

## DEVELOPING A MOOC INITIATIVE: LESSONS LEARNT FROM THE UNIVERSITAT POLITECNICA DE VALENCIA EXPERIENCE

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### ABSTRACT

Universitat Politecnica de Valencia (UPV) was the European institution with more MOOC course runs done by December 2016. This paper describes and analyses the decision-making process, and rationale of the development of this low budget real MOOC institutional initiative carried out by a traditional higher educational medium sized institution. This analysis is done using an Evaluative Research (ER) method based on an iterative approach of 6 cycles of formative evaluation. It has been a multiple stage process that includes many aspects. In this paper, we will analyze two of them: the creation, organization and management of a fast and cheap MOOC production process, including the several tools, plans, and procedures that have enabled UPV to create courses fast and with a low-cost; and the technical evolution of the initiative, with the different platforms that have been used. As a consequence of this process, UPV has its own platform (upvx.es) based on openedX and is a member of edx.org, with 50 courses, 177 editions, and more than 632.000 enrollments. The completion rate is 8.69%, and post-course surveys reveal a high level of satisfaction from students. The paper will finish addressing the challenges of making this an entirely self-sustainable initiative and reflecting about what is required for evaluating this experience globally.

**Keywords:** MOOC, e-learning, Open Universities, higher education initiatives.

### INTRODUCTION

The starting point of the proliferation of systematised experiences of "Massive Online Courses" is always referred to 2008 when Stephen Downes and George Siemens launched their course 'Connectivism and Connective Knowledge/2008' (CCK8) and started to work and learn actively with 2,200 people (Downes, 2009). Not much later, still in 2008, the term Massive Open Online Course (MOOC) was coined by David Cormier and Bryan Alexander to name that experience (Siemens, 2012). However, it was only in late 2011, when Stanford University launched their first experiences on courses as an experiment, that these courses could be called *massive*, as they created three courses that, to their surprise, had enrollments of 100,000 or more students each (Rodriguez, 2012).

That huge success captured the interest of private investors and brought media attention to MOOCs, in such a way that 2012 was called by some media the year of the MOOC (Pappano, 2012). Moreover, as a consequence of all these impressive numbers, many universities around the world started experimenting with MOOC courses. At the end of 2016

-five years after the Stanford experiences, 6850 MOOC had been produced by more than 700 universities all over the world, and more than 58 million students had enrolled in those courses (Shah, 2016).

However, MOOCs are still far from being a consolidated technology-enhanced educational alternative to traditional education. Even when the increasing of research is evident, and the results are promising (Veletsianos & Shepherdson, 2016; ), many questions remain to be solved (Margaryan, Bianco & Littlejohn 2015; Rolfe, 2015; Toven-Lindsey, Rhoads, & Lozano 2015, among others). Some of them related to more critical visions on the interpretation of the role of MOOC in the Higher Education portrait (Bulfin, Pangrazio & Selwyn, 2014) and some related to the pedagogical implications of those "massive" teaching models (Bartolome-Pina & Steffens, 2015).

One of these unsolved questions is regarding on how MOOCs are going to become self-sustainable, finding sources of revenue and ways to keep costs low (Conole, 2014; Dhawal Shah 2015; Schuwer et al., 2015). According to Hollands and Tirthali (2014) the cost per MOOC for universities are in the range of \$39,000 to \$325,000; a cost that agrees with €86,400-€96,000 range mentioned by Elpeboin (2016). This fact makes MOOC initiatives difficult to include in higher education policies (O'Connor, 2014), as well as difficult to justify in a context of economic crisis (Pedreno, Moreno, Ramon & Pernias, 2013).

This paper describes the experience acquired in the process of creating and running a MOOC initiative at a Higher Education institutional level. It includes most of the organisational and technical part of an Evaluation Research process (ER), analysed by cycles of development.

It covers the methodology, results and their interpretations structured by cycles of research, starting with the initial steps taken to launch the MOOC initiative and explaining later the production process that allows the university to develop courses in a fast and cost-efficient way. Afterwards, it treats how the initial platform evaluation was and how the initiative has moved from one platform to other. Moreover, it includes the decision-making process used to introduce improvements during the process.

Even though it is a case study, it is of general interest as it focuses on the analysis of an institutional implementation (UPV is a medium size Spanish public University with around 36000 students), during a period time of 5 complete academic periods (from 2012 to 2016), that explores the different implementation options available in the field, and emphasising in the rationale of the decision-making process. It also presents how to optimise resources, what can be useful for any other Higher Education organisation facing the same challenge at this level.

## **METHODS**

The main purpose of this paper is to document and evaluate the process that UPV followed to launch the MOOC initiative from the technical/administrative perspective that includes:

- Documenting the technical/administrative process including platform selection and implementation of specific technological tools, as well as other supporting plans and actions.
- Analyzing the decision-making process
- Identifying the achieved institutional objectives
- Evaluating the level of satisfaction with the achieved objectives
- Identifying problems that remain unresolved

This study, understood as an educational research process (Cohen, Manion & Morrison, 2013) responds to an evaluation research (ER) method, which focuses on the analysis of the process itself, the products, as well as the sustainability of the process, leaving aside some analysis of the initial objectives (Newby, 2010; MacMillan & Schummaher, 2001). The

study adopted a qualitative approach of the ER, what means, that the main goal is not to determine why something works or not, in the program, but understanding how the experience of implementation was, and what results have given under what conditions, along those years.

The UPV MOOC initiative experience has been considered as an intrinsic case study (Cresswell, 2007), taking into account that the particular conditions of a Higher Education Institution make it extremely particular, almost unique (politics, locals, history, and so on), but at the same time, its experience would be useful to other institutions that share with this some of their initial conditions. The entire research process concerned to the UPV initiative has been organized in iterative cycles of analysis (six evaluation cycles) where the MOOC runs were grouped by the period of execution and/or platform used. This study includes courses developed from 2012 until 2016.

For the part of the evaluation documented in this work (regarding administrative and technical decisions of the initiative), researchers followed a decision-making approach. On this, the primary focus of research is analyzing the decision-making process historically, in a formative educational evaluation research (MacMillan & Schummaher, 2001), in order to understand better how the process has occurred, in a way that can document the implementation and create knowledge useful in other experiences (Hadley & Mitchell, 1995).

## UPV EXPERIENCE

UPV has been involved in the development of digital video content to support teaching processes for several years, developing a significant experience in the production of video learning objects suitable to the e-learning needs.

As part of this initiative UPV has developed Polimedia, a system to record HD video learning objects using cheap audiovisual studios in a fast and straightforward way (Turro, Canero & Busquets, 2010); as well as the program "Docencia en Red" that encourages and supports teachers that develop digital learning content and systematically assess its quality (Caceres & Martinez, 2011). This program has trained more than 600 faculties in creating HQ video learning objects (Despujol, 2014).

UPV has used four different platforms (Google Course Builder, MiriadaX, a customized OpenedX instance called upvx.es and edX.org), has created 50 different courses, of which it has done 177 editions so far with more than 623,000 enrollments and an aggregated completion rate of 8.69% (including courses that do not offer a free certificate) by the end of 2016.

Table 1. Basic data about the Evaluation Cycles

Cycle	Edition	Platform	Courses	Registered	Certifications	Rate of completion
1	January 2013	Course Builder	2	1,178	160	13.58
2	February 2013	MiriadaX	14	76,459	11,805	15.44
3	July-October 2013	Course Builder	18	10,083	1,094	10.85
4	March-Sept 2014	Course Builder & Open edX	49	72,207	9,109	12.62
5	2015	edX& Open edX	42	216,236	18,349	8.49
6	2016	edX& Open edX	52	255,937	14,426	5.64
			Total	623,100	54,943	Aggregated 8.69

With this data, at the end of 2016 UPV was the European institution with more MOOC course runs done (Open Education Europa, 2016) and the sixth institution by the number of courses in edX.org with 39 courses, 2 X series and 1 MicroMaster (EdX, 2016).

Additionally, UPV had excellent post survey results, that can be summarized by an average of 4.05 over 5 in the question "Taking everything into account rate how the course has fulfilled your expectations". Those data come from more than 20,000 answered surveys from course completers and non-completers (a 20% of survey respondents were course non-completers) and reflect that enrolled students are happy with the platform, the courses and the way of learning.

The main question of this research, that is trying to be answered in the paper, is understanding the process of how a traditional face to face university can create a sustainable initiative of MOOC.

## RESULTS

### First Evaluation Cycle: Need Analysis & Pilot Experience

After the summer of 2012 a year had passed since UPV had uploaded more than 2,000 educational videos to its Youtube and iTunesU channels, and more than 2,000,000 views had been registered, what demonstrated the interest of the public in this type of educational content. On the other hand, MOOCs appeared in mass media as the next educational revolution, and there was only one MOOC developed in Spanish.

The University had the content and the tools (*Polimedia* and *Docencia en Red*) to create MOOCs with little extra effort. In the 2007-2014 UPV strategic plan, there was a strategic line devoted to intensifying the use of IT in teaching (UPV, 2007), and a significant opportunity was detected regarding digital reputation and mass media marketing. Taking all this into account, a group was created to study the feasibility of establishing a MOOC platform.

After studying the literature and state of the art, this group produced an executive report which summarises what a MOOC is, what features it has, how to generate MOOCs at UPV, what the desired characteristics for a MOOC platform would be and what were the platform alternatives available at the time. This information laid the foundations for a pilot phase in the three phases below:

### Initial Platform Evaluation

When the research about MOOC platforms started there were not too many options available: integration in an existing platform (Coursera), installing Google Course Builder (GCB), adapting UPV's LMS (based in Sakai), using the other Sakai version (OAE) or installing the just launched platform Aprendo/OpenMOOC, an open source platform created for the UNED (Universidad Nacional de Educacion a Distancia in Spain) MOOC site. After a first evaluation the conclusions were:

- The visibility and reputation of being a member of Coursera made it an attractive option. Nevertheless, at that moment, they were not accepting more members
- Sakai CLE was not oriented to MOOC. It had all that was necessary, but the interface was not very well suited to MOOC courses. Scalability was a concern.
- Sakai OAE was oriented to easy course creation but lacked several components that are required for a MOOC platform. p.e. Links to Youtube videos had to be manually created as it filtered arbitrary HTML code. The scalability concerns were the same of Sakai.
- OPENMOOC/Aprendo was the MOOC Open source platform used by the Spanish National University of Distance Education UNED in their platform. The student interface was quite similar to Udacity
- Google Course Builder was a script created to host a MOOC in Google App Engine and lacked a teacher interface, but it was very straightforward and easy to understand and modify. It relied on Google's cloud, so it could scale to almost infinite without any internal IT resources and at a low price (if the traffic is low it is free) (Google, 2016)

The Google Course Builder demo was installed and tried. It worked fine, and the code was simple to understand and modify.

A pilot course with 200 students was run adapting UPV's Sakai CLE deployment. It worked, but the interface was not completely suited to the MOOC experience desired, and scalability was a concern for the future, Sakai OAE was also discarded, so the first version of Google CB was chosen and customised, adding what was found missing with code modifications.

As Google CB did not have a teacher interface, it was decided to pack all the course information in a structured flat file, which at the end was given to the teachers as an Excel spreadsheet. The course data files for Course Builder were created using Excel Visual Basic Macros with this spreadsheet, what later showed as a good choice to be able to migrate courses between different platforms easily.

### Definition of the UPV MOOC Model

To define the UPV MOOC model we enrolled as students in several courses offered by Udacity, Coursera and MITx. After studying the structure, content and assessments of the courses offered, and taking into account the experience gathered with our "Docencia en Red" programme (Caceres-Gonzalez, & Martinez-Naharro, 2011), as well as the infrastructure available, it was decided to develop preferably courses under the xMOOC structure (Daniel, 2012).

The basic features of the structure and characteristics of UPV MOOCs were also set:

- **Structure and workload:** The course had to be structured in modules with clearly independent concepts so that there is a video for each concept. Ideally, a module would correspond to a week's work and involve about 3 hours of student dedication. It was estimated that the module would contain around an hour of video content. This estimation was included as an indication for teachers, not a strict rule, so they could create smaller modules and schedule several of them in a week if they found it appropriate or create modules with more or less video content
- **Videos and written support:** Individual videos should be 1 to 12 minutes long and recorded using the Polimedia technology (teachers could incorporate other videos, but we recommended that the bulk of the course content be created using Polimedia for the speed and economy of production). A downloadable pdf document, with the presentation used in the video or some extended material, should be included for each video
- **Assessment:** After each video, one or more formative assessment questions should be included. These issues should not be part of the final course evaluation. As a standard recommendation, it was stated that at the end of each unit there should be an exam taken into account for the course final mark and a final exam should be included at the end of the course. The recommendation was that these exams were mostly composed of multiple choice questions, but it was open to adding another type of assessment if the platform supported them. Other number and distribution of exams (a midterm and a final exam, for example) were also possible.
- **Communication & Interaction:** Forums should be included to communicate with students and for them to communicate with each other, supplemented with course announcements that the students saw when accessing the course, and that, in some cases, could be sent by email
- **Access to resources:** The courses should be launched in synchronous editions. Also, to let students access the knowledge between editions, all course materials, except the final exam, should be available between editions. Therefore, one user could follow the course any time at his or her pace and take the final exam in the next edition of the course to get the digital certificate
- **Certification:** A free non-academic digital certificate in pdf format should be offered to the students that passed the course. This certificate would bear no

academic credit (instead of calling it certificate it was called credential to avoid any confusion with continuing education certificates) and should be stored in UPV web servers to be downloaded for authenticity check

### Pilot Edition

Once the platform was selected, two courses, already created using *Polimedia* format for internal staff training and continuing education, were adapted to make our two first MOOCs.

Table 2. Basic data about the First Evaluation Cycle

Cycle	Edition	Platform	Courses	Registered	Certifications
1	January 2013	Course Builder	2	1,178	160

The MOOC team was composed by the platform coordinator, who also acted as course project manager, programmer, and systems engineer and a teaching assistant, that was hired 15 hours per week to help with course review, forum support, final survey, certificate generation and day to day course operations.

The information that was going to be asked to students in pre and post course surveys and how it was going to be retrieved was decided:

- Demographic information when they registered (country, sex, age, level of education and how they knew about the course, of which the only compulsory fields were name, email and country)
- Course and platform satisfaction questions in the post-course survey. As there was no bulk email tool yet, it was decided to use the UPV's instance of LimeSurvey, an Open Source survey tool, and make it compulsory to take the survey to get the certificate, so there were only answers from people who had passed the course

The edition went smoothly, 13.6% of enrolled students passed the courses. The replies to the post-course satisfaction survey, reveal that the courses highly fulfilled the student's expectations, as they were rated it as 4.1 out of 5 in the question devoted to expectation fulfilment (Despujol, Turro, Busquets & Canero 2014). These results validated the assumptions made about the MOOC format and the feasibility and low cost- of having a MOOC platform based in Google Course Builder running in the Google Cloud.

The upvx.es domain was acquired and redirected to Google cloud platform.

### Second Evaluation Cycle: MiriadaX

In November 2012, while preparing the pilot edition, Universia (a Latin-American universities consortium led by Banco de Santander) and Telefonica launched MiriadaX, a MOOC platform for the Spanish speaking universities and a contest to select the best MOOC in Spanish (MiriadaX 2012).

The courses had to start in March 2013, so universities had to prepare them in 3 months. UPV launched a call for proposals for its teachers, and 14 courses were presented (including the 2 of the pilot edition) and prepared.

Table 3 Basic data about the Second Evaluation Cycle

Cycle	Edition	Platform	Courses	Registered	Certifications
2	February 2013	MiriadaX	14	76,459	11,805

The satisfaction survey results were good and very similar to the ones of the pilot edition, getting 4.12 out of 5 in the expectations fulfilment question of the post-course survey (Despujol, Turro, Busquets, & Canero, 2014).

This Evaluation Cycle tested the throughput and speed of the production infrastructure and the scalability of the support group and procedures set to help teachers to create the courses and to facilitate the forum and other course communications.

Using the Excel intermediate format and having a unique team to support all courses together revealed as good solutions. Everything was done with only the platform coordinator and the part-time teaching assistant, even as some scripts had to be developed to export the content to the new format and that the platform was still in a very early stage and some processes were still very cumbersome for the course teams.

It was decided to support teachers in the course creation process as much as they needed, letting them focus on the content creation process. Some teachers created themselves the excel spreadsheet with the course content; others met with the teaching assistant to create it, and others sent the list of videos, the presentations files and word documents with the questions and the team created the spreadsheet of the course.

The bulk email tool (that was lacking in Google Course Builder) revealed as an important tool to remind students about the course as some of them enrolled in the courses and then forgot about the starting date.

As we were not in charge of generating and delivering the certificates the post-course survey was sent to all students.

After finishing the edition, MiriadaX changed the economic terms to host MOOC on the platform, and UPV decided to migrate all courses again to Google Course Builder. Having all the courses in an intermediate format gave us much flexibility to migrate between platforms.

To be able to develop 14 courses in three months, the production process was designed around three core principles:

- Using for MOOCs the technology and procedures already in place
- Taking advantage of what teachers wanted to develop, reusing already produced content and creating synergies with other on-campus initiatives if possible
- Keeping things as simple as possible for the teacher

Teachers were encouraged to use Polimedia recording studios to shoot most of the video content of the courses. The main advantages of this are that they produce HD video with high-quality audio being cheaper than a regular TV studio. Additionally, they do not need lighting adjustments, and no editing is required. Consequently, the operation is very simple, so the only staff needed is an operator with very basic training (as the only tasks are placing the wireless microphone on the teacher, checking the audio levels and starting and stopping the recording),.

Moreover, taking advantage of the experience gained in the program *Docencia en Red, a Guide for the creation of MOOC* (Caceres & Martinez, 2014), at this time, a specific process for the selection and implementation of MOOC, was created:

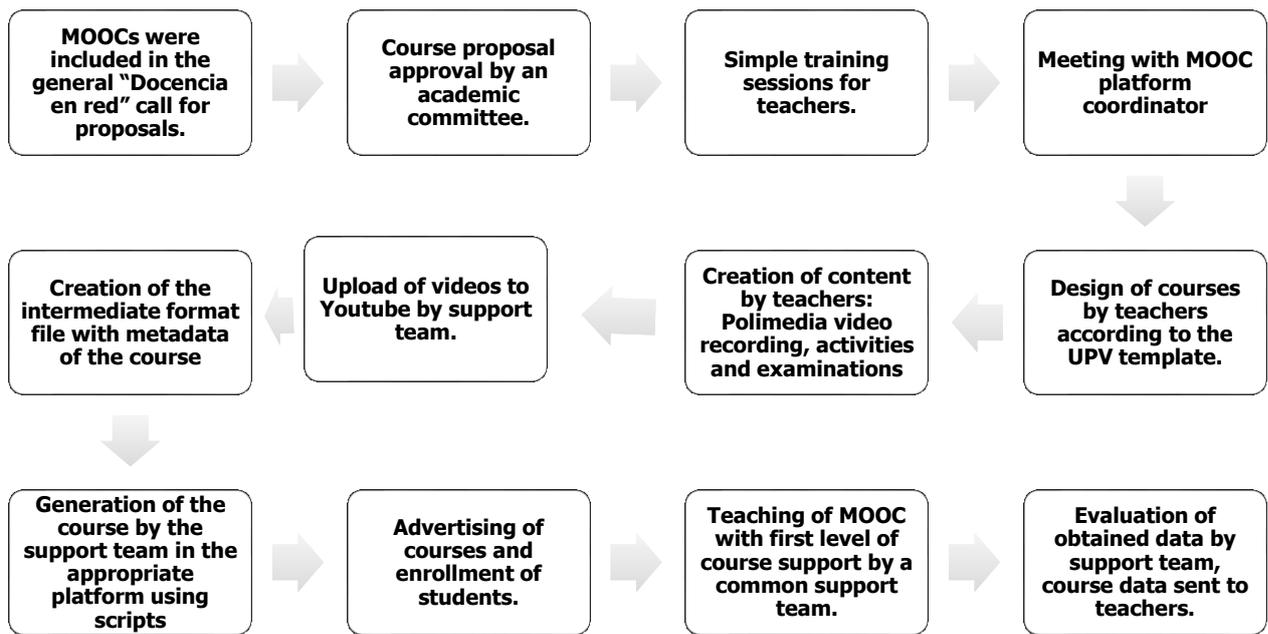


Figure 1. General Protocol of Selection & Implementation of MOOC at UPV

With this procedure, any teacher can start working in a MOOC if approved, but the university will not announce the courses until they are almost complete, so there is no problem for the institution if the teacher fails to deliver the course for any reason.

### Third Evaluation Cycle: Google Course Builder Editions

Google Course Builder was still a code designed to host an individual course, so some modifications were made to its Python code to use it independently to run each course and create a course listing page to make it look like as a common platform. Other modifications were introduced to increase its usability as well as to add new features (as sending emails to students or adding a page with the student progress in the course).

Table 4. Basic data about the Third Evaluation Cycle

Cycle	Edition	Platform	Courses	Registered	Certifications
3	July 2013	Course	10	5971	667
	October 2013	Builder	8	4112	427

In the new editions, some manual work was introduced in the process. The digital credentials in pdf had to be created using a semi-manual procedure based on a Microsoft Word Visual Basic Macro. Also, the final surveys were sent personalised (the message was different for the students that had got a credential, including a link to upload the credential to LinkedIn). This extra manual work increased the workload of teaching assistants substantially, so in September 2013 a second teaching assistant was hired.



Figure 2. An example of free certificate called "credential".

This Evaluation Cycle demonstrated that a MOOC initiative with several courses could be run smoothly using the modified code from Google Course Builder. Additionally, the cycle highlighted the downside of heavily customising an open source code, as it was impossible to migrate to the newer versions of Google Course Builder without a tremendous effort to port the customised code. The new releases included many improvements (as having several courses in the same application, event recording or administration interface) that we were not able to incorporate.

#### Fourth Evaluation Cycle: Migration to OpenedX

On June 1st, 2013 EdX open-sourced its MOOC platform and created an open source community (Fitzgerald M., 2013). The platform offered many features (including peer to peer activities), a consistent teacher interface and a better interface for students and the open source community seemed a guarantee of growth and improvement, so it was decided that it was interesting to try the Open edX platform.

There was an inconvenience, the platform installation script was prepared to be hosted on Amazon servers (that are expensive), and the installation on on-premises university servers was not well documented at that moment. After tweaking the installation scripts, the platform was installed on UPV's on-premises servers in July 2013, tested and a trial experience was scheduled. Three of the previous courses were selected for the trial experience, one of them as a massive course and the other two because they included peer to peer activities.

It was decided that upvx.es were going to have two general MOOC editions per year, one around March and other around October and a third specific edition in July with only levelling courses for people starting at the University in September. Teachers could decide if they wanted to include their courses in any edition.

Table 5. Basic data about the Fourth Evaluation Cycle

Cycle	Edition	Platform	Courses	Registered	Certifications
4	March2014	Course Builder	14	50429	6155
		Open edX	3		
	July 2014	Course Builder	8	5407	421
		Open edX			
Sept 2014	Course Builder	9	16371	2533	
	Open edX	15			

The student satisfaction results were comparable to the ones of former editions (4.2 over 5 for the upvx courses and 4.05 for the OpenEdX ones in the same post-course survey question of previous editions).

In this Evaluation Cycle, the feasibility of using OpenedX to run UPV's platform was confirmed.

After this, UPV decided to move completely into Open edX. As the configuration of the platform out of Amazon servers was not simple, and UPV wanted to be an active member of the Open edX developing community, a developer and a systems engineer were incorporated into the MOOC team at the end of 2013.

After the first Open edX trial edition, and based on the number of enrollments in all courses, several load tests were performed (Despujol, Turro, Orts, & Busquets, 2015) and a hardware configuration was chosen: three web servers, three Mongo DB servers, and two MySQL servers, that was more than enough for the traffic expected. To reduce the impact of teacher's errors two platforms were installed: a production instance with the configuration described above and a test instance where teachers develop courses.

Additionally, two new web tools were also developed to help with the production process: one to import Open edX courses from the Excel intermediate file (instead of using the Visual Basic macro), and other to move MOOC sections between courses in the same or different platforms. Therefore, teachers were able to continue developing a course in the test platform once the course was online in the production instance (Open edX only has the option to import and export entire courses, so once the course is live it is impossible to import new content without affecting the live content). Several Open edX course content components (called Xblocks) were also created (Turro & Salom 2014). The template of the platform (called the "theme") was customised to adapt it to UPV's corporate branding and to add a cookie declaration extension required by EU privacy laws.

#### **Fifth Evaluation Cycle: Joining Edx.org**

In November 2014 UPV joined edx.org as a member and this modified the overall MOOC strategy. Joining edx.org was a significant financial effort, but it was considered as an excellent opportunity to increase UPV's digital reputation and to improve relationships with some of the best universities in the world. A tenfold increase in enrollments was also expected.

UPV decided to keep upvx.es to run very local courses and to make the first run of all new courses to see how they worked before running them in edx.org. The home page of upvx.es was modified (using the "theme") to add landing pages for the courses hosted in edx.org (in a way that all the digital marketing effort of UPV could be made announcing upvx.es URLs that routed the web traffic to edx.org). 12 courses were run on upvx.es; some were the local and small courses from previous editions and others the new courses produced, with 17,421 enrollments and a success rate of 20%.

Running the courses on edx.org implied an increased workload for teaching assistants, as all videos have to be uploaded with a text transcription. Even using an own transcription and translation tool called *Translectures* (Silvestre et al., 2012), the transcriptions have to be revised and corrected. The team estimates that one minute of video requires around 3 minutes of work. Taking this into account, as well as the increase in the number of courses, two more teaching assistants (working 15 hours per week) were added to the team in March 2015.

In former upvx.es course editions we had left all course materials, except the final exam, available between editions, so that one user could follow the course any time at his or her pace and take the final exam in the next edition of the course to get the digital credential. In edX, there were two modes of running a course: instructor-paced (with a start and end date and guaranteed support from course team in course forums) and self-paced (open all

year round and without guaranteed forum support). None of them was what we had been doing exactly, so we decided to adapt our model experimenting with one course in a mixed mode.

**Table 6. Basic data about the Fifth Evaluation Cycle**

<b>Cycle</b>	<b>Edition</b>	<b>Platform</b>	<b>Courses</b>	<b>Registered</b>	<b>Certifications</b>
<b>5</b>	<b>2015</b>	<b>edX</b>	<b>30</b>	<b>198,815</b>	<b>14,858</b>
		<b>Open edX</b>	<b>12</b>	<b>17,421</b>	<b>3,491</b>

In February 2015 edX released the second Request of the High School Initiative to finance the preparation of more than 40 college readiness, high school, AP® exam preparation and introductory courses, and, of the seven courses selected in the first batch, two were awarded to UPV: a 16 weeks MOOC , and a series of 5 MOOC interrelated. These six MOOC were launched in September 2015 as self-paced courses and taught in English.

From those six courses produced, “Learn Spanish. Basic Spanish for English speakers BSP101x” was the most successful one regarding student enrollment, gathering 62,435 enrollments in the 16 weeks that it lasts. Nevertheless, its completion rate (around 2%) was much lower than the average completion rate of UPV MOOCs.

Aggregated completion rate of all self-paced MOOCs except the BSP101x was 8.34%, what is 80% of the 10.5% completion rates of the instructor-paced MOOCs of this edition.

All courses in both platforms did very well in the post-course surveys, obtaining similar results to the ones of former editions in the overall satisfaction (4.05/5 for edX and 4.1/5 for upvX). There were no substantial differences in satisfaction between instructor-paced and self-paced MOOCs.

After this Evaluation Cycle the conclusions were:

- keeping our platform to make a first run of the courses and link the courses in edx.org seems a good option to keep digital reputation and maintain independence
- edx.org enrollments for courses in Spanish were, on average, 1.2 to 1.8 range times the ones we got in upvx.es, not the tenfold increase we expected
- The course finishing rate and satisfaction surveys were similar from previous editions.
- The developed tools and procedures worked well for the new environment, and the team of one platform manager, one project/systems engineer, one platform developer, and four teaching assistants were enough to cater for 42 courses with 216,000 enrolled students and contribute to the Open edX community of developers
- Having a developer working in Open edX increases the possibility to experiment and enhance courses and positions UPV as one of the active members of the OpenedX development community
- Self-paced mode implies a 20% to 35% reduction in completion rates and the same satisfaction of students in post-course surveys. The lack of announcements along the year of the self-paced runs translates into a lower monthly enrollment rate
- A combination of one yearly instructor-led (synchronous) edition continued in self-paced mode during the rest of the year is well suited for most of our courses and gives students the chance to access the courses when they need them

### **Sixth Evaluation Cycle: Self-Paced Courses and Discontinuation of Free Certificates**

We decided to transform most courses to the mixed mode with synchronous start and self-paced continuation. Of the 36 different courses that we run on edx.org, all but three were run in this mode. On upvx.es we run in this mode four of the courses (the three biggest local courses and one of the first runs).

Table 7. Basic data about the Sixth Evaluation Cycle

Cycle	Edition	Platform	Courses	Registered	Certifications
6	2016	edX	43	246,110	13,476
		Open edX	8	9,827	950

We compared the enrollment and completion rates of the courses in synchronous mode and self-paced mode, finding that completion rates of most courses fell between 40% and 60% (for two courses it fell more than 80%, and for one course it doubled). Total enrollment numbers were similar for the two modes of running the courses, but the synchronous runs were open for the course duration (several weeks), and self-paced runs were open for the rest of the year (several months).

On January 2016 edX discontinued free certificates for all new courses to increase the amount of paid verified certificates sold, so all our courses but the ones continuing from 2015 (the six courses from High School Initiative) were offered without free certificate option. We compared the aggregated completion rate for 24 of the courses that were offered exactly with the same content than in 2015 (but without free certificate) and it fell from 10.5% to 5.6%. The aggregated verified certification rate increased from 0,7% of the enrollments to 1%, and this increase was not evenly distributed: for career oriented courses verification rates were multiplied by around 2, and for more academic courses the verification rates stayed low (around 0.5%), even descending in some cases.

As most of our courses were offered on edx.org, we also removed the free certificate for courses run on upvx.es.

After this Evaluation Cycle the conclusions were:

- The support infrastructure is enough to support the growth in the number of courses and enrollments
- Running the courses in mixed mode (first as synchronous edition and the rest of the year in self-paced mode) maximises access to courses without increasing the workload. There is a significant decrease in completion rates of self-paced mode, but the gains in content availability for students are worth it
- The extended periods of time between announcements of runs in self-paced mode impact negatively the number of enrollments. EdX should devise a way to market self-paced courses periodically
- The lack of a free recognition of achieving the course impacts negatively on the motivation for completion, and lower completion rates. There should be a way to recognise completion that does not compete with paid certificates
- This model is not self-sustainable for the University. With the revenue model of edx.org that charges only for verified certificates to students that demand them and only splits the revenues of a course after a minimum amount has been reached, and given the number of enrollments in courses in Spanish and the verification rate (between 0.2 and 3.0% of enrolled students), practically all revenue goes to the platform managers.

## CONCLUSIONS

Having a research process that tries to describe and analyse the aspects of this institutional implementation, gives us the opportunity of learning from a real context, and reflecting deeply from near the action, but with the huge numbers of an institutional initiative.

The main deliverables from each one of the Evaluation Cycles can be summarised in the following figure:

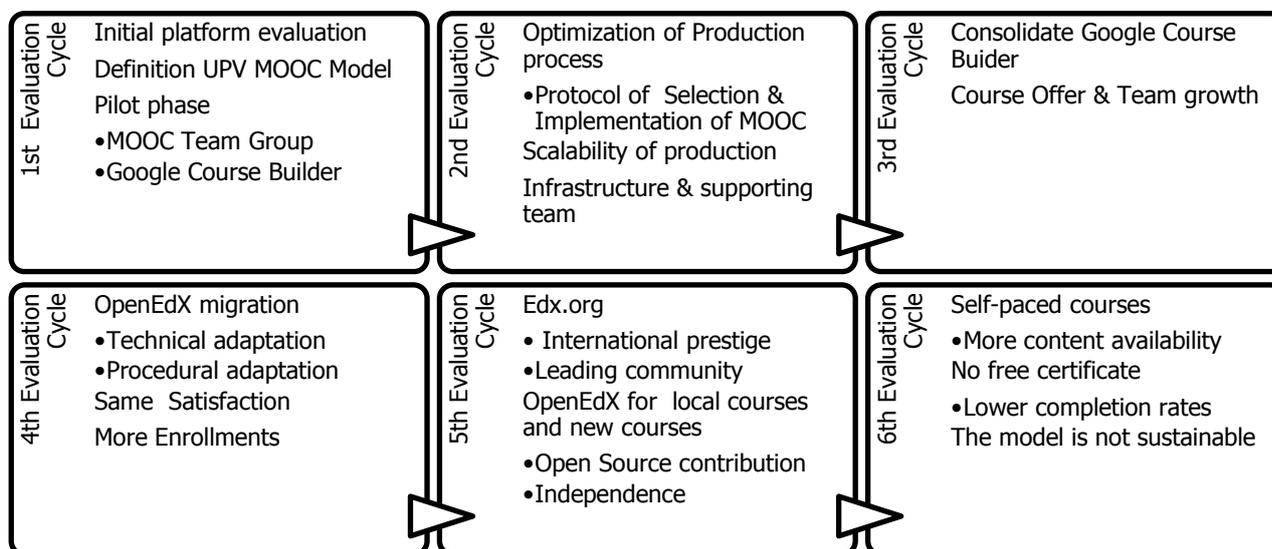


Figure 3. Main deliverables from each Evaluation Cycle

### Implications for Further Implementations

Being a member of edX is a valuable reputation tool and the opportunity to be part of a community that is setting the future of MOOCs. Nevertheless, having an own platform based on OpenedX and tools to migrate content is a good choice to maintain independence and guarantee that the initiative can continue without tying it to a specific external platform (Zancanaro, Nunez & Dominguez, 2017).

UPV has demonstrated that by having a pool of trained and motivated teachers, letting them do the courses they choose and using the right production tools and procedures, a successful MOOC initiative can be run with a marginal cost.

The uniformity of post-course survey results demonstrates that people find the three platforms (Google Course Builder, MiriadaX, and OpenedX) equally satisfactory and that they find this technology suited for learning about a wide variety of subjects that range from traditional civil law and agriculture to Android development or Optical diffraction networks for communications.

The initiative is generating an increasing stream of revenue (around 60,000 \$ in 2015 and 90,000 \$ in 2016), but it cannot be self-sustainable for UPV with the current income splitting policies of edX. EdX is working to the generation of a new model of revenue generating programmes, Micromasters (edX 2016) and UPV is going to participate in the first edition with one programme, but we believe that a change in the income splitting policy is needed for future contract renewals.

UPV has demonstrated that a full MOOC initiative can be run at low cost, but it is still uncertain if it can generate enough revenue to become self-sustainable. UPV has an ongoing pilot project to offer continuing education certificates for a fee to MOOC completers (after an online proctored exam) to explore the feasibility of financing the

courses this way. The free digital certificate has been retired (following the trend of edX.org, Coursera and the other big platforms) but we are also working in offering a low-cost way of recognising course completion.

### **Limits and Further Studies**

As it has been previously remarked, this is "just" a case study, and this is just one of the relevant aspects that must be reviewed when studying a MOOC experience.

Implementation of MOOCs in this University, and in every Higher Education Institution, constitutes a significant effort and implies many important things at an incredible variety of levels that must be taken into account. As Liyanagunawardena, Adams & Williams (2013) state and Raffaghelli, Cucchiara, & Persico (2015) and Veletsianos & Shepherdson (2016) confirm, analyzing MOOC implementation implies –or better should imply- the need of understanding multiple perspectives about how they work as well as tackling some still unsolved aspects, such as taking into account the perspectives of all stakeholders, supporting the self-regulation strategies of students to successfully survive those experiences, clarifying the ethical problems with the use of generated data and studying the ineludible pedagogical implications of the implementation of MOOCs. All of them without going in depth into the analysis of the socio-ethical and political- implications of MOOCs (Rolfe, 2015).

In this study, the UPV experience has been analysed from the technical and administrative points of view, focusing on the decision-making process and its consequences. We are aware that this is just part of the MOOC implementation experience, a much more complex ecosystem with a lot of different aspects, some of them remarked on the literature as crucial.

The team is aware that a profound pedagogical analysis is required, going beyond the organisational aspects studied here. The very nature of these courses makes it difficult to do a significant one, at least from the educational (didactic) point of view (Bates, 2015), especially if we consider the complex nature of education.

Some efforts are being carried out to understand teacher and student perspectives. In parallel to this work, an analysis of the teaching perspective of the same implementation process is being developed, including teacher workload, satisfaction, needs, and so on, as well as a students' experience study based on the post-course survey answers to gain some insights on the teacher and student experiences, as those remarked in previous works as Yousef & Wosnitza (2014), related to tools and pedagogical strategies used in the courses, El Hmoudova (2014), regarding the use of videos as base of MOOCs (that is the strategy UPV has to follow), and Abber & Miri (2014) regarding the competencies that students need to be successful in MOOCs.

Additionally, the guidelines for quality of "A guide to online learning" and Conole work have been incorporated in training provided to UPV teachers wanting to create a MOOC. We will try to validate the findings of previous research in our future papers and will apply the conclusions to the future courses of the ongoing initiative.

Finally, using the vast amount of data gathered by the platform, the initiative is trying to study how people engage with the content. Devising strategies and procedures to figure out the quality of the learning and improve it is another mostly unexplored field in which the literature is still scarce.

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