MOOCs in vocational education and training and higher education

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Abstract

This paper offers a brief overview of innovations in education, specifically Massive Open Online Courses (MOOCs), and proposes MOOC research and applications in tertiary education. The overview helps to inform funding bodies, educators and administrators on MOOCs. The paper uses the Diffusion of Innovations theory to contextualise research into MOOCs and other future scientific endeavours.

The overview also illustrates two effects in the organisational diffusion of educational technologies – bandwagon and leapfrog effects. Bandwagon effects stem from social pressure rather than strategic planning driving the adoption of innovations. This ‘me-too’ behaviour often results in poor innovation use. In contrast to bandwagon effects, leapfrog effects hinder adoption and improve innovation use relative to early-adopter organisations. Leapfrogging organisations take a wait-and-see attitude towards adopting new technologies, and then use the technology more efficiently than many early-adopter organisations.

Introduction

Teaching and innovation have ploughed forward, at least since Greek scholars about two-and-a-half millennia ago lamented an emerging innovation. Thanks to the advent of writing, learners would rely on written records, rather than solely on their memories (Gumport & Chun 1999). Similarly today, scholars, government agencies, administrators, teachers and learners face a growing universe of educational innovations — ideas and technologies — to lament and laud (Commonwealth of Australia 2013; Barber, Donnelly & Rizvi 2013; Daniel 2012). Administrators and teachers in the background and at the coalface seek efficient and effective teaching innovations (Daniel, Kanwar & Uvalić-Trumbić 2009; Murphy 2012).

Massive Open Online Courses, one such efficient and effective teaching possibility, could affect tertiary education. These learning behemoths educate and assess in excess of 150,000 students in a single class, free of charge (Daniel 2012). Gaining momentum and increased participation across academia and industry, MOOCs have the capacity to range from global jokes to roaring successes. Google, for example, has run two MOOCs on searching and one MOOC on maps, with hundreds of thousands of students across the three MOOCs.

Higher education research suggests two distinct MOOC styles: cMOOCs and xMOOCs, which differ in pedagogy and technology use (Daniel 2012). cMOOCs, the original MOOC, have less structure and rely more on student-generated content than the xMOOCs, which resemble traditional bricks-and-mortar classes with lectures, drills and tests.
Addressing federal and industry vocational education training (VET) compliance standards could open the door for the adoption and implementation of a third type of MOOC. Australia’s National Broadband Network, the National VET e-Learning Strategy and New Generation Technologies for Learning highlight the potential and to a lesser extent the peril that the VET sector faces in diffusing — adopting and implementing — today’s educational innovations.

To date, few if any, VET studies address MOOCs. Correspondingly, there is a call for increased VET scholarship (Williams, Goulding & Seddon 2013). This paper takes a small step towards addressing these gaps by drawing on the Diffusion of Innovations (DOI) theory, perhaps the most popular theory to explain organisational technology use (Jeyaraj, Rottman & Lacity 2006; Rogers 2003), to review online learning and MOOCs. The paper suggests applications and research streams for MOOCs in the VET sector.

The paper opens with a brief history of educational innovations, which sets the stage for open access and today’s latest innovation, MOOCs. The historical perspective underscores the usefulness of the Diffusion of Innovations theory, offering two broad effects in how organisations adopt and use innovations. Bandwagon effects, adoption due to social pressure, drive the adoption of innovations and often lead to poor innovation implementation. Leapfrog effects, late adopters bypassing early adopters in innovation use, attenuate the adoption of innovations but accelerate effective innovation implementation. The diffusion of online learning ideas and technologies, such as MOOCs, should demonstrate similar bandwagon and leapfrog effects.

The methodology is a literature review of peer-reviewed articles, along with related information from respectable online publishers such as NCVER, The Chronicle of Higher Education and New York Times.

Literature review

Technology and education: a brief historical perspective

In the fifth century BC, education faced a seemingly major technological impediment and controversy: ‘Written materials would undermine the learning process and diminish the quality of the personal relationship between tutor and student’ (Gumport & Chun 1999, p.6). Thanks to the advent of writing, learners could now rely on written records rather than solely on their memories. The blackboard’s inventor, over two millennia later in 1841, was hailed among the best contributors to learning and science (Daniel 2012).

Postal courses, the rage in the 1920s, had four times the enrolment of all US universities and colleges combined (Carr 2012). Scholars and the press have hailed radio, motion pictures, television, programmed learning, computers and the internet as the most important educational developments since Gutenberg’s printing press, yet another educational innovation (Daniel 2012). One bullish forecast for the latest innovation, MOOCs, is that half the US higher education institutions will cease to exist in 50 years, or much sooner, and Harvard will have ten million students (Harden 2013). History is replete with new technologies touted to change education forever.

The National VET e-Learning Strategy has three complementary goals, to: benefit from Australia’s National Broadband Network; support workforce development; and increase e-learning participation (Commonwealth of Australia 2013). If history is any gauge, e-learning and MOOCs are yet other innovations that should improve learning, but are not a panacea and are controversial and have unintended consequences.
Closed and open access

Over the last few decades, due particularly to internet technologies, the pendulum has swung from closed to open educational access. Last century state-funded universities in the US often offered the elderly free or reduced tuition (Sheppard 1980). Today, Austrian and Belgian universities offer free access but face financial burdens due to an influx of migrant students, particularly in expensive courses such as medicine and veterinary science (deWitte 2012). Mexico’s Universidad Virtual del Estado de Michoacán (<univim.edu.mx/>) offers free tertiary education such as diplomas and bachelor degrees to Michoacán residents, but only online.

However, most tertiary education institutions today practise learning management system (LMS) teaching, restricting access to copyrighted class materials to registered students during the term (Martin 2012; Murphy 2012). A learning management system, such as Blackboard or Moodle, manages access and usually without open access or lifelong learning. The system can improve student access to educational materials during the term, but offers nothing for alumni or those interested in learning for the joy of learning.

At the other end of the educational access pendulum, institutions such as Massachusetts Institute of Technology are part of an open course movement and proudly share online class materials such as syllabi, lectures, videos and readings (Daniel 2012; Murphy 2012). Anyone with internet access can view the class materials, freely, at any time. In the VET sector, the Irish-based <Alison.com> offers about 500 free VET courses in a MOOC-type model.

MOOCs, a recent open course extension, go beyond providing educational information access. MOOCs provide assessment, feedback and recognition such as class rankings and certificates of participation. MOOCs highlight and challenge traditional teaching’s closed and proprietary nature.

MOOCs

Typical MOOC features include openness, assessment, free enrolment, massive scale and synchronous operation with a current class (Daniel 2012; Kolowich 2012). Given the nascent nature of MOOCs, these typical features are guidelines rather than fixed requirements. Three poster MOOCs — Google’s power searching, Stanford’s artificial intelligence and MIT’s circuits and electronics — each enrolled over 150 000 students (Daniel 2012; Martin 2012).

Two key differences between MOOCs and traditional tertiary education are motivation and attrition. Tertiary education provides extrinsic rewards, credit, rather than the intrinsic rewards of learning something personal, such as a language or chess (Armstrong 2012). In part due to no entry barriers, MOOC completion rates are under 10%. By contrast, Phoenix, a leading online university, has 35% undergraduate and 60% graduate course completion rates (Daniel 2012).

A Duke University MOOC in bioelectricity began with 12 725 registered students, of whom 7761 watched at least one video and 3658 took at least one quiz (Belanger & Thornton 2013). By week four, just 561 students scored above a zero on the quiz. Only 346 attempted the final exam, 313 students earned a certificate of participation (2.5% of all enrolled students) and 261 of these earned a high distinction.

Early indications are that traditional students with access to a MOOC attend fewer classes, although the classes have more interaction time, as most lectures are available online (Daniel 2012; Martin 2012). For external students, Martin (2012, p.28) questions MOOCs’ large-scale applicability as, ‘the weaker students struggled, and a few strong students were bored’.
Sceptics note the negative consequences and challenges of MOOCs. MOOCs may foster plagiarism (Gibbs 2012) and counter-intuitively discriminate against the less wealthy and less well-prepared students (Carlson & Blumenstyk 2012). Two recent MOOCs that ran amok led to a cancellation of the MOOC and the resignation of a University of California Irvine professor from the MOOC (Kolowich 2013a, 2013b). In the former, design flaws and technical glitches turned the subject, Fundamentals of Online Education: Planning and Application, into an internet punch line. The instructional designer and her colleagues at Georgia Tech suspended the course (Kolowich 2013a).

Online learning

Two statewide US community and technical college studies — 24,000 Virginia students in beginning math or English (Xu & Jaggars 2011) and 40,000 Washington students across 500,000 courses (Xu & Jaggars 2013) — found that students in traditional face-to-face classes outperformed their online counterparts. In Washington, relative online performance varied across student demographics and subject areas (Xu & Jaggars 2013). Online learning had an above average negative effect on learners studying English and social sciences, whereas the effect for those studying computer science, the applied professions, and natural sciences was less negative (Xu & Jaggars 2013).

Regarding students, young, male, black and those with low grade-point averages were more likely to underperform online (Xu & Jaggars 2013). This same demographic cohort is more likely to take gatekeeping courses such as English and social science and performs poorly in online classes. Rather than ameliorate, online classes exacerbate face-to-face performance gaps between demographic groups (Xu & Jaggars 2013). This unintended discrimination supports a possible negative MOOC outcome, handicapping the less-wealthy and less well-prepared students (Carlson & Blumenstyk 2012).

In Virginia, the estimated negative online learning effect did not change significantly from 2004 and 2008, ‘suggesting that evolving technologies were either not adopted or did not have a strong impact on online success rates’ (Xu & Jaggars 2011, p.375). A popular theory for investigating and explaining how organisations adopt and subsequently use innovations, such as online learning, is the Diffusion of Innovations.

Diffusion of Innovations theory

Diffusion research and the popular press tend to adopt a pro-innovation bias (Jeyaraj, Rottman & Lacity 2006; Rogers 2003). Georgia Tech and the University of California Irvine’s MOOC experiences suggest bandwagon effects — social pressure rather than reasoned decisions led to developing the MOOCs — and exemplify that organisational adoption of an innovation does not equate to implementing that innovation well (Kolowich 2013a, 2013b). Individuals and organisations usually overestimate an innovation’s short-term impacts and underestimate both its long-term impacts and unintended consequences (Rogers 2003; Tenner 1996). As effective innovation use takes about 30 years to mature (Fidler 1997), online education may come of age in the mid-2020s, three decade after the web’s debut.

Despite abundant unanswered MOOC questions, universities seem to be hopping on the MOOC bandwagon for fear of being left behind. More so than other arguments about access or cost, bandwagon effects seem to drive much of the commentary relating to why use MOOCs and why they are important now (Watters 2013). Bandwagon effects often drive innovation adoption and lead to poor implementation of that innovation (Abrahamson 1991; Murphy et al. 2003).

In contrast to bandwagon effects, leapfrog effects relate to organisations and individuals slow to adopt an innovation but quick to use that innovation effectively (Ismail et al. 2012). For example,
organisations late to adopt websites would use the website better than some organisations early to adopt websites.

A growing MOOC ‘leapfrogging’ trend is blended courses (Martin 2012). Rather than launch and maintain MOOCs, lecturers and their students appropriate an existing MOOC. Professors personalise the MOOC with classroom time, assignments and readings. For example, two community colleges in Massachusetts use the same computer programming MOOC from MIT, but at different speeds (Lewin 2013).

Conclusions

Reviewing MOOCs, a recent and dynamic phenomenon, is difficult (Daniel 2012). There is little research, and, similar to most new technology research, what there is often has a pro-innovation bias (Rogers 2003). This literature review suggests that MOOCs are yet another innovation promoted as changing education forever. In common with other educational innovations, MOOCs should exhibit bandwagon and leapfrog effects. Funding bodies, educators and administrators should want to avoid bandwagon effects and profit from leapfrog effects.

Although both the popular and scholarly press promote the benefits of e-learning and MOOCs, the results of a few studies show that traditional face-to-face learning seems to outperform e-learning, particularly so for young, male students from minority groups and with low grade-point averages. Finally, the popularity and availability of MOOCs may force tertiary institutions to open rather than restrict access to their educational materials. And, over time, one or two MOOCs may own the space for popular VET areas.

How MOOCs will evolve in the VET sector seems a fruitful area for research. For example, how might MOOCs work for vocational education and training, globally and in the Australian context of training packages and qualification framework requirements? Furthermore, due to the need to demonstrate compliance, some courses may not be suited to MOOCs.

Rather than develop their own MOOCs, particularly due to bandwagon effects, VET providers and their staff should consider combining MOOCs with existing courses to form a blended course. For example, a computer science professor organised for his students to take a MOOC and a similar university class simultaneously (Martin 2012). The combination freed traditional lecture time for fruitful discussions. Although this research found no VET MOOCs per se, they seem to exist at <Alison.com> and possibly other websites.

MOOCs with less time and depth than a typical class could enhance and alter the MOOC landscape. Google’s Power Searching MOOCs run for three weeks (<powersearchingwithgoogle.com>). And Cornell University offers an asynchronous three-week MOOC, ‘Marketing the Hospitality Brand through New Media: Social, Mobile, and Search’ (Mangan 2013). VET providers, with shorter classes/units than higher education institutions, could customise a MOOC or augment an existing course by combining Massive Open Online Modules (MOOMs), such as Google’s Power Searching and Cornell’s Brand Marketing.

In addition to investigating the potential of Massive Open Online Modules, this paper proposes the diffusion of innovations as a theoretical perspective for studying e-learning and future research streams. One possible area particularly relevant to the VET sector is how e-learning can meet Australian Skills Qualifications Authority standards <asqa.gov.au/>. Another research area relates to how e-learning success can be measured, for example, completion and performance in online classes (Belanger & Thornton 2013), and in relation to these issues, how do blended courses (that is, MOOCs...
used in combination with traditional classes) compare with MOOCs and traditional courses? Finally, research could examine what student types and courses work well, or not well, with MOOCs.

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