Making Free Online Learning Sustainable Through Reduction of Production Costs

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Abstract

A major reservation about Massive Open Online Courses (MOOCs) is that they are extremely expensive to develop and deliver and for most institutions this cannot be justified on a sustainable financial basis. As part of the MOOC technological revolution, costs and funding opportunities have been cited as reasons not to proceed (Gaebel, Kupriyanova, Morais, and Colucci, 2014). Whereas, the findings to date show that this may not be the case for all, educational institutions are often eager to engage technology and embed it into programmes (Hollands, and Devayani, 2014). There are many examples of excellent learning materials being created and distributed on the web using low cost techniques. The Khan Academy has offered free world class education for anyone, anywhere in the world since 2006. Not only are these materials freely available for reuse, but the technologies and techniques used to create them can be easily used to cheaply create new materials. The authors, in a project funded by Intel Ireland, are currently developing and testing workflows and techniques that will facilitate the rapid development of MOOCs at relatively low cost. This project, which will include the delivery of four MOOCs in coding, aimed at young people, endeavouring to measure both the costs involved and the educational impact on the participants through qualitative and quantitative research metrics. The design, methodology and approach to innovative pedagogic practices will be tested, as will the opportunities for peer to peer learning among the students, the use of asynchronous forums, auto/peer grading and collaborative activities among the developers. A prerequisite of the project is the voluntary effort of the developers. However, as production costs are often regarded as the most expensive element of the MOOC, this project will demonstrate that by completing it "in-house" the costs will be negligible. In a recent study 38% of institutions believed that cost is a key concern (Hollands, and Devayani, 2014). The video submissions will be uploaded onto the MOOC platform as both an online repository for the learning material and as a quality checking mechanism and rolled out in a pilot programme from January 2015. The research describes some of the proposed methods that can be used to develop MOOCs at very low cost, but also how, with a competency based approach to accreditation, they may be the catalyst of significant change in higher education. (Lederman, 2013, Mulligan, 2013). In this project open badges will be used as recognition of participation and achievement, with the end goal of international accreditation, as global currency. This is despite the fact that 72% of educators believing that formal accreditation should not be allowed (Petkovska, Delipetrev, and Zdravev, 2014). One of the partners has agreed to trial the MOOC's with a Zambian student cohort, which will help achieve the globalisation of MOOC's. The pilot will be available to students within the developers sector and through wider participation with open availability to all by a registration process. As part of the research data on MOOC's the studies look to determine if the realisation of a digital campus in terms of student satisfaction by completing a MOOC are different from the results for traditional students (Walker, and Brooks, 2013). The final success of the project will be determined by the merit of scalability and by the cost analysis.

1. Introduction

Given the fact that the cost of higher education is rising out of control, this project looks at addressing an innovative approach to the rapid development of MOOC's. We are attempting to prove that MOOCs developed at low cost can be educationally effective. However, there has been little research into MOOC costs associated with the resources expended to create and sustain them. The scaling up in the use of MOOC's and influences the decision-makers in higher education in the use of educational resources to benefit students and reduce the educational tax burden to the public.

The research hopes to find that the substantially lower costs per student of regular online courses, by merit of scalability, and substantially lower costs than traditional methods. Based on this metric, MOOCs appear more cost-effective than online courses, but we will be recommending judging MOOCs by impact on learning as cost-effectiveness may not be of interest to the learner, but will be of key significance for the developer and for the tax payer.

The target audience will be young people learning to code. Institution of Technology Sligo, in a project funded by Intel Ireland, are currently developing and testing workflows and techniques that will facilitate the rapid and low-cost development of MOOCs. The developers in the project are DIFE (Drogheda Institute of Further Education), Coderdojo, DIT (Dublin Institute of Technology), FIT (Fastrack to Information Technology) and South West College as a partner to pilot some of the MOOC's.

The prevalence of coding and programming has been exemplified through embedding coding in the new junior leaving certificate. The Open Knowledge Foundation Ireland are developing a coding text for Irish Secondary Schools and the National Council for Curriculum and Assessment (NCCA), students will soon receive marks for taking part in short courses.

The research will also show how a low-cost approach to MOOC development can make this a viable solution for specialised needs in niche fields of interest, geographical regions or minority languages.

As part of the case study the videos are created by capturing the audio and screen activity of the "tutor" in a manner similar to classroom demonstrations of lectures. Based on the results of research in MOOCs to date, these are typically between 5 and 15 minutes long. These videos are then submitted to IT Sligo who render them and upload them on to the Moodle site.

The Developers have been approached by Intel on a voluntary basis to develop new material specifically for the MOOC rather than using re-purposed material. The research is supported by the Research Scientist team in Intel Open Laboratory in Istanbul.

The research will show how MOOCs, as a rapidly growing learning resource, could be beneficial in many ways for leaving certificate, transition year and junior certificate cycle students, particularly using the "flipped classroom" approach.

The scope of the research will be in two parts the pilot will run from the 1 from September 2014 to September 2015 and phase two will be the launch of the MOOCs from September 2015 to September 2015 to March 2016. The programme rolls out looks as follows:

Organisation	Developer	Start	Finish	Duration
DIFE	Jessica Matthews	19.01.15	27.02.15	5 weeks
Coderdojo	Noel King	09.03.15	01.05.15	8 weeks
DIT	Frank Duignan	23.03.15	08.05.15	7 weeks
FIT	Mark Taylor	13.04.15	03.07.15	12 weeks

The research will also have an international perspective as there will be a cohort of MOOC students from Zambia completing one or more of the MOOCs. SouthWest College will run a MOOC with a group of BTEC level 3 Zambian students. This is part of the goal of the MOOC to reach low-income learners and students in developing countries, such as Zambia. Although the possible obstacles to prevent learners from Africa include poor technology infrastructure and linguistic issues as a barrier to participate in MOOC's. Sanou (2013) explains that only 25% of Africa has electricity access and the lowest internet access all over the world with only 7%. The programme rolls out looks as follows:

2. Research Questions

Purpose and Research Questions

This study aim to investigate these research questions:

1. How were the students' experiences in terms of the course design (e.g., learning materials, activities, and teaching support)?
2. How effective was the course with regard to students' learning outcomes?
3. How do the outcomes in questions 1 and 2 differ from more expensive MOOC's?
4. What were the costs involved in constructing the MOOC's?
5. How were the instructors' experiences in terms of the course from production to execution?

3. Research Objectives

The data collection and analysis will be a mixed method of qualitative and quantitative data for analysis, using primary and secondary sources.

- Pre- and Post- questionnaires with the students
- Focus-group interview with the students
- Semi-structured, individual Interviews with the instructors
- System analysis of the student activities, logs, discussion posts etc.

4. Contribution to this Research

Digital content has been used by academic institutions Lane & McAndrew (2010). During recent years there has been an interest in knowledge sharing

and sharing open educational resources (OER) for teachers and learners, Adams, Liyanagunawardena, Rassool, & Williams (2013). In 2001 the Massachusetts Institute of Technology (MIT) launched its pioneering Open Courseware (OCW), with the aim of publishing materials from all its courses permanently on the open Web, with licenses allowing its use, modification, and redistribution. Since then many other established universities have joined the movement such as the Open University of UK through the Open Learn project and the Open Learning Initiative by Carnegie Mellon University. Open education resources had a two-fold purpose: Learners could access the material directly and, hopefully, learn from it; educators could use the material as part of their own teaching (as produced or by amending it themselves).

A significant proportion of these OER, however, were of limited use since they were usually produced in order to be a specific part of a larger educational experience within a specific educational framework. This limitation was particularly frustrating for many aspiring learners attempting to use them directly, but could also cause problems when used naively by educators (Liyanagunawardena, 2012; Weller, 2007). The concept of open access to learning was taken in a different direction with the introduction of the massive open online courses or MOOCs (Fini, 2009).

This project will examine the actual cost of developer's time, material, equipment and facilities.   Jones (2004), Bates (2005), and Rumble (1997), while acknowledging the difficulty of estimating overhead costs for technology-mediated distance instruction, offer valuable guidelines for this endeavour. Jones (2004) looks at the feasibility of sharing courses across multiple campuses, the sharing of resources should also be considered alongside the reduced costs of online assessments and peer to peer learning.

Professional work and learning are deeply intertwined. Where learning at work takes the form of formal, deliberate training or development it is easy to identify as 'learning'. By contrast, non-formal learning embedded in everyday work activities is more difficult to recognise as 'learning' (Eraut, 2000). Yet both forms of learning, formal and non-formal, are important for the development of different forms of expertise. Theoretical expertise may be learned through deliberate effort, while practical expertise is learned 'on the job'. Therefore the interweaving of professional practice and professional learning offers a new basis for how we think about work, education, and teach (Beckett & Hager, 2002).

5. Research Structure

The research will follow a mixed methodology approach. We will look to measure the students satisfaction with the MOOC's through pre-MOOC questionnaire, analysing the statistics and post-MOOC questionnaires. The developers will also complete questionnaires, attend focus groups and follow up with one to one interviews. Due to the pragmatic purpose of this research and project, the project will follow a 'design-based' research methodology, as described by Wang and Hannafin (2005). The framework for the evaluation will come from the Kirkpatrick model Rajeev, P. et. al. (2009) and will use

Cronbach's alpha to validate the MOOC questionnaires for internal consistency.

This project will utilize range of methods for collecting and analysing data Nunan (1992), Cohen et. al.al. (2007) and will adopt a mixed approach of qualitative and quantitative data collection. The main collection tools will be using the platform to track the number of students enrolling and through pre-course and post-course online questionnaires. This information should contain information about the student profile, if the MOOC has fulfilled their expectations and if the students' are satisfied in terms of course structure, content, evaluation, duration, teacher-student interaction and peer to peer learning. This information will be used to discover if the MOOC's are actually aligned the students' intended learning outcomes.

Although the above methods will help scaffold for future MOOC's (namely the post pilot), the limitations are that the sample will be a relatively small, self-selected group chosen by the project Partners/Developers. The students may already have cultivated an opinion or reflected on the MOOC, stemming from their collective group discussions. This in turn may force the project to review course demographics and possible future strategies.

6. Summary

The research is a work in progress and although the pilot is a relatively small sample and is not entirely a random selection. It is hoped that the findings from the post pilot MOOC's will support a substantive argument in favour of a low cost approach. Overall, the costs of developing and delivering MOOCs at the four institutions may vary widely. The costs depend heavily on the number of people involved in the MOOC production process and to what extent it is executed "in-house" as opposed to using external professionals. To an extent these will be minimal as the developers are volunteering their time, albeit login the actual hours allocated for the project. Additionally, platform programming costs to facilitate the extensive auto-grading or peer-grading functionalities needed for such high student enrolment numbers associated with MOOC's.

The MOOC design and delivery has been identified as a team effort for critiquing and offering constructive feedback on the MOOC prototypes, using the shared site to view videos after they have been produced through Camtastia. Bates (2005) describes as the "project management" model for web-based course development, MOOCs, as more time consuming because of the standardisation required and brand awareness, which in turn has led to institutions dedicating more resources for this part of the MOOC as the actual MOOC content can be replicated and reused in future MOOC's. The criticism in HE is that academics are generally undercompensated for the opportunity costs of their time to develop MOOC content, but hopefully this research will show that once the MOOC has been created it is only the maintaining and uploading material for current ability which is required thereafter.

Several questions remain to be explored with respect to MOOC costs and cost-effectiveness and whether they can eventually contribute to reducing the

costs of higher education. The cost analyses of re running and reusing MOOCs re-runs diminish substantially after the initial MOOC has been created and uploaded to the platform.

Bowen, P. et al. (2012) studies of MOOC effectiveness with respect to educational outcomes should be combined with cost analyses to help determine whether spending more on MOOC production and delivery leads to better learning outcomes. To answer the question of whether MOOCs are a cost-effective means to deliver education, the research will compare the costs of MOOCs to the costs of alternative delivery mechanisms. It is assumed that generating cost-effectiveness ratios for a number of educational alternatives including MOOCs would allow decision-makers to choose which programs represent the best value for money and investments of resources. Indeed in the long term the use of badges and MOOC courses taken, lead to professional development and employability, this students return on investment by participating in the MOOC are investing in their own future and that of society as a whole.

Potential transformative impact of MOOCs

It has been suggested that MOOCs in themselves are very little more than electronic learning resources (Tsigaris, 2013) and that their main impact on formal Higher education may be in their reuse by lecturers as resources for their own students. Indeed this has already started to happen and is part of the business model of some MOOC producers. (Dodd, 2014). However, the potential is there to use MOOCs in more transformative ways. MOOCs can be used as resources to "flip" the classroom where a Lecturer can ask a group of students to take the course content online, including the assessments, and provide additional face-to-face activities. This can lead to improved learning outcomes and/or opportunities to reduce teaching costs by reducing class contact time (particularly in larger institutions). (MIT News, 2014).

Of potentially greater transformative impact is the potential to use MOOCs in Competency Based Education (CBE). In 2013, a survey of university presidents indicated that they saw more disruptive potential in CBE than in MOOCs (Lederman, 2013). CBE allows learners to achieve their learning outcomes in whatever way they please and in their own time, and to gain their awards by demonstrating that learning through authentic assessment. This has the potential, not only to massively decrease the cost of education and as a result improve access; it can also speed up the time to graduation. Some commentators are also noting the potential of MOOCs in combination with alternative credentials may make higher education less relevant in the future. One MOOC provider is marketing small groups of MOOCs as a "nanodegree," which will provide the recipient with specific skills for a particular job. (LeBar, 2015) Of particular interest is the development of the Open Badging infrastructure by Mozilla. (Hickey, 2015) Such badges can be placed on the Web and students' can get recognition for short courses such as a MOOC. (This project will use the Intel Badge system and will have the opportunity to aggregate a series of badges into a conventional qualification.) Of particular value is the ability of prospective employers to verify the authenticity of the

badges as well as to drill down and examine the learning outcomes that were achieved.

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