partnership’ ‘opportunities’ with EdTech:

[W]hen they [MOOCs] started I think people did see them as they were going to just turn everything upside down and university as we know it would disappear. ... [T]he way it’s turned out is no ... because universities have also moved along. So they’re doing more with online and everything else. ... [N]ow MOOCs are looking more and more ... like opportunities for partnership than threats. (Interviewee 1)

University leaders had responded to a sea change from thinking about ‘students’ towards seeing them as ‘learners’ prompted by MOOC-related developments, particularly by developing long-term strategies for lifelong and professional education or studying these being developed elsewhere. For instance it was mentioned that Georgia Tech was re-framing its activities as being about ‘lifetime education’ and envisioning what higher education would need to be like in 2040.⁵³ Other interviewees mentioned Harvard University’s similar shift towards using a longer time span, ‘60-year curriculum’ concept to re-frame its continuing education activities.⁵⁴ Some leaders however did not believe MOOC-related signals for ‘deep’ and ‘meaningful change’ at USA universities had been mobilised, due to resource and other constraints. They saw changes only at the fringes of universities’ missions:

[T]hree or four years ago, presidents and provosts at the major universities ... would have online learning, or digital learning on their ... top three lists of most important priorities for the institution. I would be surprised if any major university presently in the United States, has it on their top three list now. ... There’s more concern about long-term ... stability of funding for the research enterprise and ... implications ... for how we think about our faculty. ... [T]here’s millions of people who are taking MOOCs, and online courses. ... And we haven’t really seen the revenue generation ... [W]hat I see is institutions pulling back ... not really building strategic capabilities ... [and] the kinds of structures ... that might facilitate deep change, real meaningful change ... There’s very few examples ... of where ... what happened with the MOOCs led to really powerful, informed development of ... strategic investment ... and experiments ... [about] how does this relate to the way that teaching and learning will happen in 2030, and beyond ... and move us away from ... the kind of traditional, agrarian calendar, for example? (Interviewee 28)

Another senior leader thought that new post-MOOC fully online degrees too closely resembled traditional campus-based offerings. They perceived them to be part of a deliberate strategy by USA universities to reject the more radical model of the original free MOOCs and move things back into more familiar territory (Interviewee 34). Another believed the original ‘unique’ MOOC signals had caused momentary reflection by university leaders about ‘openness’, ‘affordability and accessibility’ in USA higher education. However, they concluded this was ‘fading away’ as universities and EdTech moved more intensively into post-MOOC developments (Interviewee 7).

4.1.2. University resources to develop post-MOOC structures

The USA universities we visited had invested typically central resources to support their move into a post-MOOC world of fully online MOOC-related courses and degrees. They had built new or renovated old campus spaces and filled them with advanced, bespoke video production and interactive technology. They had recruited or reassigned staff to be instructional design heads, leading teams and training online teaching assistants:

I was in an office of three people four years ago, we are 41 now. ... [W]e train [campus-based] teaching assistants to be teaching assistants in online courses, and we have ... instructional designers, videographers, copywriters, animators, graphic designers, copy editors ... instructional designers ... digital media and ... my small lab where I do all these evaluations and researching [of online courses and learners]. (Interviewee 18)

[We] are serious about digital learning ... [W]e have ... vice provosts for online learning, our centre for teaching and learning, ... our learning management system, [our centre] for professional development ... [M]aybe 70 ... would see that in their job description as particularly in digital and online learning. (Interviewee 27)

Not all six USA universities had the same resources and capacity to act. Universities like Stanford were able to ‘throw resources’ at developments (Interviewee 19). Others without an ‘abundance of money’ had to rely on intermittent ‘philanthropy’ from either industry or private individuals to be able to invest (Interviewee 7).

4.1.3. Teaching subject areas for post-MOOC developments

Our interviewees highlighted teaching subject area differences in post-MOOC developments. They felt some subjects were perceived to be more prized in the knowledge/network economy than others (and/or had been flagged as such by EdTech’s market research). Subjects at the bleeding edge were business and management skills, and professional education in computer and data science. These subjects were most likely to have had post-MOOC, paid, accredited, fully-online MOOC-related taught Masters degrees co-launched with an EdTech partner like Coursera. They were also understood to be where campus-based courses perhaps could not keep pace with rapid technological change, leaving former students keen to refresh their skills. Such courses might also match new emerging tech jobs for people willing to re-skill. The rationale here was that these people might prefer online courses rather than take three or four years out from their current job:

[T]he place these degrees are targeted at, is professionals in the field that are trying to retrain for a new career, or get a leg up to get a promotion, or keep themselves secure in their current job. And ... [they] are palatable to those audiences. They have the money to pay for them, because they’re active professionals with careers. (Interviewee 6)

Interviewees not in these subject areas were more likely to have stuck with – willingly or not – original, free, universal access MOOCs. They were still motivated say, by goals of educating the masses and social responsibility. However they saw themselves as unlikely to be supported by their university if they wished to refresh their courses (Interviewee 6). Coursera staff we interviewed similarly suggested university partners had moved on from the ‘experiment’ of these original free MOOCs ‘towards a higher value product’, and more ‘career-relevant content’ that could have a ‘higher impact on a person’s life’, like post-MOOC online degrees (Interviewee 23). During our time at

Coursera the label 'MOOC' was in fact barely even mentioned. The focus instead was on post-MOOC terms like 'offerings', 'products' and 'content' (Interview 24).⁵⁵

4.1.4. Attitudes towards marketized education

A move to a post-MOOC world had not led to universal acceptance of commoditised education by academics in the universities. For example one faculty member told us:

I have a very, very strong feeling that education should be open and free to as many people as possible. ... I would have been fine if we'd never broken even. I encourage ... I constantly show students how you get around paying for it. (Interviewee 8)

However there had been a gradual infiltration of commercial attitudes in the building of dedicated post-MOOC instructional design and video production teams. Newer, non-academic recruits here appeared comfortable talking about 'learners in the market space' (Interviewee 4), were 'used to' talking 'about learners as customers' (Interviewee 18) and conceived of 're-purposing' educational 'content' into saleable modules in 'multiple ways' (Interviewee 11). Some academic faculty instructors with paid MOOC-related offerings that needed little regular updating were also happy to earn say, tens or hundreds of thousands of dollars' annual income from their revenue sharing agreements⁵⁶ with their university and Coursera:

[I]t's kind of like selling insurance. It's done and the money just keeps rolling in and I don't have to do anything for that. (Interviewee 5)

Some academic instructors had reacted to increasing monetisation by making themselves 'islands' within this post-MOOC world. Some had launched their own independent platforms or tools (Interviewees 13, 14); others kept 'somewhat of a distance' within EdTech/university relationships:

I now keep my MOOC providers at somewhat of a distance ... I must engage them because they are a channel beyond compare, both for money, which I am happy to have, and for eyeballs, which is the thing that's most important. ... edX is great and Coursera is great, but neither edX nor Coursera overlap with my goals and objectives. ... I can't trust either Coursera or edX or [my] university to operate in the best interest of society. (Interviewee 9)

4.1.5. Exclusivity and longevity in EdTech/university relationships

University senior leaders actively managed their partnership relationships with Coursera and others. They developed approaches to their number and duration of relationships. Some were in multiple, non-exclusive relationships to pursue their university's 'quest and mission':

We're probably in close to a dozen different platforms at any given point in time ... And the reason we do any of them is to try to provide quality education to more people, so make it more accessible, hopefully at even lower cost. ... [T]hat's ... our quest and mission. ... [O]ur relationships with these various partners will change over time ... For how much longer are we with our existing relationships? I don't know ... but ... it will change. New players will come in vogue and old players will disappear. ... [W]e keep looking for new ones coming across the horizon ... We want to find the best technology to meet the pedagogical needs of our learners that we can possibly find. (Interviewee 4)

Others had entered exclusive relationships but remained watchful. This was particularly so if they perceived strategic drift by EdTech away from their university's mission or faculty attitudes. An example here was that Coursera had reportedly put some free MOOCs behind a subscription-based pay-wall without perceived sufficient consultation with university faculty or leaders that wanted such content to remain freely accessible.⁵⁷ In approaching such discussions with Coursera, university leaders saw the longevity of their institution as tipping the power balance in their favour:

Coursera ... there are a lot of changes, and the people that we met initially ... they were selling one message and now there are different people selling different messages, and everything has changed drastically. So we have a partner relationship ... You keep your partners close in line because it affects you if they fail, but that's it. ... [W]e have been here for 150 years and we will continue another 150 years. Coursera may be here for probably ten years, probably more, who knows? (Interviewee 18)

Other dynamics of time horizons here were that Coursera staff perceived their ‘forward-thinking’ ability to shift directions at ‘breakneck speed’ and follow ‘the forefront of technology’ (Interviewee 23) as assets in their EdTech/university relationships. They saw themselves as driven by an intelligent, young workforce like many other Silicon Valley companies.⁵⁸ Courserians also respected longevity but with a much shorter time perspective. They wore time served as a badge of honour, with those employed for just two (Interviewee 22) to four years telling us they had been with Coursera since ‘back in the day’ (Interviewee 24). Coursera’s fast pace was seen as a welcome ‘nudge’ by some university partners, helping them ‘to be able to innovate’ – although it also meant Coursera liaison staff changed roles or moved on frequently, potentially harming the sense of continuity in EdTech/university relationships (Interviewee 17).

4.2. Symbiotic possibilities in post-MOOC EdTech/university relationships

Symbiosis in EdTech/university relationships is captured in some of the above quotes. For example, instructors gain access to ‘eyeballs’ (Interviewee 9) and Coursera generates revenue from ‘high value products’ (Interviewee 23) that attract learners. Below we present further interviewee accounts that demonstrate three apparent variants of these symbiotic relationships: *commensal* (neutral), *mutualistic* (positive) and *parasitic* (negative) (after Townsend, Harper, and Begon 2000).

4.2.1. Commensal (neutral) symbiotic EdTech/university relationships

At Emory and Stanford, MOOCs had largely been kept free and universal access. Free MOOCs were seen as best to support non-monetary university missions, outreach, access to learning, social responsibility towards race relations and so on. The global, massive scale of free MOOCs was also a means for these universities to conduct research with diverse populations into access barriers, learning styles and so on (e.g. see Kizilcec et al. 2017). This was not otherwise seen as feasible with these universities’ smaller-scale, less diverse, campus-based cohorts.

At Stanford the apparent lack of post-MOOC developments is perhaps surprising. Recall that Coursera was started by two Stanford professors and is headquartered seven miles away (Udacity was also a Stanford spin-off). However, Stanford and Emory interviewees explained that post-MOOC developments could not substitute their campus-based ‘social capital’ building, ‘connections’ and ‘networks’:

The value of our on-campus education is certainly the social capital of the connections that you make, especially as an undergrad ... [and] really inculcating the ideals of liberal education. Can you do that by not really having the rich discourse that happens when you’re ... on ... campus all the time interacting with people who are very, very different from yourself? ... [A]nd, yes, it’s a wonderful place to be. (Interviewee 27)

[W]hen MOOCs first started ... it called into question the fundamental existence of a place like [our university]. But, of course ... for [on-campus] undergraduates ... we’re also promising them a certain experience in a certain place ... where they make connections to a network and how is that going to be replaced by MOOCs, right? (Interviewee 2)

Both universities ran Coursera MOOCs. However, the EdTech/university relationship seemed commensal. Post-MOOC developments were not a threat to these universities. They also did not wish to move into EdTech territory. Stanford had even distanced itself further by putting its online courses onto an in-house modified version of open source edX (Open edX). It wanted to tailor the technology to its own needs⁵⁹ and not be steered by others:

[A]s someone who is just interested in, how do we teach people better ... one of the real advantages of ... setting up our own platform is ... [w]e can take a faculty story, take that to an engineer and say, if it seems like this is a generalisable issue that we could use for a number of courses, we can build it in our own platform. (Interviewee 26)

4.2.2. Mutualistic (positive) symbiotic EdTech/university relationships

Examples of mutualistic relationships came from Coursera and university staff telling us they generated millions in revenue together through their standard 50/50, EdTech/university revenue sharing

agreements (Interviewees 4, 16, 23). This was for a small number of highly popular, paid courses. Most MOOCs seemingly still do not make money for these universities. Other university interviewees told us another area of 'great value'; being able to do things together with EdTech they could not have alone:

[W]e receive great value from our partnerships, and Udacity, Coursera and edX enabled us to understand how people learn online and also the power of open, accessible content that led to our ability to do something really unique that pretty much nobody else has done before. (Interviewee 7)

Other university interviewees reported their EdTech/university relationships allowed them to be 'first to market' and gain 'first mover advantage' (Interviewee 11) in specific teaching areas. They valued EdTech as enabling them to be 'an early adopter' of post-MOOC developments, and making it more likely they might 'survive' any possible disruption in hot, price competitive online teaching areas like computer science where online degrees might first displace some campus-based offerings (Interviewee 17).

The most frequently noted mutualistic benefit was universities' using their experiences of working with Coursera particularly to adapt campus-based courses because of what they had learned from teaching at scale online. One example here was about optimum (i.e. short) learner attention spans.⁶⁰ This led university interviewees to 'think much more about teaching and learning' and to begin to shift their emphasis from teaching and students, to learning and learners (Interviewee 3). Other mutual benefits came from Coursera gathering and studying big data analytics on learners' best pathways through content to get the most from it. This allowed both parties together to personalise materials and learning experiences to accommodate more diverse learner needs. There had also been mutual realisations that post-MOOC lifelong learning would need new, longer-timescale, interoperable, learner-centred, learning recognition systems to manage issuance and recovery of greater numbers of course success credentials. This was perceived to generate opportunities for universities, for EdTech and for new kinds of (probably blockchain-based) EdTech/university partnerships (Interviewees 7, 34).

Another expression of mutualistic symbiosis was Coursera being able to fulfil its global-reach ambitions when courses were developed on global challenge topics and/or with a global audience in mind. At the same time the university side was able to expand, for instance, a state-based 'land grant' remit to global proportions:

[Our] university is a land grant university, in return we have ... a mission to provide education back to the state ... [W]e took that educational land grant mission to say, well, we can also educate the world for free or for very little via these MOOCs. ... [F]ive years ago the goals were very overlapped, [our] land grant mission really met up with what Coursera's goal was of educating the world. (Interviewee 11)

This passage also alludes to possible shifts from one type of symbiosis to another, say in response to Coursera's post-MOOC drift from 'educating the world' towards increased monetisation.

4.2.3. Parasitic (negative) symbiotic EdTech/university relationships

Perhaps given our purposive selection of highly committed USA universities we did not encounter evidence of parasitic EdTech/university relationships. However, our interviewees did describe Coursera and post-MOOC developments as a potential threat to *other* USA universities:

[I]t may be fine for a lot of universities. It may be fine for Harvard ... but ... I don't think it will be fine for broad access institutions. I don't think it will be fine for community colleges. I don't think it will be fine for even some of the emerging research universities. ... [T]hey don't have the resources. ... Harvard and MIT can set aside \$30 million each, for edX. ... [T]hey have unbelievable resources. ... [Others do not] have tens of millions of dollars. (Interviewee 28)

All of the regional state universities are struggling ... [W]e're not seeing student growth because of the demographics. ... [M]aybe it's the classic disruption model and we're seeing the weaker units are [where it is] starting. (Interviewee 10)

[T]he opportunities of online education, the different price points [of post-MOOC online degrees] will further shake down some of those [lower tier] universities. (Interviewee 17)

Interviewees also felt relationships with Coursera and others *could* still move from mutualistic to parasitic over time. Several believed Coursera might build legitimacy by partnering with prestigious universities then launch its own-brand courses. This would follow a Netflix-style pathway from first being a content *distributor* to becoming an original content *producer* (Interviewees 3, 13, 14). This parasitic symbiosis scenario perhaps seemed more plausible whilst Coursera, until recently, even had a prominent former Netflix executive on its staff, leading ‘product’ development.⁶¹ Others placed important caveats upon this parasitic ‘Coursera university’ scenario (Interviewee 1). Some believed Coursera itself to be nothing more than a barebones ‘video library’ (Interviewee 14) – a limited platform technology developed by engineers and ‘doctoral students’ not pedagogy specialists and education scholars (Interviewee 13). Others believed universities have an invaluable longer-term perspective on subject topics and trends and are not just driven by market fads and fashions. Coursera therefore may wish to keep relationships mutualistic, albeit without giving up its technology and skills around ‘market analysis and demand’:

[Coursera] ... it’s a bunch of Millennials ... [T]hey’re rethinking everything, which is great because it’s a fresh look ... [B]ut you’re also reinventing the wheel. ... I have to remind them of the reasons why we do things ... rein them in every once in a while. At the same time ... they can’t do it without the university partners. They need the professors developing the content ... [They are] very short-sighted, it’s what’s hot right now. ... [T]hey would die if they abandoned the universities and the input they get from the courses and infrastructure that they have. At the same time they offer what universities don’t have, which is ... market analysis and demand, and so on. (Interviewee 17)

5. Discussion

There are three main sets of implications to discuss from our findings. First, it seems possible there may be changes in symbiotic EdTech/university relationships. This suggests a need to study post-MOOC developments over time. Second, from the rationales we found we believe it may be valuable to consider developing a typology of universities to inform the focus of future studies. Third, there are some related EdTech developments that could be explored in further work.

5.1. Symbiotic relationship changes over time?

Our interview accounts suggest there may be movement between the three types of symbiotic EdTech/university relationships over time. The most apparent one would seem to be from mutualistic (positive) to parasitic (negative). Coursera may lead this movement. Alternatively, new partners may appear with stronger ambitions from the wider global EdTech sector. Current relationships may also change, and new ones be formed – parasitic or otherwise. In the USA, and perhaps in other emerging educational arenas around the world (e.g. China, India) such developments could be studied over time.

Interviewees also considered that lower tier universities might be affected first. Future work might study their current situation, whether they are in relationships, why and when they choose to enter new ones or exit old ones, as well as their susceptibility to post-MOOC developments more generally. We also interviewed instructors/faculty who are at the vanguard of post-MOOC developments. Faculty perspectives away from this frontier may be useful to consider, as well as dissenting voices from faculty in the highly committed universities. There may be tensions present given our evidence suggests university senior leaders largely shape and direct EdTech/university relationships rather than regular academic faculty members.

5.2. Developing a typology for susceptibility to post-MOOC developments?

Our framing of dynamic post-MOOC EdTech/university relationships offers a midway perspective between nationally-mediated, constrained universities and simplified global MOOC disruption narratives. Focusing on actors and relationships uncovers rationales from university leaders and instructors, related to the varying availability and use of university resources and structures, and attitudes to marketized education, as well as differing effects by teaching subject areas.

Future work might focus on developing a typology from these and possibly other considerations. It might also be useful to account for national settings where affordances for both EdTech and universities to act might differ. This could include more constrained, regulated, less-marketized landscapes (e.g. Norway; see Tømte, Fevolden, and Aanstad 2017) or rapid growth settings (e.g. China; see Baggaley 2013). Such a typology could aim to register the susceptibility of universities to be affected by post-MOOC developments.

5.3. Further post-MOOC and EdTech developments?

To understand better changes in post-MOOC EdTech/university symbiotic relationships we might also explore further EdTech's largely unspoken, global ambitions. Coursera, as an exemplar of broad online learning EdTech, appears willing and able to deliver global transformation in higher education. And yet many of our interviewees have seen little to no disruption at their highly committed (and largely well-resourced) universities. At the time of writing we are in the early stages of second wave, post-MOOC developments. However, these post-MOOC offerings are much closer to universities' core offerings of accredited masters and undergraduate degrees than the original first wave of free MOOCs. Continued study here may therefore be useful.

A closely related but seemingly under-explored issue for fully online degrees is the importance of having MOOC-related course materials appropriately approved by accreditation education bodies in the USA. Otherwise their value to learners and employers is extremely limited. Our interviewees (e.g. Interviewees 16, 28) noted this was a non-trivial process but did not go into details. Further research might therefore explore the influence of these accreditation bodies within broader post-MOOC EdTech/university relationships and developments.⁶²

Overall the USA seems a rich setting to study post-MOOC developments. It is highly marketized, publicly and privately entrepreneurial, and has a remarkably diverse, evolving constellation of higher education actors and organisations. We therefore expect to see more post-MOOC developments that could be studied. These could include new university 'species' (see Martin 2012) like hybrid online/offline universities (for example Minerva Schools at KGI⁶³) and new forms of EdTech companies (e.g. partnering around blockchain-based learning recognition/credential systems).

6. Concluding remarks

In this paper we reframed previous accounts of MOOC-related developments with a more nuanced view of constrained universities, dynamically active with EdTech companies in forming and shaping symbiotic EdTech/university relationships. We positioned MOOC-related broad online learning companies like Coursera within the larger EdTech sector. We noted Coursera's ambitions remain somewhat ambiguous but appear interwoven with an all-encompassing, cradle-to-grave, part-educational partnership/part-transformative disruption, global EdTech sector enterprise.

Our fieldwork revealed some key university rationales within our EdTech/university relationship lens. We have stressed the necessity to account for university actors and organisations in shaping post-MOOC EdTech/university relationships, and to realise these developments are uneven in terms of resourcing, teaching subject areas, exclusivity and longevity. We have suggested EdTech/university relationships are symbiotic, with commensal (neutral), mutualistic (positive) and parasitic (negative) variants apparent in our findings. We have indicated these might change over time,

suggesting the need for a longer-term perspective to study post-MOOC EdTech/university relationships and developments.

We close with an open question we have not addressed with our current research. This is, might there be path dependence in post-MOOC developments? The USA entrepreneurial spirit and pace is impressive in how far post-MOOC developments have so far unfolded there. However, will this relatively recent rush into EdTech/university relationships serve to alleviate or to amplify constraints and pressures around affordability and accessibility of USA higher education longer term? Future research might wish to explore not only whether mutualistic symbiotic EdTech/university relationships continue in this post-MOOC world, but also how students/learners in the USA and beyond are ultimately affected. It might also be important to follow whether post-MOOC developments may yet lead even highly committed universities, and EdTech, to diverge onto perhaps as yet unexpected – and undesired – paths in future.

Notes

1. Harvard University has considered itself in a 'post-MOOC' phase after moving from MOOCs to 'small private online courses' or SPOCs (e.g. see Coughlan 2013). Dhawal Shah, the 2011 creator of unofficial global MOOC ranking website, Class Central (<https://www.class-central.com/>) sees a major 'second wave' of MOOC hype since 2017 of more MOOC-related 'new degree programs' (see <https://www.edsurge.com/news/2018-05-21-the-second-wave-of-mooc-hype-is-here-and-it-s-online-degrees>, accessed 23 May 2018).
2. <https://www.coursera.org/>.
3. <https://www.udacity.com/>.
4. <https://www.edx.org/>.
5. <https://www.futurelearn.com/>.
6. For examples see <https://www.cbinsights.com/research/ed-tech-startup-market-map/>, <https://edtech.careers/industry-focus-broad-online-learning-platforms/>, <https://www.edsurge.com/product-reviews>, all accessed 29 March 2018.
7. Many first wave MOOC learners already had university-level education of some kind. For this first wave, scholars also felt EdTech companies had ignored or leapfrogged decades of best practice around online and distance pedagogy. This substantial body of critical research on pedagogy about the massive-scale living laboratory of diverse, global (x)MOOC practices has remained largely separate from mainstream MOOC practices (see Baggaley 2013; Todhunter 2013; UUK 2013; Bates 2014, 2018a, 2018b; HEA 2014; Holzweiss et al. 2014; Navarro 2015; Porter 2015; Blackmon and Major 2017). In overview, scholars have used global MOOC learners to research massive-scale learning characteristics, to test whether universal access MOOCs reach underserved populations, to explore the 'rise of the video-recorder teacher', to test new assessment approaches, to discuss big data learner analytics and related ethics, and to explore how MOOC pedagogy serves learner diversity in universal access settings (Adams et al. 2014; Firmin et al. 2014; Holzweiss et al. 2014; Marshall 2014; Literat 2015; Schmid et al. 2015; Perrotta, Czerniewicz, and Beetham 2016; Hanewicz, Platt, and Arendt 2017; Helberger, Pierson, and Poell 2018).
8. Educational scholars have refuted the 'disruptive' novelty of MOOCs, seeing them as an incremental development step from correspondence, distance and online education, and even as regressive here, in that they have delegated responsibility from educators and educational organisations onto individualised, customer 'learners' (Baggaley 2013, 2014a, 2014b, 2014c; Bates 2014; Moore 2014; Porter 2015; Hanewicz, Platt, and Arendt 2017).
9. Scholars have framed MOOC practices not as isolated new technologies but as incremental steps in a longer lineage of online education technology phases, and have labelled evolving formats as MOOCs 1.0, 2.0 and 3.0, underpinned by emerging technical parameters of Web 1.0, Web 2.0 and Web 3.0 ICT infrastructures (see Beldarain 2006; Clarà & Barberà 2013; Sandeen 2013; Fischer 2014; Naidu 2014; Zawacki-Richter and Naidu 2016; Picciano 2017; Sharma, Palvia, and Kumar 2017; Brown 2018; Peters and Jandrić 2018).
10. After the Association for Educational Communications and Technology [AECT] definition; <https://www.aect.org/>, accessed 1 May 2018.
11. We used Navitas Ventures (<https://www.navitasventures.com/insights/landscape/>), EdSurge (<https://www.edsurge.com/>), CBInsights.com, and conferences such as the EdTechX global series (e.g. <http://edtechxeurope.com/>, <http://www.edtechxafrica.com/>, <http://www.edtechxasia.com/>).
12. See <https://blog.navitasventures.com/global-edtech-landscape-3-0-15-000-teams-building-the-future-of-education-7cda8633c0ed>, published 30 August 2017; accessed 13 September 2017.
13. See <https://www.edsurge.com/product-reviews>, accessed 1 May 2018. Early stage educational products generally including game and toy-based apps.
14. See <https://blog.navitasventures.com/global-edtech-landscape-3-0-15-000-teams-building-the-future-of-education-7cda8633c0ed>, published 30 August 2017; accessed 13 September 2017.

15. There are also 'broad online learning' EdTech companies positioned more towards the procured services/LMS end of the spectrum for MOOC developments, as opposed to companies like Coursera that are more about co-development of MOOC-related materials. One example is USA-based company, 2U. However 2U's mission statement still refers to universities as 'partners': '2U partners with top colleges and universities to deliver the world's best online learning experiences' (see <https://2u.com/partners>, accessed 27 August 2018).
16. These are 2016 estimates, see <https://www.marketwatch.com/story/global-report-predicts-edtech-spend-to-reach-252bn-by-2020-2016-05-25-4203228>, accessed 1 May 2018.
17. <http://www.universityworldnews.com/article.php?story=20110521105752138>; accessed 1 May 2018.
18. <https://www.cbinsights.com/research/ed-tech-startup-funding-deals-dollars/>, accessed 31 January 2018.
19. See <https://blog.navitasventures.com/global-edtech-landscape-3-0-15-000-teams-building-the-future-of-education-7cda8633c0ed>, published 30 August 2017; accessed 13 September 2017.
20. 2016 estimates, see <https://www.marketwatch.com/story/global-report-predicts-edtech-spend-to-reach-252bn-by-2020-2016-05-25-4203228>, accessed 1 May 2018.
21. <https://edtech.careers/industry-focus-broad-online-learning-platforms/>, accessed 1 May 2018.
22. <https://about.coursera.org/>, accessed 25 May 2018. Coursera's mission and vision statements have changed over time. Its August 2018 mission statement was: 'Coursera provides universal access to the world's best education, partnering with top universities and organizations to offer courses online' (<https://www.coursera.org/>, accessed 30 August 2018). It presents itself slightly differently on different channels, e.g. LinkedIn:

Coursera is an education-focused technology company that connects millions of learners around the world with the skills and knowledge they need to transform their lives and careers. We're providing access to top-quality university-level education at a previously unimagined scale, empowering learners, organizations, and enterprises to build the skills the need to succeed in the 21st century. (<https://www.linkedin.com/company/coursera>, accessed 31 August 2018)

23. Coursera reached this milestone in 2018, ahead of an optimistic five-year timeline stated by its original chief executive back in 2016 (see Coughlan 2016, 2018).
24. <https://blog.coursera.org/welcoming-shravan-goli-courseras-chief-product-officer/>, <https://about.coursera.org/careers/>; both accessed 19 April 2018.
25. See <https://www.cbinsights.com/company/coursera>, accessed 31 January 2018; the EdTech company that has raised most funding is EverFi, a reported 251 US million dollars as at April 2017 (with support from Google Chief Executive, Eric Schmidt, and Amazon Chief Executive, Jeff Bezos).
26. As at June 2017, see <https://techcrunch.com/2017/06/07/online-learning-startup-coursera-raises-64m-at-an-800m-valuation/>, accessed 27 March 2018. A later valuation similarly puts the figure at 814 million USD; see <https://www.cnbc.com/2018/05/21/coursera-2018-disruptor-50.html>, 22 May 2018, accessed 27 August 2018.
27. <https://www.recode.net/2017/10/30/16569304/coursera-executives-financial-marketing-education-online-mooc-venture>, accessed 1 May 2018. The advert covers executive roles in marketing and product growth, customer success and design research, global business development, and software platform roles.
28. For example six new degree programmes on Coursera, including Coursera's first ever fully online, three-year, undergraduate degree in computer science with the University of London, announced March 2018, launching late-2018/early-2019, see <https://blog.coursera.org/6-new-degrees-coming-to-coursera-in-computer-science-data-science-and-public-health/>, 6 March 2018, accessed 7 March 2018.
29. <https://about.coursera.org/careers/listing/?title=Chief%20Marketing%20Officer&id=bfa799a0-18cb-49b8-bf4f-9066691817d0>, accessed 7 March 2018. Our emphasis added in all quotes in this section.
30. <https://about.coursera.org/careers/listing/?title=Chief%20Marketing%20Officer&id=bfa799a0-18cb-49b8-bf4f-9066691817d0>, accessed 7 March 2018.
31. <https://about.coursera.org/careers/listing/?title=Chief%20Product%20Officer&id=3df942b9-22c6-4565-aff6-35a85add8d6d>, accessed 7 March 2018.
32. <https://about.coursera.org/careers/listing/?title=Chief%20Product%20Officer&id=3df942b9-22c6-4565-aff6-35a85add8d6d>, accessed 7 March 2018.
33. <https://about.coursera.org/careers/listing/?title=Business%20Development%20Manager%2C%20India&id=9f41b972-e893-4659-89b1-f3ab188dc30d>, 7 March 2018.
34. <https://about.coursera.org/careers/listing/?title=Senior%20Product%20Manager%2C%20Growth&id=5f7d4225-6348-49b9-a9b9-818b9d4e2e38>, accessed 7 March 2018.
35. <https://about.coursera.org/careers/listing/?title=Senior%20Design%20Researcher&id=a0d45f2a-d969-4651-ae07-5b89e76c8110>, accessed 7 March 2018.
36. <https://about.coursera.org/careers/listing/?title=Customer%20Success%20Manager%2C%20North%20America&id=29996a4c-90b3-49e0-a480-6a56d9eaaa8f>, accessed 7 March 2018.
37. <https://about.coursera.org/careers/listing/?title=Senior%20Program%20Manager&id=0b3bbe09-4e67-4c38-8b99-ab5758c85157>, accessed 7 March 2018.
38. <https://about.coursera.org/careers/listing/?title=Senior%20Software%20Engineer%2C%20Front-End&id=0d34c19b-edc2-4e36-882c-a28d59e5373e>, accessed 7 March 2018.

39. <https://about.coursera.org/careers/listing/?title=Customer%20Success%20Manager%2C%20North%20America&id=29996a4c-90b3-49e0-a480-6a56d9eaaa8f>, accessed 7 March 2018.
40. This was in a blog post welcome by Coursera Chief Executive Officer (CEO) Jeff Maggioncalda to one new recruit resulting from these ads; <https://blog.coursera.org/welcoming-shravan-goli-courseras-chief-product-officer/>, accessed 19 April 2018.
41. The USA had 4664 degree-granting institutions in 2015 (<http://carnegieclassifications.iu.edu>, accessed 27 March 2018), almost a third of the '15,000 or more universities active around the globe' (Thoeng and Paradeise 2018, S62 [2014 estimate]).
42. Including: absolute number of MOOCs and MOOC-related offerings since 2012; range of MOOC topics; numbers of MOOC learners reached; resources for MOOC-related dedicated teams and structures; high profile courses and instructors; and prominent universities and people presenting at two Coursera Partner Conferences (an annual series since April 2013; we attended in March 2015 in Newport Beach, California, USA, where Coursera launched Specializations – a modular, so-called 'stackable' form of cumulative credentials – and in March 2017 in Boulder, Colorado, USA where Coursera launched two fully online, taught Masters degree programmes, adding to two it first launched at its 2016 conference in the Hague, Netherlands).
43. Elsewhere distinguished as 'mass market' and 'niche' MOOCs, see Tömte, Fevolden, and Aanstad 2017. We also selected interviewees with long relationships with Coursera, having launched and perhaps later lapsed MOOCs, and those involved with post-MOOC degrees.
44. We interviewed: instructors (tenured, tenure-track, non-tenure track) developing and presenting courses; online teaching assistants; instructional design teams, developing and managing MOOC-related workflows and pedagogy and audio-visual production; senior academic leaders at faculty, college and central levels; and people in technical, product and market development roles in Coursera. We also observed audio-visual production units.
45. Searching Coursera and edX websites, university websites, and speaker descriptions at the two conferences identified 10 universities matching our criteria; we contacted 80 potential interviewees at six of these, and 10 people at Coursera.
46. In 2015, there were 115 R1 USA universities, part of the broader 'R' set of 334 USA universities awarding doctorate degrees; see <http://carnegieclassifications.iu.edu/>, accessed 27 March 2018.
47. See <https://www.usnews.com/best-colleges>, accessed 12 April 2018. These figures exclude accommodation and living costs.
48. Our interview programme generated 24 h of audio, 240,000 transcribed words, and 2000 words of verified field notes.
49. This label has been publicly used by Jeff Maggioncalda, Coursera chief executive officer (CEO) saying he is, 'truly humbled by the talent and energy' of his 'fellow Courserians', <https://blog.coursera.org/welcoming-shravan-goli-courseras-chief-product-officer/>, 18 April 2018, accessed 18 April 2018.
50. We met Coursera staff at two of their conferences, and during our own MOOC development; nevertheless access proved difficult. Following multiple emails, and getting approval for a lightly modified version of our protocol, we secured interviews. Upon entering Coursera's headquarters we signed non-disclosure agreements. We were given a selective building tour and a pre-meeting briefing, before discussing with five interviewees, then receiving a post-meeting debrief.
51. For example, see 'Secrecy, swag and \$10k a month', <https://www.theguardian.com/technology/2016/jul/12/internapalooza-san-francisco-tech-industry-interns>, accessed 13 April 2018.
52. An estimated 40 jobs were being 'eliminated' around our visit; see <https://www.recode.net/2017/10/30/16569304/coursera-executives-financial-marketingeducation-online-mooc-venture>, accessed 1 May 2018.
53. Georgia Tech is mapping and planning for the university starter demographic in 2040, based on current birth statistics providing this data, see <https://www.insidehighered.com/digital-learning/insights/2018/05/16/georgia-tech-envisions-research-university-education-future>, accessed 25 May 2018.
54. See <https://www.extension.harvard.edu/about-us/meet-dean> and <https://futurepodcast.wordpress.com/2018/05/15/episode-13-maintaining-academic-rigor-in-open-enrollment-courses/>, both accessed 25 May 2018.
55. Another post-MOOC shift at Coursera was increasing business-to-business partnership with companies wanting to 'train people around the world', and that Coursera increasingly saw its 'content providers' as 'universities and companies' (Interviewee 24).
56. The typical sharing agreement reported to us was 50/50 between the EdTech company and the university. From the university's 50% revenue share, typically one-third goes to the instructor(s), one-third to their faculty or school, and one-third to central administration. More research would be needed to verify whether the 50/50 split is actually of gross or net revenues. We were not able to explore how the 50/50 split was initially determined, and who from the university side was involved in such consultations (most likely university senior leaders). At the same time, no interviewees commented that they considered this 50/50 arrangement to be unfair.
57. Coursera seems to have later re-introduced emphasis that 'free' courses remain available. At the time of writing its sign-in page now states: 'Learn skills from top universities for free' (<https://www.coursera.org/?authMode=signup>, accessed 30 August 2018).

58. For 2017 the median age in the top three Silicon Valley technology companies AOL, Facebook and LinkedIn was 27, 28 and 29, respectively, and is below 35 in all the top dozen, see <http://uk.businessinsider.com/median-tech-employee-age-chart-2017-8>, accessed 27 March 2018.
59. Many of our interviewees noted that in-house development of entirely *new* platforms, rather than *using or adapting* existing platforms, was rare, risky and 'enormously expensive' with some universities having pre-MOOC experience of developing online education platforms that 'largely failed, after investing about \$50 million' and EdTech companies elsewhere known to have spent '\$100 million' on platform development (Interviewee 28).
60. One interviewee noted research was done by EdTech platforms – including edX – to analyse learners' 'attention span'; this, as 'advertisers knew all along', turned out to be around 'two to three minutes' and only '[s]ix to seven minutes' even 'for the most engaged' learners (Interviewee 34). This reportedly 'wasn't an understood phenomenon ... in the academic world' beforehand (Interviewee 34).
61. Until October 2017 Coursera had Tom Willerer, former Netflix Vice President of Innovation as its Chief Product Officer; see <https://www.recode.net/2017/10/30/16569304/coursera-executives-financial-marketingeducation-online-mooc-venture>, accessed 20 April 2018.
62. Similarly there are other formal actors present that were not mentioned in our current fieldwork, for instance the US Office of Educational Technology (see <http://tech.ed.gov>, last accessed 22 June 2018).
63. See <https://www.minerva.kgi.edu/> and Kosslyn and Nelson 2017.

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ORCID

Duncan A. Thomas  <http://orcid.org/0000-0003-1864-5344>

Maria Nedeva  <http://orcid.org/0000-0003-0412-8063>

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