DISRUPTIVE EDUCATION:

Technology-Enabled Universities

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Executive Summary

The statistics around Massive Open Online Courses (MOOCs) are extraordinary. In a little over a year, more than 6.5 million students have enrolled in over 800 free classes produced by about 200 universities all around the world. Harvard and MIT have poured $30 million each into their edX collaboration. Private investors have made similar sized bets into Silicon Valley-based Coursera, a rival MOOC platform.

Technology messiahs foretell a world in which anyone anywhere anytime can access high quality higher education at no or low cost. Prophets of doom envisage a MOOC tsunami sweeping away the ivory tower. Skeptical hard heads counter by paraphrasing Mark Twain: talk of the demise of place-based universities is grossly exaggerated.

There is ample history to support the skeptics. Universities have gone from strength to strength in the Internet age. In contrast, MOOC completion rates are extremely low. And the business model behind giving away classes at no or very low cost to the student is at best embryonic.

Nonetheless, we believe MOOCs are here to stay. This is not only because ways to charge for completing them are now emerging. At least as importantly, MOOCs are valuable loss leaders for traditional universities.

We consider MOOCs the forcing function behind a rapidly evolving technology-enabled revolution in higher education that will feature two other major innovations in addition to MOOCs themselves.

First, there will be a mushrooming of higher quality and more interactive online degrees, targeted at time poor students with the experience to maximize the convenience benefits of online delivery.

Second, traditional place-based universities will also integrate technology into everything they do, beginning with "flipping the classroom" by allowing students to consume lecture material on their own time, using in-class time to debate issues and solve problems with peers.

Perhaps the best way to understand this revolution is to think about MOOC platforms, including Australia's Open2Study, as the iTunes of higher education. iTunes didn't change the way music was made; it revolutionized how people listened to music. MP3 files are lower quality than high fidelity stereo, but they are so much more convenient. Instead of having to buy whole albums, listeners create their own playlists and only pay for what they want.

But live music is thriving in the iTunes world. The Rolling Stones tour more and charge more for concerts than they ever have. Indie artists hope their iTunes sales will attract new fans to their concerts.

Similarly, we do not expect MOOCs to make the on-campus experience any less attractive. In fact taking a MOOC might make students more likely to end up on campus and willing to pay more for the privilege.

Coursera and edX don't make classes. But they do make content produced by academics ubiquitously available. Taking a Harvard class online isn't like being in the Harvard Yard, but it is so much cheaper and more accessible.

And cutting edge MOOCs aren't mere video captures of whole hour plus lectures. They are typically modules of less than 15 minutes with high production values interspersed with mini progression quizzes that students can select, repeat or fast forward through—all personalized to their own learning styles, needs and backgrounds.

But there are two major differences between iTunes and today's MOOC platforms. On the one hand, they would love to be able to generate the revenues iTunes can. On the other hand, whereas Apple struggled to get music companies onboard, universities are welcoming MOOCs with open arms.

MOOCs may one day soon generate lots of revenues through certificates of completion or by licensing content to universities. But MOOCs would probably be sustainable even if these revenue streams don't materialize. This is because universities are willing to spend lots of money producing high quality MOOC content as classic loss leaders for their businesses.

But MOOCs also allow universities to project their brands globally and to identify the best students wherever they are on the planet. MOOCs make possible real time, big data experiments in new pedagogy like adaptive and personalized e-learning, peer assessment, and the gamification of higher education. And administrators hope MOOC success on the global stage will inspire more innovation on their own campuses.

In turn, this MOOC ethos has swept through the world of online degrees—catering above all to time poor working professionals for whom campus-based education is a luxury they cannot afford.

In the US, Georgia Tech ("Tech") has partnered with a MOOC platform, Udacity, and telecom giant AT&T to produce an online masters in computer science degree for $6,600 that it hopes will attract 10,000 students. It's pitched in direct competition with Tech's $40,000 on-campus master's degree

Tech's academic talent creates the classes. Udacity provides the technology to put these classes online and the labour to interact with the masses of students. AT&T injected the cash to make the innovation possible. Tech and Udacity will split the profits. AT&T hopes for a reputational boost from being involved.

Closer to home, Swinburne University has partnered with SEEK in Swinburne Online to offer a wide range of undergraduate degrees to students without ever having to set foot on campus. In a little more than a year, more than 7,000 full-time students have enrolled for what Swinburne Online calls "entirely digital" learning. And their academic performance and satisfaction levels are reported to be similar to those of students who take on-campus classes at Swinburne in the same degrees.

Wither the place-based university in this brave new world?

The future is bright, but it will require universities to embrace radical change to a centuries-old model, and to do so at a pace much more rapid than normal "university time". The good news is that our universities are confronting the challenges today with real verve, and with their eyes wide open.

The key is to use technology to make efficiency gains, for example using MOOCs for standard first year classes and pre-university foundation classes, and then to focus on those precious things that cannot be commoditized online.

You don't need Brideshead Revisited romanticism to see that university education at its best is a rich ecosystem, with everything from in class discussion, debate and problem solving, to residential living and students services, to internships and international experiences embedded in the curriculum.

There will always be a place for the Ivy League elite. But this is a pipedream for the preponderance of students. A well rounded campus-based experience, provided more affordably, and enriched and made more efficient by technology, isn't.

The greatest value of the disruptive education revolution led by MOOCs is that it is forcing universities to focus on their core competence for which they have long been revered and cherished. That core competence, to paraphrase Plutarch, is to kindle the fire to learn in young minds.

Universities have gone from strength to strength
in the internet age

1. Introduction

Australian higher education has been struggling since the global financial crisis to defend its very successful export model of teaching large numbers of international students against the backdrop of a high dollar, greater competition from the United States and other English-speaking countries, and increasing quality in Asian universities.

Now our universities confront another equally powerful force that we call "disruptive education", a revolution in technology-enabled higher education. Since the New York Times declared 2012 "the year of the MOOC", Massive Open Online Courses, have been everywhere— at least as much a response to the heightened competitiveness and cost pressures facing universities as the product of new technology, per se.

But when you strip away the gaudy take-up statistics, what do MOOCs really mean for higher education?

Technology messiahs foretell a world in which anyone anywhere anytime can access high quality higher education at no or low cost. Prophets of doom envisage a MOOC tsunami sweeping away the ivory tower. Skeptical hard heads counter by paraphrasing Mark Twain: talk of the demise of place-based universities is grossly exaggerated.

There is ample history to support the skeptics. Universities have gone from strength to strength in the Internet age, even though several major universities lost their shirts online after the dotcom bubble burst. While MOOC enrolments are stratospheric, their completion rates are extremely low. And the business model for using expensive technology and high priced academic talent to give away classes for no or very low cost is at best embryonic.

But MOOCs, and online higher education in general, don't have to be as successful as Apple or Google to change universities profoundly. Consider the last revolutionary change to knowledge creation and dissemination, Gutenberg's printing press. While it didn't herald the demise of Oxford and Cambridge, the emergence of the book forever changed higher education.

Students could read the Bible and Aristotle outside the classroom, rather than having to wait to be told about the greats by their teachers. The genius of Oxbridge that then emerged was the tutorial, where students discussed and debated ideas with their tutors and their peers based on what they had all read beforehand outside the classroom.

Students no longer needed to be physically in Cambridge or Oxford to get a classical education. They could study the same books anywhere.

This allowed universities teaching the same material as Oxbridge to emerge on the Continent, and then in the New World.

We believe Internet-based teaching and learning is the printing press on steroids. You don't have to be in the Harvard Yard to be part of Michael Sandel's "Justice" course. You can watch his TV series or take his MOOC—without having to be admitted to Harvard, without having to travel to Cambridge, Massachusetts, and without having to pay Harvard tuition. More generally, "students" (i.e. people anywhere at any point in their lives who want to learn) have unlimited opportunities to learn at their fingertips.

Beyond the supersizing of printing press effects, two pedagogical quantum leaps are also possible—real time experiments at massive scale showing what works best when it comes to student learning, and to use the data to continuously improve pedagogy; and personalized higher education allowing individual students to chart unique pathways through course material based on their experience, expertise and learning styles.

In the digital age, anything that can be commoditized will be, at massive scale. This is likely to be just as true for higher education as it has been for news and music, retail and banking. But some things cannot be commoditized.

Just as people still throng to music concerts for the unique experiences they entail, the rich and dense ecosystems of communities of learning that are embedded in place-based universities will remain precious, cherished and revered.

The challenge facing higher education today is to determine the optimal mix of online and on-campus teaching and learning, both within individual institutions and across whole systems of higher education. To do so, universities will have to confront the uncomfortable if not unthinkable: sweeping changes to the centuries-old model of a university education at a pace much faster than normal "university time".

The upside from embracing technology-enabled education promises to be very high. But if universities are complacent, passive or slow, the downside risk from new entrants with much lower costs and prices is equally stark. In this fast moving world, inaction is a major risk. Like other industries in the digital cross hairs, higher education must try to execute an extremely difficult multitasking act: supporting the existing business model to keep the lights on, while simultaneously experimenting with radical change to future proof the business.

We believe winning in the brave new world of technology-enabled higher education will require at least two profound mindset changes for universities.

First, they must understand that creating knowledge and sharing it with students is no longer enough. Information is ubiquitous today—from how to start a business and how intelligence services monitor our lives, to decoding our own genomes and seeing dark matter at the edge of the universe. The challenge facing us all is to see through this blizzard of information and knowledge to see the forest amid millions of twigs and then to take the best path forward to get to the other side.

This is not merely about self-improvement and self-worth; it is at least as much about social contribution and career prospects. As Thomas Friedman has observed: The world does not care what you know. Everything is on Google. The world only cares about, and will only pay for, what you can do with what you know. ('The Professors' Big Stage', New York Times, 5 March 2013)

This does not mean there is no place for philosophy or literature in the 21st century. Far from it. But the skills acquired in understanding Kant and Shakespeare are at least as important as exegetical knowledge of the texts themselves, and these skills must be readily transferable to other domains.

Second, universities will have to be much more self-reflective and self-critical when it comes to what they do, with more focus on the customers—students. This is the credo of Jeff Bezos, founder of Amazon, arguably the world's most successful e-business. He said:

To continually revitalise your business, you can't stop at 'What are we good at?' You have to ask 'What do our customers need and want?' And no matter how hard it is, you better get good at those things. (*MIT Technology Review*, 1 December 2011)

Embracing Friedman and Bezos may feel heretical. But the ethos of empowering and energising students goes back to at least Plutarch, who said 2000 years ago "the mind is not a vessel to be filled, but a fire to be kindled".

The Internet, Smartphones and social media are at the very core of everyday life for the young, and increasingly the not so young as well. If the university were to turn a blind eye to the Facebook and Wikipedia world it would lose its students (literally as well as metaphorically), and squander higher education's unique and invaluable role of kindling fires in the leaders of tomorrow.

But there is an avalanche of evidence that universities are not burying their collective head in the sand. Experimentation is everywhere, from the oldest universities to the youngest tech start-ups.

The fundamental objectives of this report are first to document and organize these manifold experiments and then to suggest where they might most productively go in the coming years.

Figure 1 depicts a series of transitions that we believe "traditional" higher education is making and will have to continue to make to thrive in the "tech-enabled" future.

Figure 1. Disruptive Education: Transforming Universities

	TRADITIONAL		TECH-ENABLED		
What universities are good at	Degree	→	Life platform	What students want	PRODUCT
Receive facts	Knowledge	→	Skills	Solve problems	STUDENT LEARNING
Lecture to students	Stand and deliver	→	Curate content	Facilitate learning	ACADEMIC TEACHING
Master the material	Technical experts	→	Career ready	Leadership, teamwork, communication	GRADUATE ATTRIBUTES

The fundamental feature that distinguishes universities from continuing education on the one hand and research institutes on the other is that universities award "degrees"—the gold standard educational qualification on which the business model of universities is based.

When students can take MOOCs from Harvard and Stanford without ever enrolling in either place, the value of a degree per se is likely to come into question—particularly if others in society,

from peers to employers, come to value a MOOC credential. There is emerging evidence that this is already beginning to happen.

This means students will only continue to pay real money for university degrees if they continue to add much more value than other cheaper and more convenient educational experiences and credentials. We consider this unique value proposition of the university to be providing a "life platform" for success.

Acquiring "knowledge" remains critical to this life platform, but it isn't enough. Students need cognitive and behavioral "skills" to thrive. Mastering the material, from ancient history to quantum mechanics, is essential; but it can be gained at 3am on a tablet in a bed in Colombo, Sri Lanka from a Nobel Laureate who gave a TED talk in Long Beach, California. Developing the ability to use this knowledge, from problem solving to working in teams, cannot easily be done online.

The "stand and deliver" lecture to students is an endangered species. Why go to a university classroom in Slough to take Macroeconomics 101 when you can watch and learn from Milton Friedman's best students in Chicago online for free? In this sense the appeal of MOOCs is that they are living, breathing textbooks—only much cheaper and much more easily accessed. And for many people, watching a two-hour movie of a novel is a better value proposition than reading the 500 pages of the original text.

This means that teaching in universities will have to be fundamentally reconceived. We believe "curating content" is a good description for part of the coming role of teaching academics. Curators in art galleries are not trying to put up their own canvasses next to Picassos. But they do add tremendous value in helping us get the most out of Picasso, and Matisse at the same time. Similarly, people with millions of followers on Twitter often are not followed so much for their own views and outputs, but because they identify for us things they think we will want to read, listen to or watch—and we take their lead.

Unlike Twitter gurus and museum curators, academics can add even more value by helping students use what they learn. Helping students actively "solve problems" rather than passively "acquire facts" is how we should understand the learning goals of university teaching. And students will want curatorial advice in constructing their education "playlists" of knowledge.

Instead of "technical experts" who are knowledge specialists in everything from ancient history to neuroscience, university graduates should have not only mastered technical competences but also have been primed to thrive in their careers, and in their lives more generally. Employers often criticize universities for producing students who know a lot about their given fields but cannot function effectively in the workplace. Conversely, there is a recurring theme in many success stories of vastly different people who were average students. The seeds of their later success were sowed on university campuses— just not in their formal classrooms.

This depiction of the coming age of higher education excludes two words omnipresent in the university lexicon, "government" and "research".

We believe that when it comes to the challenges and opportunities of technology-enabled education, the most important way governments can help public universities is not to give them more money but to get out of the way so they can innovate.

No Western government will be in a position significantly to increase university funding for the foreseeable future, unlike many of their Asian counterparts. To allow first world universities to win in the technology age, governments will have to decrease the regulatory burden on them. Regulations that protect the interests of society are essential; regulations that stifle innovation are the exact opposite.

The world's best universities are all "research-intensive", but they also say this makes them the best places for students to get their higher educations. This is based on the premise, often asserted but rarely proved, that it is their research quality that adds most value to their teaching programs.

We believe it is probably true, but for indirect reasons having to do with the creativity and drive of top researchers, the fact that they keep abreast of the latest developments in their fields, and because they attract the most talented students—not necessarily because bringing research directly into the classroom is always of great value.

In this report, the only thing we need to say about research concerns its funding. In all research-intensive universities, teaching revenues subsidize research—because grants and contracts invariably do not pay for the full cost of undertaking research.

Today's level of redistribution from teaching to research cannot continue if universities are to meet the challenges and take advantage of the opportunities in an era of technology-enabled higher education. With increasing global competition for students, and therefore more choice and more pressure on price, increasingly more of the revenue margin from tuition and fees will need to be reinvested into teaching and learning.

2. University Futures

There is no unique path to success in the world of technology-enabled higher education. In this report, we identify three distinct futures that are not mutually exclusive and whose overlaps will have to be managed carefully:

1. MOOCs produced by universities at considerable cost to them but distributed by content aggregators at very low prices

2. Online degrees offered by both place-based and virtual universities, which harness interactive technologies and are less costly to produce and are more scalable than conventional degrees

3. Hybrid degrees integrating technology into rich campus-based educations for which students will have to pay a premium

There are likely to be real limits to how far MOOCs can go. They are great vehicles for projecting a university's brand globally and hence for identifying and subsequently recruiting talent (both students and academics) wherever it may be. Their massive scale also means that real time experiments in new forms of pedagogy and assessment can help improve education and do so quickly—not only online courses, but for all university classes through inspiration as well as demonstration. This is why place-based universities are willing to make considerable investment in MOOCs as loss leaders and then give away for free their content to MOOC aggregators.

But MOOCs are far from degrees. The leading edge in their credentialing today is a certificate of completion for specific courses. Crossing the Rubicon into credit and towards degrees would be a massive step, requiring at minimum market acceptance of the new credentials. Low-priced certification of completion of individual MOOCs seems the most sensible business model.

There are already large and successful providers with vast experience and market share in online degrees, from the for-profit University of Phoenix in the US, to virtual universities like Britain's Open University and Open University Australia, to place-based universities with long and large distance learning histories such as the University of New England.

These largely virtual universities do not have the cachet, and generally cannot charge the prices, of good place-based universities. There is nothing to stop all universities, however, getting into the business of online degrees. But being good online and staying competitive requires increasingly large technology investments that foster active learning among students and with their teachers. And to generate big volume (the name of the online game) the price point will have to be lower than placed-based degrees in the open market. Brand confusion—or, worse, brand erosion—is a major risk for traditional universities

in getting more heavily into the business of online degrees.

This leaves place-based institutions with the attractive option of leveraging their traditional strengths by folding technology into everything they do as hybrid universities, beginning with "flipping the classroom" by allowing students to consume lecture material on their own time, using in-class time to debate issues and solve problems with peers. Creating this hybrid university will be expensive, and universities will have to convince students that this is worth the large price premium required.

Place-based universities will have to invest in the whole ecosystem of campus life that extends well beyond the classroom and formal education and into experiential learning. Residential accommodation is critical, but neither is it enough on its own. University life is also about student services, from health to careers, all manner of student organisations, retail precincts, and sports and educational facilities. This will be a particular challenge for Australian universities in major cities that have long been essentially commuter campuses where students only come to take classes and then leave for their homes and, increasingly, their jobs. And academics will have to change fundamentally how they think about their jobs, made all the more challenging by the enterprise

bargaining arrangements and trade union compacts common to public universities around the world.

Three features of these disruptive education futures should be emphasized at the outset.

First, the future is already here in the very real sense that there are many examples of less developed versions of each future operating today. We see many examples, from Coursera's stunning growth in attracting students around the world, to Georgia Tech's new $6,600 master's degree with a target enrolment of 10,000 students, and to manifold university experiments with flipped classrooms.

Second, while each future is analytically distinct, in practice there are likely to be substantial and important overlaps among them. Place-based universities already have online degrees sitting alongside campus-based programs, and online degrees already taking advantage of MOOCs for content. Indeed, it is likely that many universities in the future will contribute MOOCs to a MOOC platform (or do it in-house), run their own online degrees, and have intensive place-based degrees all at the same time. They will also use MOOCs in online programs and use lecture material from online degrees as core elements in the flipped classroom of place-based degrees.

Third, unlike the dotcom wave of technological innovation in digital higher education that crashed with the tech wreck more than a decade ago, we believe that an ongoing digital revolution in higher education is here to stay. This will render obsolete, perhaps sooner rather than later, the current trajectory of ever bigger campus-based universities, relying on large lectures as the core mechanism for teaching students, and increasing tuition fees to cover ever higher fixed costs including research.

The other important observation to make about technology-enabled higher education concerns the emergence of adaptive e-learning, which we expect will add value to each of the three future platforms we have outlined.

More than half a century ago American psychologist B. F. Skinner championed the pedagogical upside of "teaching machines" that adjusted the test a student took based on her behaviour. Get question 1 right, move straight to question 3; get question 1 wrong, go to a remedial question, and so on.

There were two key features to this simple idea. First, assessment was a learning tool—for students and for teachers. Instead of just serving to assign a student a mark, assessing how students performed could be instantly fed back into what the student was asked to master.

Second, learning was personalized, because different students would take their own individual paths through a test.

Co-founder Andrew Ng proudly claims that Coursera has gathered more information on how students learn in its short life than the rest of the world has gathered in the millennium's history of education, and he is no doubt right. Add cutting edge "big data" analytics and it is easy to see how MOOCs offer an unprecedented laboratory for educators to understand how students learn, and to improve their teaching as a result.

The notion of personalized, interactive and fully adaptive e-learning is at the core of Australian start-up company Smart Sparrow. The three core features of this approach are:

• Adaptive feedback: allows teachers to monitor student learning in real time to give new challenges to students who are mastering the material or providing more help to students who are struggling

• Adaptive learning paths: students who are performing well can be skipped to higher levels whereas those who are struggling can be sent to more foundational material

• Adaptive content: allows teachers to adjust overall course content on the fly based on real time feedback about student outcomes

we believe that an ongoing digital revolution in higher eduction is here to stay

But perhaps the ultimate form of adaptive learning would be to "gamify" the university, the way Mathletics has gamified arithmetic and more for school children. The beauty of gamification is not only that it is completely personalized; games are also fun. Strive to master level one, feel good about getting there, but then be fired up to open the door to level two, and so on.

Not everything in higher education will be gamified. But UNSW economists Isabella Dobrescu and Alberto Motta are developing a game they call "playconomics" in which age old concepts like comparative advantage are taught in game form, replete with avatars and multiple levels of attainment.

This short foray into the dynamic world of adaptive e-learning only gives a taste of what is possible. But for the purposes of our report it is critical to note that all three of our higher education futures can—and likely will—be made more adaptive and more personalized. MOOCs lend themselves naturally to the world of big data and field experiments about pedagogy, one reason so many universities are interested in them. But the value of adaptive and personalized learning is just as high in relatively small, flipped classrooms and the most specialized online degree as in the biggest MOOC.

3. MOOCs by the numbers

We start our analysis of the brave new world of tech-enabled higher education with the best available data on MOOCs. But this analysis comes with two caveats in a domain where significant innovations seem almost daily occurrences. First, the data reported below are snapshots from a single point in time, June–July 2013. Second, this snapshot also conceals just how quickly the MOOC world has evolved in what are no doubt only the early stages of the classical S-curve of innovation.

Table 1 presents information on the world's largest MOOC platforms today.

No matter what indicator you use, Stanford-born Coursera leads the way—with 83 university partners, 393 courses and 4,000,000 total enrolments. The Harvard–MIT collaboration, edX, is in second place, but on most metrics is only about a quarter the size of Coursera.

Indeed, there are signs edX may morph from a course content provider into an open learning management system in partnership with Stanford University—the open online successor to first Blackboard and now Moodle that dominate place-based universities.

Table 1. MOOC Platforms

Platform	Participating Universities	Courses	Total students	Largest course
Coursera (US)	83	393	4,000,000	Think Again: How to Reason and Argue, Duke University, 180,000
edX (US)	28	44	1,000,000	Circuits and Electronics, MIT, 155,000
Canvas Network (US)	27	22		
Future Learn (UK)	24	Late 2013		
Open 2 Study (Australia)	13	23		
OpenUpEd (EU)	11	61		
CourseSites (US)	20	30		
NPTEL (India)	8	260		
Udacity	2	25	1,500,000	Introduction to Computer Science, 320,000

According to Coursera information given to partner universities, of the 3.4 million registrants in Coursera's first year:

• 55% never completed one lesson (1.88M)
• 3% to 5% of those who started a class completed it (102K)
• 70% had a bachelor degree

These data underscore two facts about MOOC students. First, they aren't motivated by completion the way traditional university students are motivated by the degree. In contrast, Open2Study reports much higher completion rates, presumably because their MOOCs are a "try before you buy" degree pathway. Second, most already have degrees and are engaged in further education for other reasons, perhaps self-improvement or the hope that they'll catch the attention of a leading university.

Moving outside the US, Australia's Open2Study has hit the ground running, as the UK's FutureLearn is poised to do later this year (both taking advantage of the history and know-how of their Open University parents). India and the EU also both have operating MOOC platforms, but they seem very much to be focused on local students rather than the full global market.

Udacity, the brainchild of Stanford's Sebastian Thrun and a darling of the business press, has mounted the second highest number of MOOCs, has the second most enrolments after Coursera, and has the world's largest MOOC thus far with 320,000 in Thrun's "Introduction to Computer Science".

But Udacity's model is very different from the other major MOOC platforms. Coursera et al partner with universities that contribute many of the same courses offered to full-fee paying students but outside the partners' degree programs. In contrast, Udacity finds its own teaching talent to teach its own courses that it hopes to sell to universities that will then give course credit for them, for a price.

We will assess the divergent business models of Coursera and Udacity in subsequent sections of this report.

Sources:
1. Coursera homepage, www.coursera.org, accessed on 5/7/13; Facebook post June 19, www.facebook.com/Coursera, accessed on 5/7/13
2. edX Courses, www.edx.org/course-list, accessed on 5/7/13; 'One year, 27 schools, 1 million enrollments', Kath Xu, The Tech, June 7 2013, http://tech.mit.edu/V133/N27/edx.html, accessed 3/7/13; 'edX's First Course Research Highlights', Jennifer DeBoer, edX Blog, June 28 2013, https://www.edx.org/blog/edxs-first-course-research/1013
3. Canvas Network homepage, www.canvas.net, accessed on 5/7/13
4. Future Learn Partners, www.futurelearn.com/partners, accessed on 5/7/13
5. Open2Study Free Subjects, www.open2study.com/subjects, accessed on 5/7/13
6. OpenupEd Courses, www.openuped.eu/courses, accessed on 5/7/13
7. CourseSites MOOC Catalog, www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/mooccatalog.html, accessed on 5/7/13
8. NPTEL homepage, www.nptel.iitm.ac.in, accessed on 5/7/13
9. Udacity Course Catalog, www.udacity.com/courses, accessed on 5/7/13; email correspondence with Udacity, July 6th 2013

Table 2 turns to the issue of the leading universities in terms of generating MOOC content. Perhaps not surprisingly, Stanford, the birthplace of Coursera and Udacity, leads the way. Also no surprise that 13 of the top 20 MOOC providers are American. But few would have predicted that the University of Pennsylvania in Philadelphia and Spain's National University of Distance Education would rank second and third in terms of MOOC provision. Britain's Open University is the only other non-American player in the top 10, and the University of Melbourne is the only Australian University in the list, with seven MOOCs—good for 20th place.

Table 2 also amply demonstrates the dominance of Coursera as a MOOC platform. Eighteen of the top MOOC-providing universities are Coursera partners. The other two in the top 20 are Harvard and MIT, the co-owners of edX.

Table 2. Top 20 MOOC-Providing Universities			
Rank	**Institution**	**#Courses**	**MOOC Platform**
1	Stanford University	27	Coursera
2	University of Pennsylvania	22	Coursera
3	The National University of Distance Education, Spain	20	OpenupEd
4	University of Washington	16	Coursera
5	Harvard University	14	edX
6	Georgia Institute of Technology	13	Coursera
7	Johns Hopkins University	13	Coursera
8	Duke University	12	Coursera
9	The Open University, UK	12	OpenupEd
10	Massachusetts Institute of Technology	11	edX
11	Rice University	11	Coursera, edX
12	Princeton University	10	Coursera
13	University of Illinois at Urbana-Champaign	10	Coursera
14	University of Michigan	10	Coursera
15	Commonwealth Education Trust	8	Coursera
16	École Polytechnique Fédérale de Lausanne	8	Coursera
17	University of Copenhagen	8	Coursera
18	University of Toronto	8	Coursera, edX
19	University of California, Irvine	7	Coursera
20	University of Melbourne	7	Coursera

Table 3 shows that the common perception that MOOCs only work for technical material in the STEM disciplines is misguided. Science (including computer science where the Coursera and Udacity founders work) accounts for 30% of MOOCs, but fully 22% are in the humanities. Indeed, Coursera's most popular MOOC is in the humanities: "Think Again: how to reason and argue", developed by Duke University's Walter Sinnott-Armstrong and Ram Neta. Few would expect that there would be more MOOCs in education, where there are rarely clear cut right and wrong answers, than in either mathematics or engineering, where precision is the name of the game.

More generally, while 55% of all MOOCs today are in STEM disciplines, the remaining 45% are in the humanities and social sciences.

Table 3. MOOCs by Discipline		
Discipline	**Total**	**Percentage**
Science	231	30%
Engineering	40	5%
Business & Economics	98	13%
Education	82	11%
Humanities	170	22%
Mathematics & Statistics	69	9%
Health & Medicine	85	11%

Sources:
1. Coursera Courses, www.coursera.org/courses, accessed on 5/7/13
2. edX Courses, www.edx.org/course-list, accessed on 5/7/13
3. OpenupEd Courses, www.openuped.eu/courses, accessed on 5/7/13
4. Canvas Network homepage, www.canvas.net, accessed on 5/7/13
5. Open2Study Free Subjects, www.open2study.com/subjects, accessed on 5/7/13
6. CourseSites MOOC Catalog, www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/mooccatalog.html, accessed 5/7/13
7. Udacity Course Catalog, www.udacity.com/courses, accessed on 5/7/13

Trend data from the University of Washington (UW) in Seattle reveal how the demand for its MOOCs has tapered off from the first offering. UW has offered two MOOCs four times and one MOOC thrice, as shown in figure 2. It appears that the course Scientific Computing has reached a stable enrolment level after four sessions. The drop-off in enrolments from the first offering is probably largely due to the significant increase in MOOC competition in the time since UW offered its first MOOCs.

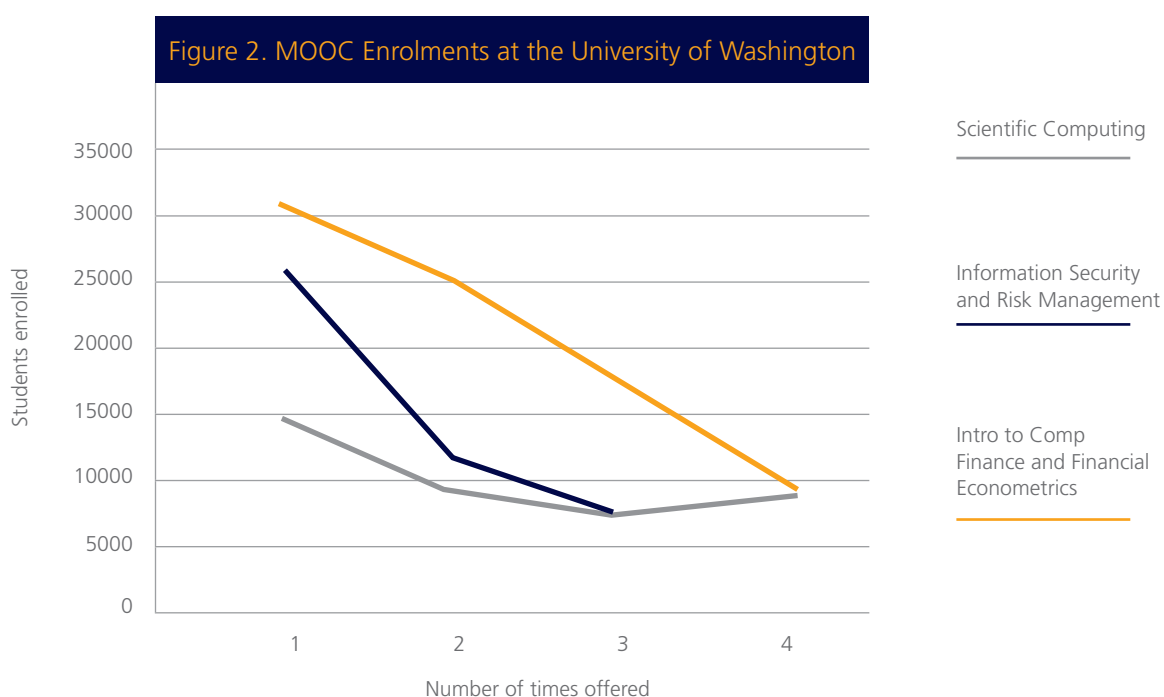Figure 2. MOOC Enrolments at the University of Washington

Table 4 offers a different time slice of MOOCs from the University of Melbourne, focusing on how long students stick with classes they start and how much they are engaged in them. Again, attrition is a major story.

Table 4. University of Melbourne Coursera MOOCs (June 19 2013)			
	Macroeconomics (complete)	**Generating the Wealth of Nations (last week of teaching)**	**Discrete Optimisation (Day 1)**
Sign-up	63,637	28,590	43,104
Active students	26,080	9,949	10,051
Active students in last week (% total)	1,943 (7.4%)	2,210 (22.2%)	9,369 (93.2%)
Lectures downloaded	387,512	123,140	49,803
Discussion threads created	840	349	97
In-video quizzes completed	252,986	Not used	Not used
Peer Assessment Submissions and Evaluations	1082/3423	1033/3677	Not used

Finally, and based on our best efforts to find publicly available data, Table 5 demonstrates that while the US is the largest single location of MOOC enrolment (predictable given the dominance of American universities among MOOC providers), the bulk of MOOC students are non-American. Indeed, India and Brazil rank second and third in terms of originating MOOC enrolments.

Table 5. MOOC Enrolments by Country

	Coursera	edX	Udacity
United States	27.7%	27.7%	42.0%
India	8.8%	13.0%	7.0%
Brazil	5.1%	3.8%	
UK	4.4%	4.2%	5.0%
Spain	4.0%	2.7%	
Canada	3.6%		
Australia	2.3%		
Russia	2.2%		
Germany			4.0%
Rest of World	41.9%	48.6%	

Sources:
1. 'Online learning: Campus 2.0', Mitchell Waldrop, 13 March 2013, http://www.nature.com/news/online-learning-campus-2-0-1.12590, accessed 11/6/13

2. 'Our Reach Extends Around the World', edX Media Kit June 2013, p.3, https://www.edx.org/sites/default/files/mediak-it/2013/06/03/edX_Media_Kit_June.pdf

3. 'Coursera Hits 1 Million Students, With Udacity Close Behind', Jeffrey Young, The Chronicle of Higher Education, 10 August 2012, http://chronicle.com/blogs/wiredcampus/coursera-hits-1-million-students-with-udacity-close-behind/38801

Interestingly, China, the biggest market for international students, is currently not among the top nine MOOC enrollers. This is probably a function of the fact that, unlike in India, English is still not so common among the Chinese population and the Chinese government is probably quite circumspect when it comes to allowing its citizens to use the Internet to access largely Western educations.

Of course, the upside to the Chinese MOOC market is potentially immense (see Box 1). And rumours abound about proto Chinese MOOC platforms that may one day soon rival Coursera the way Weibo has so successfully emerged as the Chinese Twitter.

Box 1. *MOOCs in China*

Despite being the single largest source country for international students where growth continues to be double digit, China's embrace of MOOCs has been underwhelming. China is currently only the 10th largest market for MOOCs even though it has 22% of the world's Internet users. The need to take courses in English may be one reason, but Chinese student enrolments in MOOCs are well below non-English speaking Brazil and Russia, countries of comparable GDP per capita.

But according to Xinhua, the official mouthpiece of the Chinese government, "free online teaching is set to explode in China". In an April news report, Chinese educators saw MOOCs as the most important invention for education since the Internet. In fact, the Chinese government is placing significant importance on online learning as the country struggles to build enough capacity of quality higher education.

With such bullish statements and enormous market potential of hundreds of millions of people, it is not surprising that Coursera co-founder Chinese-American Andrew Ng, was promoting the MOOCed future at Tsinghua University in April.

Coursera is pursuing a China strategy where Chinese-language MOOCs are produced in-country with a local flavor. As a first step, Coursera plans to launch Chinese-language MOOCs this August in partnership with National University of Taiwan in history classes and with Chinese University of Hong Kong in Chinese Opera.

However, the Chinese government could end up heading Coursera and other non-Chinese MOOC platforms off at the pass. There are rumours that China is moving to develop its own MOOC platform, with reports of a Tsinghua University-led edX like MOOC platform being developed. This could have major implications for Coursera's Chinese market growth aspirations, not to mention the potentially significant impact on student mobility patterns from Australia's leading source market.

The overall conclusion to be drawn from these tables and figures is that MOOCs are an American product that, while being consumed voraciously in the large home market, is doing big business around the world with the fastest growth and biggest potential in the developing world, and Asia above all. In this sense, MOOCs are no different from Apple or Google.

4. MOOCs: iTunes of Higher Education, Loss Leaders for Universities

In this section, we try to peer inside the world of MOOCs to answer three key questions:

• What is the emerging business model for MOOC platform's like Coursera?

• Why are so many universities offering their content for free on MOOC platforms?

• What is the pedagogical merit of MOOCs?

We think the best way to understand the ecology of MOOCs is to consider them the proto iTunes of higher education. The core of the analogy is that iTunes transformed the music industry not by changing the way music was made or recorded, but by revolutionizing how it was made available to listeners. Coursera does not make the Stanford and Melbourne classes on its website, but it does make them ubiquitously available.

MP3 files are not of the same quality as high fidelity stereo recordings, but they are so much more convenient to use than even CDs let alone long playing vinyl albums. Taking a Harvard class online isn't like being in the Harvard Yard, but it is so much cheaper and more accessible.

In the world of albums, consumers couldn't choose to buy one song; they had to buy the whole album—unless they were willing to buy the single the record company chose for them. On iTunes, the unit is the song, and the consumer is king with infinite ability to make personalized playlists. Cutting edge MOOCs aren't mere recordings of whole hour plus lectures; they are typically videos cut into modules of less than 15 minutes that students can select, repeat or fast forward through.

Moreover, there is still very much a place for live music in the iTunes world. Bands like the Rolling Stones charge more for concerts than they ever have. Indie artists hope their iTunes sales will attract new fans to their concerts. Similarly, we do not expect MOOCs to make the on-campus experience less appealing, but in fact might make students who take a university's MOOC more likely to end up on its campus.

There are, however, two major differences between iTunes and today's MOOC platforms. First, Coursera and others would love to be able to generate the revenues iTunes can. Second, whereas Apple had to fight to get traditional music companies to buy into iTunes for fear of losing their own revenue streams, universities have embraced MOOCs with open arms.

Let us now explore the iTunes analogy in more detail.
Certainly investors seem to think that Coursera will one day be able to crack the revenue problem the way iTunes has. Coursera has received about $65 million

dollars in investment. Most recently $43 million has come from venture capitalists and for-profit online education companies. But Caltech and the University of Pennsylvania were pivotal ground floor investors in Coursera, committing $3.7m in July 2012 long before the first Coursera MOOC was launched. Harvard and MIT say they have each put almost ten times as much as Penn and Caltech into their edX.

The costs of developing the UK's FutureLearn are surely in the millions of pounds, though Open University has not been public with the extent of its investment. Box 2 provides more details on FutureLearn.

Box 2. *FutureLearn*

FutureLearn (FL) is the brainchild of Britain's Open University. It has 21 university partners in the UK along with Monash University from Australia and Trinity College, Dublin, as well as big-name institutions such as the BBC and the British Museum. Its first courses will launch in late 2013.

FL says its MOOCs are the first being built specifically for tablets and Smartphones, with apps for partner institutions. Students will be able to choose their own peer learners rather than navigating a huge forum of students. FL views its intuitive user interface as another competitive advantage.

FutureLearn hopes to build its brand on its UK heritage and to harness its tightly knit group of partners to promote more collaboration to accelerate learning by doing.

FL's business model is to offer a lower quality product (certificates not degrees) to new, lower class consumers (those who can't get into a UK university through traditional means) at a lower cost than going to university.

Source: private correspondence with FutureLearn

Direct university investments in MOOC platforms themselves are only the tip of the iceberg. Many more universities are spending considerable sums on developing the MOOCs they then place on MOOC platforms—adding greatly to the value of these platforms. Estimates of what it costs to make a MOOC vary enormously, from as little as a couple of hundred dollars at MR University at George Mason (technology combining voiceovers and PowerPoint slides) to $25,000 (probably only direct costs and without high production values) to up to half a million dollars (including not only more elaborate production but also all development, teaching and administration costs).

Whatever the true costs of creating a MOOC, it is clear that many universities have real skin in the MOOCs game. Why are they acting so differently from Metallica and the Beatles regarding iTunes?

Universities must either believe that MOOCs won't adversely affect but might even enhance their place-based educational models, or they are resigned to the inevitability that MOOCs will very quickly destroy the traditional university, so they had better get into the new game fast. All the evidence today says it is very much the former. Indeed, we think there are several reasons why MOOCs may actually increase the value and quality of place-based degrees—explaining the substantial investments so many universities are making in them.

But before discussing the positives of MOOCs for place-based universities, we briefly address the issue of whether MOOCs will ever make the kind of money for platforms and university contributors the way iTunes does for Apple and musicians.

The reason to be optimistic is that there is increasing evidence—much of it comparing MOOCs with their on-campus parent courses—that online is better than on campus, at least in the core market segment for MOOCs: the lecture.

Traditional in class lectures are fundamentally inefficient if not ineffective. The very best lecturer is able to engage students of different levels and with different backgrounds at the same time. But this is a skill very few people possess. Lectures are inevitably too slow and too basic for some students, too fast and too challenging for others. By pitching at average students, learning outcomes from lectures must also be average.

Not so in the flipped classroom where lectures are replaced by online material that students can fast forward or repeat, skip through or pause—and in which teachers can understand precisely how their students are responding to what they are being taught. Lecturers can learn how their students are learning, not teach such material the same way they always have, based on preconceived notions not only about what is important but also about how students learn what is important.

Moreover, Coursera has done pioneering work on crowd-sourced "peer grading". Students assess each other's performance, both by assigning them marks and by offering them comments. Coursera needed a solution to the challenge of grading 100,000 poetry exams, far from the computer science 0-1 world of unambiguously right and wrong answers. They found that having groups of students assess their peers' work resulted in marks that were very similar to those academics assigned.

But whereas an academic's time cannot be scaled, peer grading can be. It was then that Coursera also realized there was a major collateral benefit to peer grading— the graders learned from the act of grading, just as much as the recipients learned from the peer comments they received. But if MOOCs are better than lectures, this still doesn't mean people will be willing to pay for them. Can MOOCs move from giving away content towards "freemium" models where some students will pay for specific MOOC services?

Here Coursera again is in the lead with its "Signature Track", though the revenue dollars involved are today paltry compared with the investment multimillions behind the company required to create the high production value, user friendly, cutting edge interface MOOCs for which Coursera wants to be known.

Traditional in class lectures are
fundamentally inefficient

Box 3. *Coursera's Signature Track*

Signature Track offers:

• Identity Verification. Create a special profile to link a student's coursework to their real identity using photo ID and unique typing pattern

• Verified Certificates. Earn official recognition from universities and Coursera for accomplishment, with a verifiable electronic certificate

• Sharable Course Records. Share electronic course records with employers, educational institutions or anyone else through a unique, secure URL

For the following MOOCs:

• Introduction to Genetics and Evolution, Duke University

• Microeconomics Principles, University of Illinois at Urbana-Champaign

• Nutrition for Health Promotion and Disease Prevention, University of California, San Francisco

• Computational Investing Part I, Georgia Tech

• Clinical Problem Solving, University of California, San Francisco

Price: $30–$100 per course

How does it work?

1. To join Signature Track, students build a Signature Profile that links their coursework to their identity. The Signature Profile includes photo ID, as well as the student's Signature Phrase, a biometric profile of unique typing pattern. Every time coursework is submitted, students easily authenticate their identity by typing their Signature Phrase.

2. When a course's Signature Track is successfully completed, students receive a Verified Certificate issued by the participating university and Coursera. Students are also able to electronically share their course performance in a verified format via the Certifiable Course Records page.

3. The Verified Certificate does not include credit towards a degree, nor does it make them a student at the issuing university. Instead, the Verified Certificate proves a student met the passing criteria of their rigorous online course.

4. Joining a course's Signature Track is optional. Students can still fully participate in the course if they decide not to join, and they will still receive the standard Statement of Accomplishment if they successfully complete the free course.

Source: http://blog.coursera.org/post/40080531667/signaturetrack

Since its launch in January 2013, Signature Track has generated $800,000 from five very successful MOOCs. If Coursera can multiply these revenues many times by deploying Signature Track in more MOOCs, the world will surely take notice and Coursera's investors will be very happy.

But there nonetheless seems a limit to how far this can go. If Coursera offered a degree based on taking, say, 32 of its MOOCs (equivalent to a college degree of four classes per semester for four years), and if all were authenticated by Signature Track, the cost of a notional Coursera degree would be $3200—much less than the cost of taking a single class on campus at Stanford University and less than the price of one semester's study at most American public universities.

The University of Washington considered at the outset different ways to monetize their free MOOCs. UW created an "enhanced version" of four of their MOOCs where an instructor was added, and there were additional exit requirements and more content to the original MOOC. In the end, fewer than ten students registered and paid the $895 fee for these "enhanced MOOCs". Box 4 highlights two Australian universities approaches to monetizing MOOCs.

Until MOOC completions gain the market credibility of degrees, it will be hard to

charge more for them. But here it is likely that the market for higher education may start to converge, as online degrees start being offered at lower and lower prices. For example, as we show in the next section, Georgia Tech has partnered with Udacity to offer a full two-year master's degree online for $6,600, not much more than twice our national Coursera degree.

Investors will surely focus squarely on these financial trajectories for online offerings. Our simple point at this stage is that universities seem to be backing MOOCs not because of the revenues they are likely to generate anytime soon.

Box 3. *Coursera's Signature Track*

Deakin University—badges and online credit

In what could be an innovative way to recognise the increasingly coveted soft skills of teamwork, leadership and communication, Deakin University in Geelong, Victoria is trialing the awarding of peer credit badges. These digital badges are an experiment by Deakin in assessing a student's performance. Learners are encouraged "to create and share rich evidence of their attainment of learning outcomes" through providing feedback on each other's work and award peer credit using digital badging.

These badges are part of Deakin's latest push into massive open online courses. The first MOOC will leverage Deakin research strength and focus on humanitarian emergencies and be open to all comers. Up to 100 participants can elect to have their learning recognized for credit by Deakin by paying a fee of $495. The credit is only valid if the student chooses to articulate into a Deakin postgraduate award program in International and Community Development.

The digital badges do not count towards marks but will be noted by assessors. Deakin hopes this combination of peer assessment and incentive to convert a MOOC into credit is "one possible way of authenticating online learning".
University of New England's uneOpen—try before you buy

Touted as Australia's first free open online course platform, uneOpen offers a pathway to credit towards a university degree.

In what is designed to meet "what students want", this new pathway provides greater flexibility and choice, and alternative pathways to degree completion, while driving down costs.

Vice-Chancellor Professor Jim Barber says: "People are looking for more flexible options; they want to be able to cherry pick from the academic services on offer, study at their own pace and tailor their programs to meet their personal or professional needs.uneOpen offers a range of services for a fee, such as tutorial support and examinations and ultimately credit recognition towards a UNE degree, such as Master of Business, Bachelor of Criminology and Bachelor of Social Science. While the subject content is free, uneOpen charges $150/hr for a private video tutorial or $35/hr for group video tutorial and $495 to sit the exam.

It's aimed at the mature age student who wants to further enhance their professional learning. Prospective students access the full range of subjects on offer through logging in via Facebook, Twitter or Google.

The format is not as interactive as a Coursera or edX type MOOC. Enrolled students gain unrestricted online access to subject materials, as well as access to an online forum with fellow learners.

To use a different industry analogy, MOOC platforms may act like online supermarkets for sellers of higher education. Everyone in retail knows there is no point having a great product if customers don't know about it.

When students are looking for MOOCs, the best and easiest place to look is Coursera or another platform where all the MOOCs sit, rather than surfing through countless university web pages that are there to do much more than let students find the university's MOOCs. However, new websites such as MOOC Advisor (http://mooc.studentadvisor.com/) propose to help students find MOOCs by subject, popularity and rating.

If you want to have students take your MOOC, it makes sense to put it on a good MOOC platform. But why do universities want lots of students from around the world to take their MOOCs?

There are three operational benefits for universities on these MOOC platforms: the big data is available for everyone; member universities can each learn from one another on what works and what doesn't; and Coursera or edX provide sophisticated software and hardware technology platforms.

We believe there are six strategic benefits for place-based universities.

First, MOOCs allow universities to project their brands globally at relatively low cost.

Consider the case of the University of Pennsylvania (see Box 5), one of the top contributors to Coursera. Penn is in the Ivy League but few people outside the northeast US know about it. Now more than a million students have taken a Penn-branded MOOC. Even if Penn has spent a few million dollars on its MOOCs, reaching a million students around the world through conventional marketing would have probably required a much larger budget.

Box 5. *Penn's Coursera love affair*

Coursera was born at Stanford University in the heart of Silicon Valley. But its biggest convert may well be the University of Pennsylvania in Philadelphia.

Penn has been awarding degrees since 1757 and is a founding member of the Ivy League. It prides itself on providing high quality and highly selective undergraduate education as well as being a world leader in research. Last year, only 12 per cent of the 35,000 students who applied for undergraduate admission were offered places to study. The Penn brand, along with other icons such as the Wharton School of business, is the touchstone of the university's reputation as well as its business model.

In May 2013, Penn announced the virtual arrival of its one-millionth Coursera student, which equates to more than a quarter of Coursera's total enrolment. Why would Penn jump so fully onto the Coursera bandwagon? Senior administrators hope MOOCs will "jumpstart a conversation about technology in the classroom".

But this is likely to be a lengthy process, requiring a transformation in the way academics think about teaching, the decommissioning of lecture theatres, the reconfiguring of formal and informal learning spaces, not to mention a substantial reworking of the financial model.

In the short term, Penn is MOOCing itself to enhance its reputation and to project its brand globally. Penn may be a household name among the east coast establishment, but it doesn't have the sports star power of UCLA nor the global veneration of Harvard.

It is hard to quantify the real branding benefit for Penn but the right marketing question to ask might be: how much would a university of 24,000 students be willing to pay to guarantee 1 million prospective customers try its products? How much would Penn have to pay to search for and find the very top sliver of those customers worldwide, students of such potential that they could well thrive on its campus?

The answer in Penn's case is "quite a bit". Penn made a joint investment with Caltech of $3.7m in Coursera. And the fixed start-up cost to make a high production value MOOC is significant, up to $100,000 on some estimates, not to mention the hundreds of hours of academics' time in development, production and delivery.

Second, MOOCs are a great way for universities to find high quality students they would never have known about and who would never have known about them. Udacity founder Sebastian Thrun reputedly realized the potential of MOOCs when he offered his Stanford artificial intelligence class online for free and more than 100,000 students took it. His Stanford students took the same exam as the online students. The first Stanford student came 411th in the class. Now Stanford can reach the top 410 elsewhere in the world and try to get them to come to the campus at Palo Alto.

Third, the company you keep can help drive reputation, and MOOCs provide a great way for universities around the world to associate their brands with MOOC pioneers like Harvard, MIT and Stanford— simply by joining the MOOC platforms they started.

Fourth, MOOCs offer the prospect of large-scale field experiments in real time in educational pedagogy. From modes of assessment to how to use examples to getting the most out of simulations, running an experiment on hundreds of thousands of students where all the results are recorded instantly in digital form is so much more effective than trying to do the same experiment in a traditional lecture theatre with several hundred students.

Fifth, universities are experimenting with MOOCs because the real benefits specific to each institution will be determined through learning by doing at all levels, from senior leadership to academics to students. In a recent opinion piece in The Chronicle of Higher Education, Clay Shirky wrote that the future of MOOCs is now "largely in the hands of the people experimenting with the new tools, rather than [in the hands of those] defending themselves from them".

Finally, MOOCs might inspire more academics to be better and more creative teachers. As Thomas Friedman noted, his geeky childhood friend Michael Sandel is treated like a rock star in Korea because of his Justice MOOC. This reception may well have the effect of stimulating more innovation in teaching among Sandel's colleagues at Harvard or, indeed, academics anywhere.

It is clearly very hard to put a dollar value on these benefits. But at the moment it seems evident that for many place-based universities, these intangible benefits of participating in MOOCs outweigh the sometimes substantial costs of participation. The University of Washington, with 16 MOOCs of its own on Coursera, justifies the expense as an investment in "marketing brand equity".

But for now many universities do not need MOOC-specific revenues from certificates of completion to justify their investments. Nor do they seem worried that MOOCs might make major inroads into their core business of place-based education.

The UW worked with Coursera on monetisation models for MOOCs from the outset. In addition to the experiment of the "enhanced versions" of the MOOCs, the UW has considered the following financial models for MOOC monetisation:

• Match students and companies
• Make deals with vendors (e.g. book publishers)
• Sell enterprise platform and its content to companies and universities
• Use the platform as a Learning Management System (LMS) for a school
• Tutoring services
• Sponsorships
• Transcript service

So far, none of these has transpired in the immediate term and the bottom line for UW's MOOC investment is to increase access to the UW resources for populations that the UW would not otherwise have served and to publicise the leading role of the UW in online learning. Long term, UW has concerns it might be difficult to make money with the current MOOC model, particularly with thousands of students from developing countries with little real income.

Of course, there is likely to be a winner takes all quality to the world of MOOC demand. No surprise that universities are putting some of their best professors and most attractive classes online. Sebastian Thrun's Introduction to Computer Science or MIT's Circuits and Electronics might be world best in their technical fields. When the Hong Kong University of Science and Technology (HKUST) entered the MOOC fray with Coursera, it decided to leverage its comparative advantage of sitting right next to China, with MOOCs on the science of Chinese food, new approaches to Chinese history, and a class on technology and society in China.

There will no doubt be lots of shaking out among competing providers of similar MOOCs. For example, the University of Melbourne's most successful Coursera MOOC to date is its Principles of Macroeconomics in which 63,000 students enrolled (See Table 4 and Box 6). But the University of Illinois is also running a core macroeconomics MOOC, and there are already 36 economics courses on Coursera, and another 35 in business.

Melbourne and Illinois might be wary of economics MOOCs with big-name professors such as Yale's Bob Shiller who "predicted the financial crisis" or with catchy titles like Duke's A Beginner's Guide to Irrational Behaviour. Of course lots of students will try many if not all of them until they find what they like.

In sum, the dynamism of the MOOCs market is only matched by the uncertainty over where it is headed. But we believe two core propositions: MOOCs are likely here to stay as sustainable businesses, in no small part because place-based universities gain value from them (as "loss leaders"); MOOCs are already the iTunes of higher education in what they provide students even though no one has figured out yet how to monetize this service.

In many ways, online university degrees are a bigger challenge to the place-based university business model. We discuss this challenge in the next section.

Box 6. *The MOOC Value Proposition for the University of Melbourne*

The University of Melbourne, Australia's second oldest university and with Australia's highest research placing in the Shanghai Jiao Tong World University Rankings, was one of the first universities to embrace the MOOCs phenomenon, joining Coursera. Provost Professor Margaret Sheil is the only non-American to sit on the Coursera advisory board.

For UniMelb, experimenting with MOOCs is all about challenging the traditional boundaries of teaching and learning, which it defines as opposing binaries such as online vs f2f, free vs fee, degrees vs certificates, instructor vs peer-based, and so on. The hope is that digital technologies will enhance student interaction with academics, other students and course content. Blended learning that leverages the power of MOOCs is seen as an ideal way to add diversity and flexibility for on-campus programs. In fact, for UniMelb "on-campus = online + more" where "more" is the research-teaching nexus embodied by a rich scholarly community, as well as opportunities for broader personal development – especially for 18–22-year-old students.

Strategically, UniMelb hopes MOOCs will provide the opportunity to develop high quality resources for flipped interactive classes, to offer courses at scale, improve learning and teaching through data analytics, and showcase high quality courses.

5. Online Degrees: Low Cost, High Volume, New Markets

Imagine a world in which traditional universities upend their place-based business model by moving all instruction and assessment online, dramatically cutting costs, passing on big savings to students, and scaling up student numbers far beyond what any campus could physically house. That world now exists at Atlanta-based Georgia Institute of Technology, one of the leading technology-oriented universities in the US—with respect to one degree at least, its Masters of Computer Science, detailed in Box 7.

To add to Georgia Tech's innovations, it has recruited two non-university partners. Udacity founder Sebastian Thrun is calling this initiative "MOOC 2.0", because the Georgia Tech-created academic content in this new degree will be delivered using Udacity's online pedagogy. But rather than a single course, this is now applied to a whole degree for students enrolled by Georgia Tech, not to a series of standalone classes on a MOOC platform. This online degree is not replacing but will run in parallel to Georgia Tech's traditional place-based master's program in computer science.

The third player in the venture is AT&T. But the US telecom giant is not providing its own technology to support the project, presumably because Udacity's is better fit for purpose. Rather AT&T is underwriting the substantial start-up costs that neither Tech nor Udacity could afford. The value proposition from this investment-cum-philanthropy for AT&T must rest on the assumption of doing well by doing good—in terms of better brand projection and higher quality staff recruitment.

Udacity seems to be learning from its own mistakes in this new venture. Its original dedicated partnership to provide specific foundation classes like basic maths, elementary statistics, and college algebra for San Jose State University (SJSU) has been suspended. The courses were remedial in nature and included both SJSU undergraduate students but also non-enrolled high school leavers. The reasons appear to be that completion rates and student satisfaction were too low and failure rates were too high. Implications are difficult to draw about the efficacy of MOOCs in this instance given all these students had failed previously.

Box 7. *Partners in Disruption: Georgia Tech, Udacity and AT&T*

Georgia Tech has announced a new online master's degree in computer science for $6,600 beginning in the northern autumn of 2013, in partnership with MOOC start-up Udacity and US telecom giant AT&T.

Georgia Tech is a very good American private university with a global reputation in computer science. Why would it choose to potentially cannibalise its flagship on-campus program for which 300 students pay $40,000 by offering an "entirely comparable" new degree online for one-sixth the cost? The answers: drive down costs, expand volume, reach new markets.

The business model relies on a division of labour among three kinds of educators—academics who develop content, instructors who deliver it and mentors who answer questions about it. Tech believes it will only need to hire eight new instructors—non-academics with domain expertise—to service the projected 10,000 students because Udacity mentors will do most of the toing and froing with students. In turn, this will free up instructors to spend more time focusing on delivery and give academics more time to develop new content—including by pursuing their research interests.

Tech will retain responsibility for all academic decisions, from approving classes to giving students their final grades. According to Inside Higher Ed, regular Georgia Tech faculty members will be paid $20,000 for creating a new online class and $10,000 for initial delivery. The academic creator then receives a royalty of $2,500 for each subsequent delivery of the course, irrespective of who does the delivering. In turn, Udacity will receive 40% of total revenues for use of its educational technology as well as its mentors; Georgia Tech will keep the remaining 60%.

AT&T's role is providing $2m in start-up capital for the venture to minimise financial risk for Tech, along with providing branding to the program. This is philanthropy not investment. AT&T will benefit from its perceived community leadership in building much needed capacity for STEM postgraduates as well as from students and others who might be more attracted to buying AT&T products or working for AT&T as a result of the company's visible association with the degree

The new degree aims to segment the student market into four parts:

Type of student	Quality	Credential	Numbers
Traditional	Meet full Georgia Tech admission standards	Full degree	6,000
Potential degree students	Conversion to degree after satisfactory completion of two courses	Two courses	2,000
Certificate	Credential for completion of less than full degree	Certificate	2,000
MOOC	No admission standard	Individual certificate of completion	unlimited

The three-year revenue projections are $1.3 million in tuition and fees in year 1, $7.5 million in year 2, and $19.1 million in year 3. By the third year, the full running program should reach profitability, delivering a margin of $4.7 million to Tech and Udacity. And Tech will reinvest any profits back into funding research programs and hiring more researchers.

Sources:
http://www.insidehighered.com/news/2013/05/14/georgia-tech-and-udacity-roll-out-massive-new-low-cost-degree-program
http://www.insidehighered.com/news/2013/05/28/documents-shed-light-details-georgia-tech-udacity-deal
http://www.forbes.com/sites/michaelhorn/2013/06/13/udacity-and-georgia-tech-cross-the-rubicon/

Today most adults are trying to execute

a nearly impossible

balancing act

Box 7 outlines the core premises behind this audacious Udacity experiment, this time at the postgraduate level for a full degree, and all based on cutting costs, increasing scale and targeting new markets. There is compelling business logic to what the "partners in disruption" are proposing—a big name university offering an online degree that is entirely equivalent to the on-campus program but for only one-sixth the price. But will it work in the real world of higher education?

This will depend on the answers to three further questions that we address in the remainder of this report. Our summary position is as follows:

• What is the market for online degrees?
  * The potential online degree market is very big—anyone unwilling to pay all the costs (time and convenience as well as money) of place-based degrees.

• What will universities need to change to produce online degrees?
  * Meeting this market will require large culture change for traditional universities in terms of how academics view their jobs.

• Will online degrees crowd out place based degrees?
  * Even if online degrees succeed dramatically, place-based degrees can also continue to thrive so long as universities focus on what cannot be commoditized online.

Close followers of higher education will not be surprized that Georgia Tech's innovation was not in its liberal arts undergraduate degree for full-time students but rather for a postgraduate degree in a technical subject with right and wrong answers (computer science), which is better able to cross language and cultural barriers to developing countries, and which acts like a de facto credential (for ICT professionals). Let's unpack each element of this student profile.

Today most adults are trying to execute a nearly impossible balancing act: they need to generate as much income as they can; they know their future income streams will be enhanced by higher education; and they want to have fulfilling personal lives. For many, studying full-time is a luxury they simply cannot afford. They want taking classes to have as little disruptive influence on their jobs and their personal lives as possible but to have maximum positive impact on their careers. And, of course, they want to pay as little as they can for their educations.

Universities have been trying to "meet the customer" in two ways.
On the one hand, degrees such as the MBA have gone from being full-time on main university campuses with instruction during the day to part-time in central business districts with instruction on weeknights and weekends.

This allows working professionals to walk out the door of their offices and into the classroom before going home to be with family and friends.

On the other hand, many universities—with Australian universities Monash and RMIT in the global vanguard—have made it possible for international students to earn degrees without ever stepping foot on the main campus. This has been made possible by opening branch campuses in countries of high student demand.

Other major Australian off-campus providers, including Charles Sturt, New England and Deakin, successfully educate tens of thousands of domestic and international students through distance education now largely delivered online. However, this online delivery is quite traditional with access to materials via CD, DVD or website, merely replicating and making more convenient and cheaper what has long been done by "correspondence".

Both groups of domestic and international off-campus students would surely like the 84% tuition discount Georgia Tech is giving its online students versus that paid by their on-campus peers.

Online degrees potentially allow universities to cater more effectively both to time poor professionals at home and to foreign students without the wherewithal to travel to main university campuses that are invariably in another continent. So the upside in terms of student demand is potentially very high—particularly given the manifold innovations in pedagogy being generated by technology-enabled education today. Indeed the University of Washington already has 15 master degree programs and 40 certificate programs completely online.

The other market motivation for Georgia Tech's innovation is defensive. The 1990s were the heyday of IT and computer science degrees. Since then the market has determined that undergraduate qualifications are not enough.
But professional development credentials have been successfully developed by hi-tech companies with big global brands and world leading technical expertise—like Cisco and Novell. These credentials are much cheaper, much shorter and more conveniently attained than a conventional master's degree. Tech's new degree tries to stem the bleeding.

Udacity has struggled with its undergraduate program at San Jose State University but has high hopes for its postgraduate degree at Georgia Tech. Why?
The conventional answer is that 18-year-olds find it much harder to exercise the necessary organisational skills, motivation and self-discipline required to do well without the structure of the classroom than people with considerably more life experience (including prior experiences with higher education).

But we also know that increasing numbers of undergraduates do not fit this conventional profile of recent school leavers and are balancing their lives the same way as the stylized part-time postgraduates, by taking fewer classes and more years to graduate, and struggling hard to make it to campus to take their classes.

Here Swinburne Online in Australia suggests that there is considerable demand for undergraduate online degrees (See Box 8). In so doing it has also pushed the envelope on the range of subjects that can be offered online, moving far away from the computer science/IT focus of Georgia Tech and Udacity.

Box 8. *Swinburne Online*

Since its creation in 2012, Swinburne Online has gone from zero to 7,000 undergraduate students, and is tracking towards 10,000. Degrees are offered in a wide variety of traditionally high volume courses, such as psychology, business, accounting and communications design—in parallel to equivalent programs delivered traditionally on campus, but targeted at students who for whatever mix of reasons do not wish to "attend" university, mostly older students in full-time work.

Learning is "entirely digital" where students are arranged in online cohorts of 25, facilitated by an e-Learning Advisor (eLA) and connected through blogs, email and learning management systems. The eLA is specifically trained to lead active yet asynchronous learning among the group and must first pass induction and training in "e-moderation" and facilitation of online learning cohorts.

Swinburne and SEEK are joint partners under a company structure where SEEK's role is upfront investment (like AT&T's role in Georgia Tech, presumably again with some positive returns for the corporate brand as well) to allow Swinburne to invest in both technological and pedagogical innovations. Again like Udacity-Georgia Tech, all the eLAs and SLOs (student liaison officers who are available 24/7 in a call centre type operation for general student enquiries) are employed by the company at arm's length to the university.

The results so far are very encouraging. Swinburne reports the learning outcomes and student satisfaction of online are at least as good and sometimes better than those achieved by students on campus in a more traditional setting.

Swinburne retains responsibility for the admission of the student using the same standards as for on campus. The role of the traditional academics is to advise Swinburne Online of the minimum qualifications and expertise of the eLAs required for each course. There is no content creation in the traditional sense but rather the academic "transfers academic knowledge", which for each course takes about four days of the academic's time, and for which they are expected to undertake as part of their teaching load. Swinburne has made no distinction in an academic's teaching obligation between online and in-class.

Source: private correspondence with Swinburne University of Technology

Since its creation in 2012, Swinburne Online has gone from

zero to 7,000

undergraduate students

Australia's Swinburne University's partnership with SEEK to form Swinburne Online has taken advantage of the cap removal on government-funded places and tapped into a rich vein of unmet online demand at the undergraduate level (See Box 8). This follows the pattern of longstanding distance learning providers in Australia, led by the University of New England, a university with 20,000 students—15,000 of whom take their classes online and never venture onto the Armidale campus.

So if student demand for online degrees is so high, why haven't more universities gone online faster and more extensively? One important answer is "academic culture", coupled with the fact that many academics retain the security of tenured lifetime appointment.

Georgia Tech knows that universities often operate as close to worker run firms, or at least akin to professional service firms where the art of management is less top down and more collegial persuasion. Tech also knows that academics are notoriously small "c" conservative when it comes to their attachment to "the way we have always done things".

Online degrees could be expected to be the enemy of rank and file academics, and certainly there are plenty of examples of this when it comes to technology and higher education, even when the projects are cutting edge and of very high quality (see Box 9 for the example of Duke University with 2U).

Box 9. *Duke Academics Reject 2U*

Formerly known as 2tor, "2U" is a recent initiative between ten top-tier US universities including Northwestern, Notre Dame, University of Southern California, University of North Carolina, Georgetown University and Washington University in St Louis. The consortium of research universities is entering a five-year pilot project to offer for-credit online classes to undergraduate students who are willing to pay top-tier prices.

Unlike MOOCs, these SPOCs—small private online courses—are not limited to students from universities within the consortium. Each course would also only enrol a few hundred students, with each online class consisting of around 20 students led by an instructor such as a grad student. Known as "Semester Online", the goal of the for-profit 2U is to allow undergrads at any member university to take courses their university did not offer or only offered occasionally.

Duke University faculty in the Arts and Sciences Council voted against Duke's participation in the 2U initiative by a narrow margin of 16–14. While Duke continues to be a major player in the MOOC platform Coursera, Duke faculty rejected the 2U initiative because of concerns about for-credit online education being offered by third parties. Inside Higher Ed reported that "Faculty also expressed concern about the administration's handling of the deal and 2U's cut of the revenue".

Critics were concerned the Semester Online format would undermine Duke's reputation of strong faculty–student interaction in its teaching. Duke faculty also voiced concern about the lower quality of some of the other member universities in 2U such that Duke would be in effect granting credit to students not good enough to get into Duke in the first place.

Despite supporters arguing that much could be learned through the experiment, opponents felt that Duke was outsourcing too much control of its curriculum. According to DukeToday website, one critic, Professor Wahneema Lubiano, was opposed to handing over to a private company the ability "to shape the nature of our interactions with students".

Duke faculty opposing 2U argued the irony of Duke's online push. Thomas Pfau, a professor of English and German who was interviewed in Inside Higher Ed, was reported as saying: "There we are believing in a brick and mortar framework in our pedagogical mission 8,000 miles away [Duke Kunshan University outside Shanghai], but here [in Durham, North Carolina] where the students are actually in place, we seem to want to encourage them to take classes online—the absurdity of that was noted by a number of faculty."

Sources: http://www.insidehighered.com/news/2013/04/30/duke-faculty-reject-plan-it-join-online-consortium
http://today.duke.edu/2013/04/councilvote

Georgia Tech seems to have circumvented this opposition, for now at least. It has done this by paying academics a healthy sum to develop online classes; giving them royalties on their intellectual property; outsourcing most of the interactions with students; investing the online returns into hiring more researchers and physical space; and freeing up more time for research.

Swinburne and UNE are playing a different game—treating their academics identically irrespective of whether their classrooms are online or on campus. In turn, this is made possible by the fact that the Australian government gives universities the same money to educate Australian undergraduates irrespective of whether the students are online or on campus.

No doubt the incentive for Swinburne, UNE and other online providers will be to ensure they have lower fixed costs than traditional universities over the long term, to really make online work for them. But there are many difficulties in starting an online business and making it viable. In addition to start-up costs, there are continuing infrastructure costs and personnel costs. Online degrees are also more exposed to operating risks including market uncertainties in a nascent field compared with those faced by place-based universities in mature markets.

Nonetheless, in the US, state governments in California and Florida are pushing for more online instruction—as a way of cutting costs as well as increasing access (see Box 10).

Online degrees could be expected to be the enemy of rank and file academics

Box 10. *US Lawmakers: More Access, Lower Cost*

The California public higher education system, from the flagship University of California campus at Berkeley to literally hundreds of community colleges in the state, has long been the envy of the world. But it has fallen on very hard times since the financial crisis in 2008. The state government has reduced funding for higher education significantly; campuses have reacted by reducing places. Now the politicians are fighting back.

In June 2013, the California Senate unanimously passed senate bill 520 (SB520) which, if also passed by the lower house, the Assembly, would ensure California students enrolled in the state public higher education system would have access to online courses for credit in up to 20 high-demand lower-division courses in which they might not have been able to enrol due to insufficient places. SB520 would require the UC to use online platforms that are open to courses offered by outside vendors, and hence to providers who have not gone through the same accreditation process required of courses developed within the UC.

The UC system response has been pointed, saying that the bill is based on the "false belief that private providers are in a position to add value to the ongoing and future efforts of the three public higher education segments to serve their students with quality online courses".

But Florida lawmakers, also cash strapped since the GFC, have taken this "false faith" further by jumping on the MOOCs-as-credit bandwagon. Governor Rick Scott has signed legislation that will allow students who have yet to enrol in college the option to earn transfer credits by taking MOOCs, even though virtually no MOOCs are accredited in the way that all of Florida's state universities are. The stated aim of the Florida legislation's sponsor is to "break the accreditation monopoly of universities".

Sources: http://mfeldstein.com/californias-online-education-bill-sb-520-passes-senate/
http://www.ucop.edu/state/legislation/php-app/read_doc.php?id=2249
http://www.insidehighered.com/quicktakes/2013/07/01/watered-down-mooc-bill-becomes-law-florida

But all of the successes of online degrees from Armidale to Atlanta beg the question: will cheaper and more convenient online degrees "crowd out" expensive place-based degrees? This is the fear that leads some to predict an online race to the bottom, in which low cost online degrees cannibalise enrolment from previously viable and much more expensive place-based degrees.

But surely online degrees will only erode the place-based market share if traditional universities cannot provide campus-based educations for those students willing to pay premium prices and embrace the time and effort it takes to be on campus?

We believe universities can rise to this challenge, and will discuss how in the next section.

6. The Hybrid University: The Prius Campus

The UCLA Anderson Graduate School of Management, a global top-20 business school, doesn't seem to be worried that online degrees will crowd out those offered on campus. In fact, it is running two versions of its part-time Fully Employed MBA (FEMBA) for working professionals side by side. One requires students to come to UCLA's campus in Westwood, Los Angeles for all classes. The other, called FEMBA Flex, allows students to do the bulk of their coursework online, anywhere, anytime (see Box 11). Complete either and you are awarded a UCLA MBA; enrol in either and the price is the same.

Box 11. *UCLA'S FEMBA Flex*

UCLA Anderson School of Management added a new option for its Fully Employed MBA (FEMBA) degree in autumn 2012. The admissions requirements, faculty, courses and degree are identical to the FEMBA program. So too is the price of the degree. But FEMBA Flex is delivered via online lectures interspersed with a small number of intensive weekends on the UCLA campus in Westwood, with collaborative group work and web-based learning tools.

"The FEMBA Flex option offers working professionals, whose schedules may not offer them the flexibility to travel to campus as often as required, greater accessibility and opportunity to further their education," said Carla Hayn, Senior Associate Dean for the UCLA Anderson Fully Employed MBA and Executive MBA programs. "Our curriculum is extremely global already, and we want to make UCLA accessible to a range of professionals from corporate executives and military servicemen and women across the US to stay-home parents looking to transition back into the workforce. UCLA Anderson wins when we bring the most energetic and dynamic leaders into the classroom and FEMBA Flex expands our ability to do that."

Blending online and face-to-face learning environments provides professionals with busy work schedules or other commitments a greater opportunity to further their education. The FEMBA Flex schedule typically runs for 33 months, though an accelerated route can be completed in as few as 27 months—compared with 24 months for the full-time MBA.

Source: http://www.anderson.ucla.edu/x39831.xml

Is the largely online version as good as the class-based version? UCLA is certainly throwing as much technology and pedagogy at FEMBA Flex as it can to try to ensure real comparability in educational quality across the two platforms.

Can UCLA hold the line on price for its FEMBA Flex? The early returns say it can. Working professionals highly value the flexibility of online delivery—but this is just as true at Georgia Tech as UCLA. The real key to the full-price FEMBA Flex is that students must value it equivalently to the on-campus MBA, and this must be based on the presumption that it will have the same career value as the place-based FEMBA. The fact that students from both programs are awarded UCLA MBAs, rather than one being called something like the UCLA Online MBA is key. Presumably students in FEMBA Flex want to defend this "no difference" approach, and paying the full price for the Flex version is an important element in that.

It is unlikely, however, that it will be possible to hold the line forever on charging as much for fully online as for on-campus education. The reason is that fully online degrees should have lower fixed costs per student, and whoever pays for the cost of a degree—students, their parents or the government—knows that. The attractiveness of lower cost online is only likely to increase in the post-GFC world where governments and families alike want to improve their balance sheets by saving more and spending less.

How can the place-based university respond? There are three basic answers. First, use technology to realize efficiencies and cut costs where this makes sense. Second, use technology to improve the quality of precious on-campus time (i.e. the flipped classroom). Finally, invest in experiential learning—from student clubs and residential life, to problem solving and team work in the classroom, to internships and international experiences—that cannot be effectively moved online.

As we have already reported, cash strapped state governments in the US have begun demanding that public universities accept online substitutes for on-campus classes, and that the costs of getting the education drop accordingly.

The thinking behind this push is clear—most "general education" in the first year or two of undergraduate degrees is about introductory classes in major disciplines that are taught in large lectures. If introduction to microeconomics is taught in 100 universities using the same textbook, and if the textbook author now has a MOOC using the same material, doesn't it make sense for students in all the universities to use the MOOC? The quality of lectures should be higher, and the total cost of teaching all the students should be lower.

If general education is therefore a commodity, it must be ripe for low cost and large scale MOOC-ification. The same is likely also true for the pre-university "foundation" programs offered to students (particularly international students for whom English is not a native language) to prepare them for on-campus life.

It is thus not implausible to envisage a world in which the place-based building blocks of undergraduate degrees move largely online, with convenience, price and access the key drivers in both segments.

Place-based universities, however, will have to draw a line in the sand to stanch this potential hemorrhaging into online education. We believe they can do so, not by resisting technology but by embracing technology, deploying it efficiently and effectively, and then—most critically of all—focusing attention on what cannot be commoditized on line.

What does this mean in practice?

The clearest use of technology in a place-based university will be to "flip the classroom". This means putting the best lecture-like material online for students to consume where, when and how they like—but critically to master the material before they arrive on campus, so that they debate it, ask questions about it and apply it at university. The simple rendering of

flipping is to put lectures online so that students can do tutorials on campus, and this is a powerful metaphor because it is precisely what the printing press did to Oxford, and what Princeton and Yale and private colleges such as Pomona and Williams now do—leveraging student–faculty ratios of less than 10:1 to promise students small class sizes and very interactive experiences.

In the de-centred world of tech-enabled, peer-based, blended learning, the ratios are much less important. It is the size of the student learning group that matters. Constellations of groups of six to eight students all gathered around tech-enabled modular tables, as exemplified by the new business school of RMIT Melbourne, are a window into what the future will look like. Perhaps the roaming facilitator in these classes will be a Georgia Tech-like instructor with domain expertise, or even come in the form of online support from a Udacity-like mentor or the Swinburne Online eLA.

It is also important to note at this stage that there will be a range of options regarding precisely how to flip classroom content. A lecturer could certainly put all her material on video and online. But in the brave new world of MOOCs, particularly given the fact that MOOC classes are typi-cally broken up into less than 15-minute modules rather than full lectures, the academic curators of place-based content could make their own playlist from the

best MOOCed content—put together by the curator using some of their own material interwoven into best of breed MOOCs. Think of MOOC modules as "guest lecturers" rather than replacement instructors.

In turn, this suggests another potential revenue stream for MOOCs. A Stanford academic might give away a MOOC for free to Coursera, for the reasons we suggested in section 4. Coursera might then try to make money from this content through its Signature Track credentialing. But it might also be able to license modules from specific MOOCs to academics, either within the Coursera partnership or potentially on the open market as well.

But there is much more to Stanford or Oxbridge than great lecturers. These institutions are possessed with dense on campus residential ecosystems from which students benefit at least as much as they do from what they learn in class.

The Ivy League guarantees that undergraduate students, and many postgraduates, can live on campus for the entirety of their degrees. These traditional residential universities have students living, not just studying on campus, serviced by food and retail providers and a vast array of student services, from health to careers. It means gymnasiums, cafés and sporting fields.

It means student clubs, societies and networks covering everything from bee keeping and entrepreneurship to anarchist politics, Tibetan human rights and investment banking. Aspects of ideal student life outside the classroom are what add the most value.

But for many students today, visions of Brideshead Revisited are mostly nostalgic and romantic. The pure elite ivory tower will endure, but it will become smaller and more removed from everyday realities for most students, who are time poor and will demand more immediate return from their campus-based ecosystems.

The 21st century dimensions of the rich ecosystem should build around the experiential learning of leadership and teamwork skills. This means learning to be global citizens by interacting with students from diverse cultures and nationalities on campus and by having meaningful international experiences integrated into the on-campus curriculum, as well as professional placements that promote the transition from student life to working life.

Built on this framework of shared learning experiences, students will organically form large networks developing life-long bonds.

These lifelong networks will certainly help the students, but they will also help their universities by creating alumni who will "give back" in myriad ways, from mentoring to philanthropy, for decades to come.

Few would deny that this is the kind of higher education that will never be replicated online, and for which students will be willing to pay a premium price.

How can public universities invest in their own rich ecosystems so that they may not only co-exist but also thrive in a technology-enabled world? There seem to be several keys:

1. Increase the efficiency of university preparation and general education courses using the scale economies embodied in MOOCs

2. Make large upfront investments in technology (online pedagogy and technology-enabled formal classrooms and informal learning spaces) and the decommissioning of lecture theatres in favour of de-centred and smaller learning spaces

3. Lead a process of culture change among academics to rethink the teaching part of their jobs—encouraging them to see it not as imparting knowledge to students but facilitating intellectual and personal growth in students

4. Turn commuter campuses into rich living ecosystems, beginning with but not limited to providing residential accommodation for a large proportion of the student body

5. Integrate leadership training, professional placements and international experiences as core parts of a degree for the 21st century

These are clearly all major challenges, but they are decisions which place-based universities will have to face in the technology-enabled age of higher education. The challenge is probably greatest for public universities that will always have a mandate to educate more citizens. They will likely have to do so with less public money for the foreseeable future as all Western governments cut spending to try to rebalance the public finances after the massive stimulus programs that began in 2009.

Here are some suggestions of initiatives that might help facilitate this transition, and are already being embraced by some universities, along with the constant university plea for "more money" from government (which will likely go unheeded in the straitened fiscal times of the post GFC world):

• Use partnerships with private organisations to build infrastructure from IT to classroom and from dormitories to residences and other facilities

• Get buy-in from academics for flipping the classroom by giving them an upside in the use of their online IP, reducing the routine burdens of the classroom, and delivering on the promise that there will be more, not less, time for research

• Use MOOC platforms for world best content, and for profit providers like Udacity for teaching support that research-intensive academics should not be expected to provide

• Be creative in differentiating between what a place-based university degree offers over an online certificate

For public universities, this will inevitably mean moving more and more to a "user pays" rather than "state pays" system. T his means taking on the holy grail of public universities the world over—the deregulation of tuition. We believe the path to deregulated fees is not so difficult, but it will mean universities having to embrace the Jeff Bezos ethos of getting good at what their customers want and need. Students will be willing to pay to study at those universities that can create better life opportunities.

We call this future the "Prius campus" for two reasons. First, place-based universities will have to become hybrids between the traditional Oxbridge–Ivy residential model and the brave new MOOCed world of sophisticated online pedagogy. Second, place-based universities are not in a position to be hybrid Porsches for a small elite; they must be reasonably priced mass production institutions realising the aspirations of normal people not only in Australia but the world over.

There may be hybrid Porsches to be driven. For example, the Minerva project aims to be the online Ivy League with completely flipped classrooms at a very high price— bringing small groups of elite students together to globetrot a select number of rotating global cities to discuss content they have consumed 100% online.

But most place-based universities will have to think just as hard about the cost of what they do as its inherent quality. Great outcomes are possible. But the time to start thinking about thriving in the tech-enabled future is now.

7. Conclusion

What the theory of disruptive innovation suggests is that the business models of many traditional colleges and universities is broken. Their collapse is so fundamental that it cannot be stanched by improving the financial performance of endowment investments, tapping wealthy alumni donors more effectively or collecting more tax dollars from the public. There needs to be a new model. (Clayton Christensen et. al., Disrupting College, February 2011, p. 10)

When Harvard professor Clay Christensen speaks about disruptive innovation, ears prick all around the world. So we should take him seriously when he says "there needs to be a new model" for universities. That is what we have done in this report, focusing on MOOCs and technology-enabled higher education more generally.

But Christensen's invocation has perhaps even greater resonance in Australia than elsewhere because of a second sea change in the world of higher education we highlighted in our report last year "From University Exports to the Multinational University"
http://ussc.edu.au/ussc/assets/media/docs/publications/1301_GarrettGallagher_HigherEd_Final.pdf

Australia is justly proud of its global leadership in educating international students, the country's largest export industry outside iron ore and coal. But this very successful export model has come under increasing stress since the global financial crisis. Dramatic quality improvements in Asian universities will inevitably keep more Asian students at home. American public universities are becoming very 'Australian' very quickly, responding to less government funding with a focus on recruiting more international students. The high Australian dollar has eroded our historic price advantages over universities in other English-speaking countries.

Figure 3 neatly captures both Australia's historic successes and its rising challenges when it comes to recruiting international students. In 2012, 230,000 international students enrolled in Australian higher education. The comparable figure in the United States was about 760,000, and 430,000 in the United Kingdom. But if you take into account the different populations of these three countries, Australia is about five times as successful as the US when it comes to recruiting international students and about 1.5 times as successful as the UK.

But Australia's international enrolments peaked in 2010 and have actually declined since then, by 12,000 students in 2012 and with reports of more losses in 2012. In contrast, new international enrolments in the US and the UK increased by 73,000 and 30,000 respectively.

Figure 3. International Student Enrolments 2004-2012

Legend:
- Australia
- UK
- United States
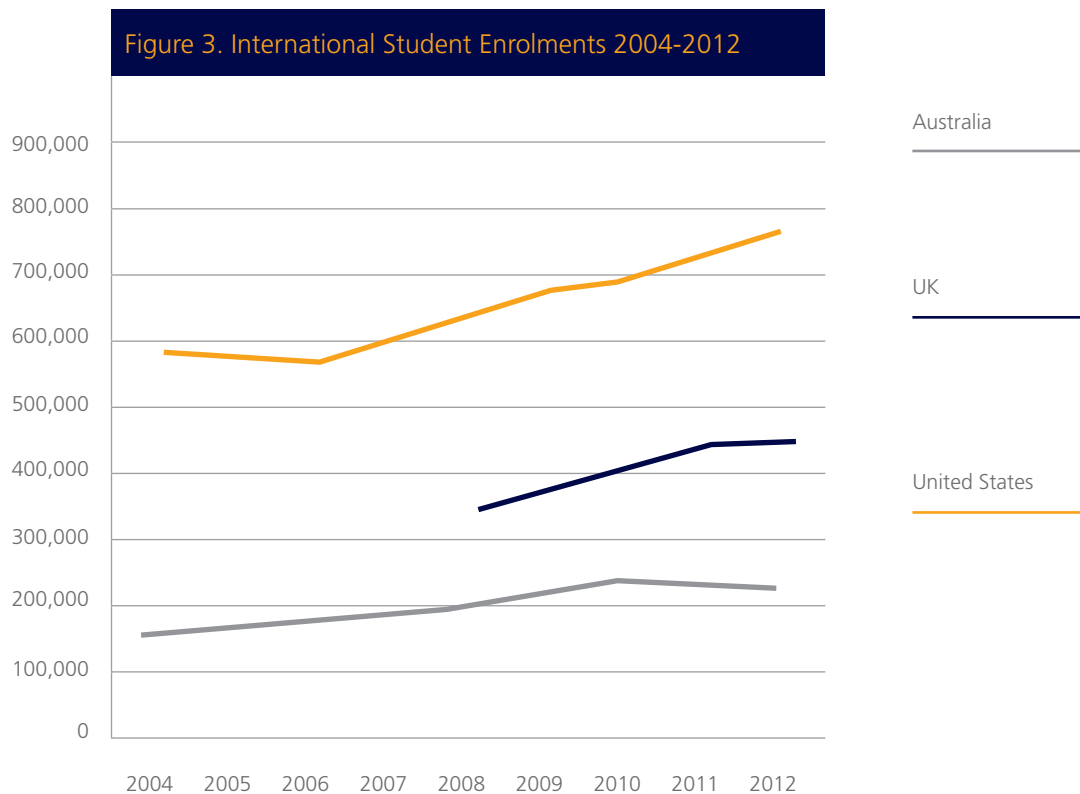
Sources:
1. International Students: Leading Places of Origin, Open Doors Data, http://www.iie.org/Research-and-Publications/Open-Doors/Data/International-Students/Leading-Places-of-Origin/
2. AEI Detailed Pivot Tables, May 2013, Austrade.gov.au
Table 1, Statistical First Release 183 – Student Enrolments and Qualifications, HESA, http://www.hesa.ac.uk/index.php?option=com_content&task=view&id=2667&Itemid=161

The combination of globalisation and rapid technological change is transforming all markets—including the market for higher education. The recent weakening of the Australian dollar will no doubt help the country's higher education export model, as will the UK's tightening on visa restrictions for international students. But the broader structural trends make it most unlikely that Australia will be as successful in the coming decade as in the past decade when it comes to international students. Australian international education is a maturing market.

A tougher international market will likely interact with technology-enabled higher education in two quite different ways.

On the downside, against growing global quality competition it will become increasingly difficult for Australian universities to use growth in international student revenues to fund their highest priorities, not only student accommodation and research infrastructure—but increasingly investments in new technology too.

On the upside, technology offers the promise of changing Australia's international student strategy in ways that may create new market opportunities. For example, using online programs for pre-university foundation studies and/or general education requirements could reduce the on-campus time commitments required of international students. This could not only make an Australian education even more attractive but also reduce the physical constraints on Australian campuses already straining from a decade of sustained and rapid growth in student numbers.

Nonetheless, it is against the backdrop of the very real stresses on Australia's export model that the challenges and opportunities of technology-enabled higher education should be assessed. That is what we have aimed to highlight in this report, focusing on the effects of the disruptor in chief—the rise of MOOCs made possible by the information and communications technology revolution.

We are not wide-eyed optimists about the egalitarian and democratising power of MOOCs to make high quality higher education freely available to anyone anywhere who wants to increase their human capital or just enrich their lives. Nor do we side with the curmudgeons who say they have seen technologies come and go without changing the venerable universities, and that MOOCs may just be today's online grocery store or education tourism.

Rather, we believe MOOCs may well prove to be the iTunes of higher education—disrupting everything, unleashing vast unmet and unforeseen demand, creating completely new customer expectations, making lots of things better for customers and pushing providers to question everything they do, while evolving into a great business for themselves. This means three things.

First, MOOCs are here to stay, because they make sense for place-based universities even if MOOC platforms don't find a way to charge for their products. MOOCs help universities spread their brands, identify talent, experiment with pedagogy and inspire their academics. One day they may even be able to put universities in a better financial position either on the revenue or expenditure sides of the ledger.

Second, interactive online degrees are the contemporary update of longstanding distance learning programs. Distance learning solved the problem of universities not being in places where students were, typically within one country. Today's online degrees are partly a response to a bigger version of that problem, students who are in other countries. But today's online degrees are really targeted at a very contemporary phenomenon in developed countries: the heightened importance of convenience for the increasing numbers of people for whom time is their most precious resource. And new pedagogy means that online degrees are so much more interactive and effective as learning tools than traditional distance learning.

Finally, there is a bright outlook for place-based university degrees. Indeed, they are likely to be more valuable in the future than they have been in the past. But generating this value critically depends on focusing on what cannot be commoditized online and can only happen in living breathing learning communities where looking directly into the eyes of people is invaluable. MOOCs and online degrees could generate real scale economies that place-based universities should leverage to focus on their unique ecosystem. This may require that students pay a little more for their place-based educations. But we have no doubt this is a price they will be willing to pay, so long as universities continually rise to the challenges of disruptive education by being the best educational institutions they can be. We summarize these three futures in Table 6 below.

Table 6. Technology-Enabled Higher Education's Three Features			
	MOOCs	**Online Degrees**	**Hybrid Universities**
Product	Certificates of completion	Degrees	Degrees
Delivery	Online	Online + short residential intensives	Online + on campus + experiential
Scale	Global	Larger than traditional degrees	Smaller than today's campuses
Price	Nil/very low	Lower than today's degrees	Higher than today's degrees