Addressing retention and completion in MOOCs - a student-centric design approach.

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Abstract: The recent development of massively open online courses (MOOCs) has led to a plethora of courses being offered to the general public, as students, but these have had extreme issues of retention and completion with MOOCs typically returning less than 10% of students completing the course. As part of the dCCDFLITE EU project, the authors developed a MOOC on entrepreneurship and innovation, highlighting distributed concurrent design (dCCD) and the Osterwalder Canvas as tools for student use. The course was designed to be student-centric, expecting that students would work through the learning materials independently and then form in groups, using CCD, to develop their business plans. However, the experience of this MOOC, presented statistically in this paper, was no different from the norm, which leads the authors to consider whether we require new pedagogical models for this type of online learning, and how we should measure success in such environments.

Introduction

The development of entrepreneurs and innovators in the IT industry is becoming ever more important given the increasing competition in the use of IT for business innovation, coupled with a shortage in IT skills, not only for IT professionals but also for eLeaders, as identified by many bodies including the European Commission (Gareis et al. 2014). Added to the very high unemployment rates in several European countries, especially among the young, the European Commission gave a lot of importance to entrepreneurship that would help alleviate that problem while aiming to increase Europe's IT potential against the almost ubiquitous domination of the sector by the United States. The work described here discusses the results of an Erasmus, Life-long learning programme project, called "dCCDFLITE - distributed Concurrent Design Framework for eLearning in IT Entrepreneurship" (FLITE for short), which ran from 1st Oct 2010 to 30th September 2015.

The purpose of the MOOC was to develop entrepreneurial and innovative thinking designed to help develop eLeaders in the IT industry, and higher education graduates into employment. With the massification of higher education and a growing percentage of the European population now having degrees, just being a graduate is no guarantee of employment (Flinders 2013). Employers are looking for something that sets a graduate apart such as other knowledge and skills, work experience or entrepreneurial skills. For example, in the UK, whilst there is a significant demand for, and a shortage of, IT professionals (around 800K by 2020 across Europe) and eLeaders (around 300K by 2020 across Europe) (empirica 2012), employers are often reluctant to take on and train graduates and seek to employ those with a couple of years experience in the industry. However, their reluctance to provide graduate internships or work experience means the pipeline to develop experienced professionals is strangled. One outcome of this is that while the overall employment of UK IT graduates within their graduate discipline is one the best of all subjects, excluding other work, further study etc. the actual unemployment rate of UK IT graduates is the worst of any subject. As a result students with just an undergraduate degree, and nothing more to add to their CV, will often be the last for consideration by employers (CPHC 2012). There are many reasons for this, such as the diversity of the cohort, for example BME (Black and Minority Ethnic) students have the worse employment rates across all disciplines in the UK, and there are a higher proportion of these students in Computer Science than any other discipline. That being said, we need to help students develop skills and knowledge that employers are seeking and entrepreneurial thinking is one of those skills (Cooney 2012). Another issue focuses on the relationship between higher education (HE) and industry. Whilst there is a lot of good work across Europe in this space, there is a lot more that can be done and higher education establishments tend to focus on links between staff and industry and less on student links with industry. By trying to engage HE IT students with the IT industry, it was hoped that the engagement and

the knowledge transfer between those students and industry would be enhanced. As a European project it was also hoped that students and industry would work across country boundaries helping to facilitate multi-cultural working, and develop relationships that may yield fruit in the longer term – yet another skill / experience highly valued by employers (Crossman & Clarke 2009).

Engaging HE students and industry employees in joint working across Europe could only be practical through online collaboration, and therefore a distance-learning course in entrepreneurship and innovation was developed. Another key focus of the FLITE project was to help develop entrepreneurial collaboration, which is an increasingly important online skill in this digital age and one not only highly sought after by employers, but also considered essential for successful online learning, and fundamental to being an entrepreneur. A process called Concurrent Design (CCD), which was originally developed by NASA (Strand & Staupe 2010), was adapted for use in eLearning (Strand 2012) during a previous project, and a distributed version of CCD, called dCCD, was developed. CCD is "a systematic approach to integrated product development that emphasises the response to customer expectations. It embodies team values of co-operation, trust and sharing in such a manner that decision making is by consensus, involving all perspectives in parallel, from the beginning of the product life-cycle" (Stamatis et al. 2015). It focuses on people (the experts with the knowledge to solve the problem), the processes (what to do, when to do it etc.) and the tools to solve the problem e.g. project management tools. This project was the first time that dCCD was used as part of a group process in an online course. There are many approaches to entrepreneurship training however the group decided to focus on use of the Osterwalder Canvas based on the Business Model Ontology developed by Alexander Osterwalder (2004) which supports both business modelling, providing a methodology and a graphical modelling tool, and personal modelling, through the use of Osterwalder Business Model You (BMY) which helps someone to examiner their own entrepreneurial skills and personal networks (Clark 2012). The approach taken was to provide online training for the students in the use of CCD and to get them to apply it in their application of the Osterwalder Canvas for entrepreneurial modelling and BMY, which was something that had not been tried before.

The rest of this paper reviews the literature on MOOCs and approaches to student-centred learning, it then describes the lessons learned from a small pilot run by the project, which were taken on board in the design of the MOOC, which is described in some detail. It then analyses the results and finally draws some conclusions about how we should measure the success of education when delivered through a MOOC.

Review of MOOCs, their Challenges, and Student-Centred Learning

MOOCs are typically divided into cMOOCs and xMOOCs (or some combination of the two) although a variety of "flavours" have been identified over the years (Clarke 2013). xMOOCs tend to replicate typical didactic teaching models (Weller, et al. 2012) but can often end up as poorer versions of traditional classroom-based teaching models. As a result, recent trends in MOOC development have been more towards cMOOCs, which are based on a constructivist, student-centric approach and have the potential to disrupt traditional teaching in higher education (Jacoby 2014). However there are significant challenges for learners within cMOOCs, particularly for novice learners, such as the complexity of the conversations and networks that develop, which can be overwhelming and may require significant levels of support to help students learn how to use them (Kop et al. 2011). Many have shown that students struggle to manage their own workload in a MOOC, and this is one of the biggest challenges students face in student-centred learning, the issue tending to affect novices more than the advanced students (Zutshi and Rodafinos 2013).

There are a number of significant differences between online and face-to-face, student-centred collaborative learning such as those identified by Ellis (2001), a major issue being that students "can no longer rely on the lecturer to tell them what, how, where and when to think". This is because the lecturer moves more to the role of a "facilitator", becoming a more equal member of the group in discussions i.e. taking a less dominant role in a debate than would typically be the case in a classroom situation. Whilst students in Ellis' experiment noted many advantages of online learning, such as a written record of a discussion being permanently available for review, students also noted many disadvantages, such as the lack of an immediate response to a question, the inability to read body language, or to hear how someone expresses a view and hence pick up on the depth of feeling of a comment. Instructors also found that coaxing students into participation online was harder than in a classroom-based, face-to-face discussion. However in order for online learning to be successful, it is crucial that students feel part of a learning community (Ellis 2001, Bernard 2000). Chandrasekaran et al (2015) also noted the challenges of students feeling isolated and overwhelmed by the volume of student posts, however

in a MOOC where a genuinely large number of students are engaging with a course, the number of posts and discussion threads can be overwhelming for both instructors and students, and so some automated means to try and prioritise where instructors should intervene in MOOC forums is an on-going research area.

Given the shift of responsibility from the instructor to the student in most MOOCs, this is potentially a significant factor affecting completion rates, which tend to be very low, usually in single figure percentages. Researchers have analysed many reasons for this, such as those suggested by Muilenburg and Berge (2005) who identified eight factors for attrition in their study of over 1000 students, these were: academic skills, technical skills, learner motivation, time for studies, support studies, cost of internet connection, access to internet connection and technical problems. However, more recent research studies have begun to recognise the need to reflect on the way we judge the success of a MOOC, and that whilst there are aspects in common with traditional teaching, there are also differences. It is important to understand the "role of students and how they act within a MOOC" (Diver and Martinez 2015). Many researchers, such as Diver and Martinez (2015) and Halawa et al. (2014), have taken the approach of analysing activity patterns in student learning to try and predict dropout. One of the first challenges is to define what constitutes a student. Single figure success rates are usually based on enrolment data, however, noting the "low cost of entry and exit for MOOCs" (Halawa et al. 2014), typically about 50% of those students will never actually start the course so the first challenge is to define the active cohort from which to measure success. Halawa et al (2014) chose to define an active student as one who had viewed at least one video. They then analysed activity patterns in order to try and predict dropouts, which also needs defining. They choose to define an active student as one who had either been absent for a month in total (not related to the last time a student engaged with the course) or viewed less than 50% of the videos. Some would consider these to be quite high thresholds, noting that for most students, as they point out, absences of several days at a time are not uncommon however, as the absence time lengthens, the probability of dropout will increase. Halawa et al. (2014) divided a student's decision to leave a course into two broad categories: internal motivational factors which includes a student's desire to persist (often influenced by self-efficacy) and their academic ability, and external factors, e.g. outside commitments, which are virtually impossible to detect. Note that self-regulation, such as "time management, self-teaching methods and metacognitive evaluation of one's own understanding", is an issue in retention. Level of interest in the materials was also noted as another factor.

Diver and Martinez (2015) undertook an analysis purely based on what they could "observe and quantify". This showed a number of correlational links, e.g. that students who interact less with forums and videos are more likely to drop out, however that does not mean there is a causal link between the two. They also reported that students from the USA achieved better results than the rest of the world, the reasons were not known, however language skills in English are very likely to have been one of the factors. They also note that for a traditional course there is a "relatively high bar of requirements" which must be satisfied in order to join, which is not true for a MOOC. They also noted that some courses offer a range of completion certificates depending on the stage students reach in the MOOC. More research is needed to understand how much certificates are valued and if these can be used to influence behaviour. The value of a certificate to a student is likely to be influenced by its acceptance in the marketplace by employers (Larson 2013), and this varies across the world, the ability to cheat in a MOOC being a major factor in acceptance (Gidwani 2013).

A key factor in the analysis of MOOC success is that failure rates are still being judged by the teacher's expectations of a traditional course, not the learning goals and intentions of the students, which change over time and are invariably different to traditional courses as MOOCs are easy to sign up to and have no penalty if the student drops out. Kizilcec and Halawa (2015) looked at attrition and achievement gaps in online learning noting that 17% of their respondents stopped engaging in the course as they had learned all they intended to learn. Similarly, a survey of student intentions by Gütl et al (2014) showed that only 22% of students had originally intended to complete their MOOC.

Lessons learned from the Small Pilot

Prior to the development of the MOOC, a small pilot was run with 11 students from academic institutions from Greece, Norway, Portugal, Sweden and the UK. The purpose was to test the learning materials before being used on a large scale and to explore the approach used for student engagement in self-directed learning. The course consisted of about 50 hours of learning (this included time to working through the learning materials as well as student independent learning) and was designed to be completed over an eight-week period, although in the event, this was extended by a few weeks to allow for time off during Christmas. The design of the materials included a range of text, videos, references to further

reading on the web, quizzes and discussions, and were designed to provide a range of learning experiences, taking full advantage of different pedagogical approaches available online. The VLE (virtual learning environment) used was Pearson OpenClass (Pearson 2015), and chosen on the basis of familiarity by the core team, availability and cost. It supported the basics one would expect from a VLE but did not support any real novel pedagogy. The results of the pilot have been published elsewhere (Stamatis et al. 2015) so are not discussed in detail here other than to highlight the key findings which influenced the design of the MOOC. These were as follows:

- Despite volunteering for the pilot and being interviewed locally to assess their commitment and time to do the course, it was clear that most students were either unwilling or unable to put the effort in to become independent learners and the team delivering the pilot had to provide a lot more support than expected.
- Only the students who were really motivated to start up their own company in the near future or had already done so, had the motivation to complete the course (note that the course was taken addition to their normal studies).
- Feedback from the students sought a clearer distinction between domain content (entrepreneurship and innovation topics) vs. the processes to achieve that (CCD and Osterwalder Canvas).
- The learning management system (Pearson OpenClass) clearly impacted the learning experience in terms of the user interfaces and the structure of materials presented however it is hard to separate these issues out from the overall learning experience of the student.
- A mind-map showing the structure of materials and suggested order of how to work through them was provided and students found this very useful.
- Group formation was a challenge as the groups needed to be formed around a specific business idea. With some negotiation this was possible with a small number of students but alerted the team to the challenges of managing this within a larger group.

Design of the MOOC

The project requirements for the primary implementation of the course were to have at least 50 students undertake the online learning, however, the team were keen to challenge boundaries and test if their approach was truly scalable and a decision was therefore taken to run it as a MOOC. The same basic course structure was adopted, i.e. 50 hours of learning undertaken over an eight-week period. Research tell us that this is considered quite a long time for a MOOC and the longer the MOOC, the higher the dropout rate (Kloft et al. 2014). In order to complete the MOOC in 8 weeks students had to put in about 6+ hours of effort per week which is also quite high for a MOOC and therefore likely to increase the dropout rate (Kloft et al. 2014). However these requirements were kept for two reasons – they had been committed to in the project bid and it was therefore difficult to vary them, and it was also felt that a minimum of 50 hours of effort was required to teach the topic and provide time for the students to practice and implement the concepts taught. Taking on board the feedback from the pilot, the following changes were made:

- The MOOC platform chosen was Canvas (Instructure 2015), for the following reasons:
  1) Uncertainty about whether Pearson OpenClass could support large numbers of students.
  2) The team wanted to try out some pedagogical innovations and Pearson OpenClass was too limited.
  3) Canvas not only provided a free platform for use but free support for individual tutors.
  4) Canvas had a worldwide audience, which would help the MOOC to recruit.
- A guided route (in the form of a timeline) was provided to help students work through the materials, and the mind-map from the pilot was enhanced. The design of the course was to provide more traditional support at the front end to ensure students had undertaken the learning, which most students seemed to want. They were invited to work through the materials in any order they liked, but most used the timeline as a guide.
- In the pilot, some synchronous video conferencing had been used, however this was not possible with students scattered across time zones all over the world, although they were encouraged to use it within their groups if they felt it possible, and useful, to do. Students were encouraged to use the video messaging tool within Canvas. This is a built-in facility where students can easily record a video message for others to view, and simply make it available to them. It was hoped this might help compensate for the lack of synchronous video conferencing as part of the course.
- Some of the materials were reviewed and strengthened to e.g. the quizzes were enhanced so both students and staff could see how students were performing etc.

A key component of the pedagogic approach was group work. While there were many reasons for this, the two key ones were:
1) It was required in order to use distributed Concurrent Design (dCCD).
2) Whilst the percentage of learning that occurs through dialogue and discussion in adult learning is unclear, there is ample

research to suggest it is a significant component of learning and therefore important to address (Jarvis 2011).

The MOOC ran between May and July 2015, with the same structure as the small pilot. A summary of student engagement on the MOOC was as follows: 1556 registered to take the MOOC. Of those, 804 registered but never attended the course (51.7%) which is typical of most MOOCs (Onah 2014). 752 attended at least once, 572 ceased using the MOOC after 3 weeks, 28 of whom withdrew themselves from the course. A total of 152 were considered to be active after week 6, about 10%, which is not an uncommon level of engagement in a MOOC. However, the number of genuinely active students reduced further, with 12 submitting the personal business model, 9 submitting business plans (all by individuals, none by groups) and 21 completing the final MOOC survey.

One of the most major challenges of the MOOC was to manage the group formation. This has been done successfully by others who have run a MOOC (Mackness et al. 2010) for example by getting students to pro-actively put themselves forward to be placed in a group and then when there are sufficient number, a group is formed and the next one begins development. That approach would not work for this MOOC because groups needed to be focused around the development of a business idea and the group needed to jointly work on that problem. However, allowing hundreds of students to try and negotiate their own groups from scratch felt like it could be a rather chaotic approach. As a result, a decision was taken to use Canvas to automatically allocate students to a group, ask them to discuss a business idea between them and depending on the outcome, stay with the group or move to another group. A maximum group size of 15 students was set with the hope that on average, 50% would engage with the course so each group would end up with around 6 functioning students. This did not work well as not all students engage in a MOOC on the same day or even in the same week, despite an official start date to the course that they were notified of several times. The automatic allocation assigned all students to a group, including the 804 who didn't make it to the start of the course, but of course it was impossible to tell at the start who would be active. So, with over 100 groups created, many had only one active participant and advising students how long they should wait to see if any more members of the group engaged was a very hard decision.

In order to try and facilitate group formation, a discussion forum was created for students to post business ideas and whilst it took some time to engage students, some students did find each other and form small groups through this mechanism but overall it was not that successful. Canvas also provided the facility for students to create their own groups so students were allowed to form their own groups if they wished. This was not entirely successful, 11 groups were formed by students, with membership ranging from 2 to 307. As a result, if the students were unable to find a group to work with they either gave up or simply did the work on their own. This group formation negotiation process occurred during the first 3-4 weeks of the course while the students were working through the taught learning materials. Ultimately some groups worked with a few people for a short while but during the MOOC, as appears to be normal, people were dropping in and out throughout the course, which made group formation and working extremely challenging. In order to try and maintain active groups only, non-active students, were removed from groups a couple of times through the course. Also a number of other discussion groups were invented prior to the course starting and during the course as needed, for example: an ice breaker forum for students to tell others about themselves and their interests; a help and support discussion forum, several topic based discussion groups for e.g. Business Model You, finance, value propositions, a place for students to upload their assessments and for others to critique them etc. All of these were active discussion groups and it is clear that the students who engaged in these dialogues benefited from the discussions.

Once the core learning for all the topics of entrepreneurship, innovation, CCD, Osterwalder Canvas and BMY had been undertaken by students, as discussed above, the second half of the course focused on the application of their learning in groups. In this latter half students were essentially left to develop their business plans at their own pace, i.e. the pedagogic approach was a form of scaffold and fade (Davis 2015). In addition to group work, given research has demonstrated the importance of peer review to the learning process (Carless 2015), it was felt that this should be part of the learning process and so the students were asked to generate a draft business plan and to peer review 4 others. They were then asked to resubmit their business plan for final peer review along with a short video, no longer than 3 minutes in duration (which could be delivered by one or more of the group members), to pitch their ideas to an audience of e.g. potential investors. One of the challenges in any group learning experience, be it face-to-face or distance-learning, is to keep students in sync and not unexpectedly the students, being essentially left to work at their own pace for the last part of the course, worked at varying speeds. So some draft plans appeared when others submitted their final plans etc. making the process of peer review difficult, and of course students tended to focus on completing their own plans before undertaking the peer review of others. However, given the small number of submissions, the team were able to provide feedback on the draft and final submissions for all students.

Student Survey Results

As identified above, a total of 152 students were considered to be still engaged by week 6, about 20% of the active cohort, however, as the workload became tougher and more student-centric, many more dropped out. 12 Business Model You submissions (~1.6 of those who started the course) were uploaded but ultimately there were 9 (~1.2%) very engaged students who made multiple business plan submissions, taking feedback from each other and the course team before making a final submission. Two video pitches were submitted however one could still not be viewed even after three submissions by the student. In terms of comparisons with other MOOC courses, success rates are often in single figures so these might seem even lower however, they are not out of line with the sector, for example an analysis by Driver and Martinez (2015) reported that for 84,377 students who started their MOOC, 1902 obtained a statement of completion (2%). In terms of the questionnaire results, key highlights from survey data taken at the scheduled close of the MOOC are given below:

Welcome survey – students were asked to complete this at the start of the course to help us understand their motivation for taking the course and their background. A total of 234 responses were received. Key highlights are:
- In terms of the primary reason for taking an open online course, the two top answers were that they enjoyed learning about topics that interest them (39%) and they hope to gain skills for a new career (30%).
- 34% had taken an entrepreneurship course before and 90% had thought about starting their own company.
- 25% of the students were from Western Europe, 19% from Africa, 17% from Eastern Europe, 14% from North America, 12% from Asia, and the remaining 13% were from the Caribbean, South America, Middle East and Australia & South Pacific.
- 57% did not have English as primary language
- 60% were male, 40% were female.
- 65% were aged between 19 and 34 years old, 27% were in the 35-54 age range.
- 29% had never taken an online course before. 13% had taken one at School. 12% had taken a Canvas course before.
- Whilst the MOOC was originally designed for IT industry employees and HE students, the MOOC was opened up to anyone interested. However, 11% of participants were working in the IT industry, 12% were students studying an IT degree, 10% were both working and studying in IT i.e. 33% of participants were working in, and/or studying, IT.
- Students were asked about their motivations for taking the course. 23% said they wanted to be passive participants, 15% said they just want to drop in and get what they wanted, 10% just want to observe. In other words, 48% had no intention of interacting with others or completing the course. However given most students did not complete the survey it is likely that many more never intended to complete. These stats are not out of line with Gütl et al (2014) where only 22% of their 134 students intended to complete and Kizilcec and Halawa (2015), who reported that 17% of their learners stopped engaging when they had learned what they intended to learn.

User experience survey – students were asked to fill this in when they were about half way through the course although students could in theory complete it at any time, so results have to be taken in that context. 38 responses were received and it was clear that for those who were engaging with the course, overall they were very positive and getting a lot from it. Key highlights from the survey were as follows:
- 97% of students awarded the course at least 3 out of 5 stars, 84% awarded 4 or 5 out of 5 stars.
- 82% were likely to recommend the course to a friend (6-10 out of 10 where 5 is neutral)
- 82% agreed or strongly agreed that the course activities had a positive impact on their learning experience.
- 87% agreed or strongly agreed that the course materials had a positive impact on their learning experience.
- 47% of people wanted a MOOC to last 4-6 weeks, 18% wanted 6-8 weeks and 16% requested 8 weeks or more. So the high dropout rates due to length were unsurprising, given the MOOC was scheduled for 8 weeks, this only met about 30% of student wishes.
- The actual time people were spending on the MOOC per week was: 39% (2-4 hours), 21% (1-2 hours). At the start they planned to spend: 30% (2-4 hours), 26% (1-2 hours) and 26% (4-6 hours). These being the top answers.
- In terms of instructor involvement – 58% wanted variety, 24% wanted to learn on their own or through communication with an instructor only. Only 13% explicitly wanted to interact with their peers, which explains the poor level of group development and submission.

Final survey – Students were asked to complete this at the end of the course and 21 responded, so percentages need to be read with some caution, nevertheless they are interesting. Key highlights are:
- 95% completed at least half of the course

- 84% agreed that the course made them think about addressing challenges in their work life in a more entrepreneurial way.
- 100% said it was extremely likely or quite likely they would start their own company within 5 years in other words, it would appear that only those really motivated to learn, because they perceived a benefit to themselves, had the motivation to complete.
- When asked if students considered the opportunity to work in groups with other participants from other countries an added value, 60% said yes, 25% said somewhat.
- Despite the apparent resistance to working in groups, 84% of respondents considered the opportunity to work in groups with participants from both business and universities was an added value, 10.5% said somewhat. Given the low number of respondents it would be likely that these students were the ones who were originally supportive of group working.
- In terms of the distributed Concurrent Design (dCCD) collaborative process, 60% found it useful and 20% said they found it somewhat useful.
- When asked if they used social media within their group, 10% used it a lot and 15% used social media a little.
- 31.5% tried to use the Canvas built-in video messaging facility and liked it, 58% didn't try it, but no one was negative about it.
- 75% found the timeline useful, 10% occasionally referred to it, 15% didn't find it useful.
- When asked if they preferred to be allocated to a group automatically at the start, the results were completely split with 42% saying yes, 42% saying no, and the rest had no preference.

Conclusions

So by the standards of most MOOCs, the number of students who made a final submission was low but not completely out of line with the sector, however if one were to compare this with a traditional course, the numbers would be very disappointing. It is obvious we need to question whether a MOOC should be judged successful or not in the same way as a traditional course. The reality is that a MOOC will leak students as it progresses but that doesn't mean students haven't learned anything, or not achieved the learning they desired. Some key factors to consider in judging the success of this and other MOOCs are as follows:

- Signing up for a MOOC is simple and requires no commitment or exchange of money so, as identified above, it is well established in the research literature that students will be less committed to the course as there is no penalty or consequence of not participating, unlike in a traditional course where e.g. they might lose financially if they drop out and in general, considerably more thought and preparation has occurred before students actually enrol for a traditional course. In other words, registering for a MOOC represents an aspiration at a particular point in time, it does not necessarily represent a well thought through decision or commitment and life can get in the way of that aspiration and priorities can change prior before the start of the course. So, judging success rates by the same measure as traditional learning is simply not appropriate. The fact that half the students don't even start most MOOCs is unsurprising and including those who never engage, in the failure rate of a MOOC (which people tend to interpret as failure to deliver a worthwhile course) does not make sense.
- It is clear from our surveys that at least 48% of students had no intention of completing the MOOC, they knew what they wanted to get from participation and planned to drop out after they achieved that. So perhaps we should have split students on registration into those who want to do the group work and those who didn't i.e. don't try to force students into groups who plainly aren't interested in that part of the learning process.
- Again it is clear from our surveys that many students have no desire to work in a group. Whilst the benefits can be tremendous, it is usually considered by students as more challenging (Pelled 1999) requiring: more commitment to work with students across time zones, who may drop in and out of the course, may have poor language skills, may be working through the learning materials at a faster or slower pace than others, may do group work at a different pace to others (given MOOCs are not full-time study), may promise to do work and then not deliver on time or at all etc. Group work is well known (Felder et al. 2000) to have an averaging effect on grades pulling bright students' marks downwards and raising those of the weaker students. Given the commitment required by this MOOC to learn complex materials and ideas, it is only the bright, very committed students who were likely to complete and although no grade was awarded, these students may well be more averse to group work based on prior experiences. A focus on student-centric learning forces the student to take control however group work removes that control as students can't control each other, in other words, group work in a student-centric model has the potential to render students powerless.
- The formation of groups is a challenge in MOOCs, however, our requirement was not only to form a group but to

form a group around a particular business idea which students could jointly work on. Given students do not all engage in a MOOC at the same time, are notorious for dropping in and out (again as there is no penalty for disengaging), coupled with trying to form groups from potentially hundreds of students, it is hardly surprising that no groups managed to bond sufficiently well to make a group submission. Another issue to consider is that in reading the potential business ideas posted by students, most of these were very specific to a student's particular situation and context, which would make it hard for others to understand quickly in order to make an equal contribution to the group work. There is no easy answer to this other than perhaps to provide some potential business ideas for groups to work with so all students have an equal understanding of the problem at the start about the entrepreneurial idea however, this may not be well received if students are keen to develop their own ideas and has the potential to increase the dropout rate if they are prevented from doing so.

- Another challenge was that the course was in English and for 57% of the students this was not their first language. Whilst the English appeared pretty good for those students who engaged, one BMY submission was in a foreign language. Overall it is unclear the extent to which language skills affected the dropout rate however it clearly must have affected some.

- On reflection, the title of the MOOC, "Entrepreneurship and Innovation", should have made it clear that collaboration was a key part of the course. Although identified in the description of the course, it is quite possible many students did not read this properly and merely signed up on the basis of the title. Given the requirement to learn and use dCCD, anecdotal evidence from informal conversations with some students provided feedback that this may have been a stumbling block for many as it requires considerable effort to learn and for group work it also requires that the students have learned it at the same time in order to use it in the group collaboration. As already discussed above, students on a MOOC do drop in and out, and engage at a different pace making it very difficult for this to be implemented. Another issue is that whilst dCCD is a useful skill, it is not required in order to become an entrepreneur and for students with limited time to engage, it would be an obvious topic to skip.

- The first experience inside a MOOC has been shown to be critical for students to return, as if they are confused by the interface or are unsure what to do, then they are more likely to give up at that point. We were aware of some difficulties by students who had never used Canvas before and familiarity with the learning environment can be very important to retaining students, in addition to how the MOOC is implemented within it.

- Because student-centred learning requires students to take the lead and be pro-active in deciding what to learn, how and when, many students will view it as requiring more effort and find it harder than being told what to do, and when to do it, by an instructor. An obvious conclusion from this is the student-centric learning may lead to increased dropout rates. However, it is hard not to run a MOOC in a student-centric way because the number of students typically involved makes individual tuition and support impossible.

- Acknowledging that anyone can sign up, no pre-requisites are required and of course many students may not have the skills and abilities required to complete the course, means that it is not sensible for courses to be judged as failures in traditional terms. However, if students struggle academically they may take pre-requisite courses and come back later and this should be considered a success not a failure.

- Another issue we have not had capacity to explore in this paper is that of metacognition. The vast majority of students to-date, at all levels of education have experienced traditional classroom learning and learned how to learn in that environment. Most are not only unprepared to learn online but have no or little experience of it, lack the self-direction, motivation and drive to succeed without the structure of a scheduled class and pressure / expectations from an instructor. Online learning will often provide materials in different formats and most students are not yet metacognitive in this environment, in other words they do not know how online learning works for them. In the future, this is likely to be less of an issue as experiences of online learning are likely to be commonplace as soon as children start school so they will be better prepared as adults.

Considerations in judging the success of MOOCs
- Acknowledge unqualified students will register for the course
- Acknowledge the existence of the aspirational learner and do not include these in the failure rates i.e. the hopeful ones with good intentions who enrol but never make it to the starting block.
- Recognise and support the different types of students who register for a MOOC and, given the focus has to be on student-centric learning, measure success by students' intended learning outcomes providing appropriate routes for each type and intention e.g. the passive learners, the active learners, the completer / finishers, those who like group work, those who don't or those who want to dip in for a specific piece of learning. Within this context, provide appropriate completion points, which is often done in the form of badges, and provide may routes through the course so students can dip into the learning that they are seeking. In the case of our MOOC, there could have been certificates for the following: 1) after working through the learning materials or a subset of them 2) development of

a business plan, 3) completion of business plan peer reviews

In conclusion, there are many factors which need to come together in order for a student to be successful in a MOOC and these factors need to be recognised as different from a traditional course, resulting in a different definition of failure: These are:

MOOC success factor	Comparison with traditional course
1. Good language skills in which the MOOC is delivered	Filtered by entry requirements
2. Metacognition i.e. each student needs a good understanding of how they learn online	At this point in history, most students are more metacognitive in a traditional learning environment
3. Motivation to compete the course - influenced by a variety of persistence factors such as self-efficacy, level of interest in the topic, mindset, social belongingness etc. (Halawa et al. 2014)	In most cases students will be more motivated in a traditional environment as they will have had e.g. put more effort into apply or make a financial commitment Penalties for non-completion are likely to be greater.
4. Time to undertake the course.	Given the motivation issues, most students will have thought longer and harder about how to commit time to the course given the likely greater penalties for non-engagement.
5. Learner support - both within and outside of the MOOC	Similar issues.
6. Trigger to drive the decision to take the course at this point in time	These may be similar.
7. Academic ability to do the course i.e. student has the pre-requisite knowledge	Filtered by entry requirements
8. Technical issues including technical skills, cost and access to the internet, technical problems.	Less critical to success in traditional courses.
9. Recognition of how students measure their success and what they want to achieve in the course	Success is judged by the instructor not the student.

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