Starting MOOCs in African University: The Experience of Cadi Ayyad University, Process, Review, Recommendations, and Prospects

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ABSTRACT The increasing number of enlistees claiming their right to enroll in the programs of African Universities and the limited number of Higher Education Institutions (HEIs) were the prime reasons of students overcrowding in classes. Massive Open Online Courses (MOOCs) showed a potential to help limiting the challenges of massification in open access HEIs. As the literature review of the MOOC situation in Africa is still nascent, we will qualitatively share the experience of Cadi Ayyad University in Marrakech, Morocco (UCA) in launching a MOOC for its learners as a case study. Created in 2013, this MOOC was entitled UC@MOOC and appeared to respond to the challenges of massification in open access HEIs and the language difficulties faced by students. We will also present an overview of this project, its achievements and the quantity of knowledge delivery it accomplished. This MOOC experience attracted learners from other countries. And we have found that a shortage of MOOCs in Africa drove learners from other African francophone countries to learn from UC@MOOC. Yet a low-cost MOOC with certain limitations such as the weak ICT infrastructure available to the African public will thrive if operated using a MOOC platform and boosted its financial means.

INDEX TERMS Africa, blended learning, e-learning, MOOC, massification.

I. INTRODUCTION & LITERATURE REVIEW

The world's population is unarguably increasing on a yearly basis. In mid-2019, the global population reached 7.7 billion, having added one billion people since 2007 and two billion since 1994. With a certainty of 95%, it is expected to stand between 8.5 and 8.6 billion by 2030, between 9.4 and 10.1 billion by 2050, and between 9.4 and 12.7 billion by 2100 [1]. Albeit the yearly growth rate dropped from 2.1% in the 70s and settled in 1.1% in the last decade. And yet, this yearly change is forecast to continuous decreasing in the years to come resulting to world population growth by a slower rate. Nevertheless, the world population is not forecast to any potential decrease.

The most overcrowded continent in the world is Asia. It recorded 4.6 billion in 2019 followed by Africa with a population of 1.3 billion. What is more important is the yearly

change of both continents, in fact, Africa has the biggest yearly change of 2.52% among all continents whereas Asia recorded 0.89% in the same year [2]. At some time in the future Africa will host more population than the other continents, if the African yearly change stays high. However, these statistics indicate that the African countries have the highest population increase every year.

As a result of population increase, the African university in general, and the Moroccan University in particular suffers from the overcrowding phenomenon. According to Times Higher Education (THE) 2019 [3], Cadi Ayyad University (UCA) occupied the position of top-ranked university in Morocco. Figure 1 shows the growth of students versus the physical places provided by UCA during the past 6 years.

As the university tries to provide more chairs to students, they enroll in larger numbers that don't fit in the available places. The more convenient cure to this problem is to provide more locals for students, which could mean more institutions, or even more universities. But this option didn't happen
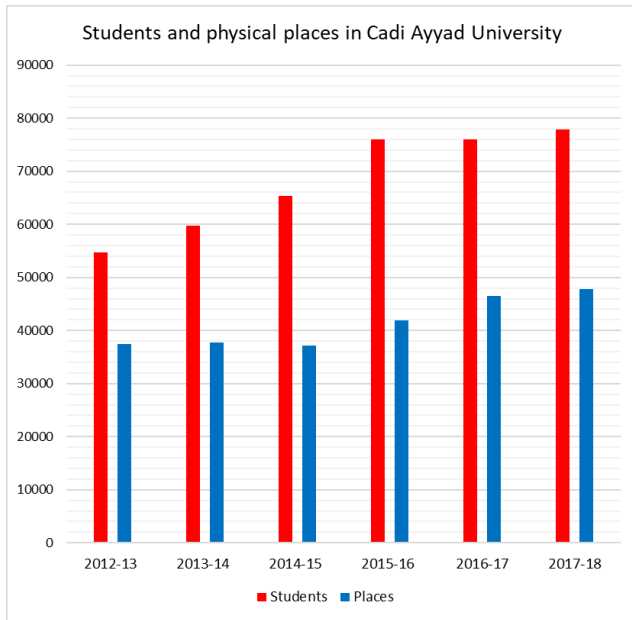
FIGURE 1. Ayyad University from 2012 to 2018-statistics from the ministry of higher education [4]–[8].

during the past 6 years in Morocco nor are the 2015-2030 strategical visions [9] to reform the educational sector implied the instauration of more universities or Higher Educational Institutions (HEIs).

Carlson [10] denied the coexistence of education quality and large numbers of students packed in small classrooms. Also, Khan & Iqbal conducted a study in a pursuit to identify the problems faced by teachers in overcrowded classrooms, they have found from the study they ran (some of results) that 100% of the teachers questioned by the study affirmed: "effective teaching was not possible in overcrowded classrooms as it caused physical, discipline, instructional and evaluation problems." And teachers were complaining of poor discipline and unhygienic condition of the classes [11]. They were weak in their instructional perspective of teaching because of overcrowding. The most evident weakness reported by all of the teachers were facing evaluation problems because of large numbers of students in one class.

A few researchers got to the problem of escalating number of students seeking admission in universities. Santally argued: "The fact that the university is currently unable to expand physically and that this is also a costly initiative, and, on the other hand, with a policy of increasing intake (distance) e-learning becomes a condition and a strategic approach for achieving the University's objective without the need to overcrowd the campus." He also mentioned the option of "opening the University for late hours might solve to some extent the problem of space constraint and that of an overcrowded campus, but this has cost and safety issues and other implications related to conditions of service of employed staff" [12]. And in response to the large population of young that need to be integrated into higher educational system over

the coming years of his country, Jamlan [13] argued: "University of Bahrain must seriously examine e-learning as a solution to classroom overcrowding (for both blended learning situations or entire programs of study)". Bello *et al.* [14] also responded to the problem of overcrowding in Nigeria's HEIs by proposing a "Synchronous Virtual learning environment will facilitate real time learning experience between lecturers and students."

The cited researchers tend to cure the problem of students' congestion in HEIs by making use of e-learning technologies. As the continuously developed technologies became more used nowadays, our modern digital century added new settings to the sector of education. E-learning for instance became a part of this sector and aids the knowledge delivery to be extended to larger audiences and facilitate the access to information. An indisputable added value. Recently, a new e-learning derivative emerged to existence, Massive Open Online Courses (MOOCs) who proposed a new and distinct model of online learning delivery, simply thanks to the advantageous employment of Internet and Communication technology (ICT).

Our paper acts on the pillar of extending the reach of the university by expanding its roots in the online environment that became easy to access by individuals in our era. The continuous development of technologies knew a constant, if not accelerating, advancement and production of many tools and devices leading individuals' lives to a more sophisticated easiness and simplicity, including ICT. And thus, by providing an additional online environment to students, our university expected some positive return on this investment. Balaji & Sekhar defined the main objective of MOOCs: is to enhance the higher education learning [15].

The word MOOC was first coined in 2008 by Cormier *et al.* [16]. It was right after when George Siemens and Stephen Downes launched the online course *Connectivism and Connective Knowledge* also known by the name CCK08. The course was presented to 25 tuition fee-paying students in Extended Education at the University of Manitoba in addition to 2,300 other students from the general public who took the online class free of charge. With a duration of 12 weeks, the course offered a full load of handy interactive learning activities and possibilities [17]. Not so long later, the New York Times announced the year 2012 to be the year of MOOCs [18]. Since then, MOOCs became famous having occupied the intention and coverage of media.

The American continent created and was the pioneer of starting the MOOCs in the world. Coursera, edX, and Udacity or the big three were fully operational by mid-2012 and delivering courses of many institutions and universities [19]–[21]. In 2013, MOOCs activity began in earnest Europe starting with the pan-European initiative OpenupEd and different (regional) MOOC platforms became available (e.g., FutureLearn, Iversity, FUN, UNEDcoma, Miríada X) [22]. In September 2013, the European Commission launched the initiative Opening Up Education to further enhance the adoption of open education in Europe [23].

The European Commission funded a number of MOOC projects. Including HOME, Higher education Online: MOOCs the European way. A European-funded project, initiated and coordinated by EADTU, which started in January 2014. The aim of HOME is to develop and strengthen an open network for European cooperation on open education, in general, and MOOCs, in particular [24].

Another project is MOONLITE; it aims to develop cross-national cooperation services to explore larger-scale uptake of MOOCs in Europe as well as creating learning and collaboration opportunities for refugees, stakeholders and MOOC providers in member states [25]. The focus of these projects, however, is limited inside Europe. In the literature review we have noticed a gap of MOOC projects in the black continent. Veletsianos et Al. agrees that the field lacks an empirical understanding of how people experience MOOCs and why they engage in particular activities in the ways that they do [26].

Even though, some researchers communicated their insights on how MOOCs could operate in Africa. Boga & McGreal introduced a MOOC Tanzanian project in which the goal was to create a MOOC IT curriculum aligned with the needs of Tanzanian private sector employment tracks. No results or usage data has been provided afterwards [27]. Oyo and Kalema discussed their strategical vision of MOOC implementation in African countries and how these courses may widen HE access to disadvantaged students in the context of limited resources in Africa [28].

Nevertheless, the MOOC projects in Africa are either absent from the arena or they exist but are not being spoken about. A Systematic Analysis and Synthesis of the Empirical MOOC Literature Published during 2013–2015 showed in the answer of one of its research questions ''How is Empirical MOOC Research Geographically Distributed?'' that Africa occupied the sixth position in a list of seven [29]. Only three relevant publications published by African scholars during the mentioned time-frame, while North America -the first in this list- contributed by 254 publications. In that capacity, in this paper we will contribute to the scientific community by an empirical MOOC research sharing the experience of UCA as an African case study in implementing a MOOC that blends in the African environment.

UCA dived in this stream and decided to carry its own MOOC project in 2013. The project name's UC@MOOC. At the start there was a choice of following other initiatives like France Université Numérique (FUN) [30], but instead UCA followed the ideology of becoming a MOOC provider rather than a follower. This choice was not coined from naught; the main reason is that UC@MOOC meant to wear a different skin than the standard MOOC projects in order to blend in the African atmosphere.

II. METHODOLOGY
A. RESEARCH OBJECTIVE & QUESTIONS
The first objective of this paper is to present the important pillars to build upon a successful MOOC project for a university suffering from students overcrowding. Or at least the pillars UCA set to build-over its MOOC experience. We enhance therefore our argument as affiliates of a MOOC provider university by the accumulated experience during the years of operation by our team.

The second objective is set to present an overview, achievements, limitations, and recommendations of UC@MOOC, the MOOC of UCA as an African initiative.

To arrive at a comprehensive coverage of these aims we drew the following research questions to be answered in this paper:

RQ1: What are the implementation phases of MOOCs?

RQ2: Will MOOCs work in African university?

B. DATA SOURCES & METHODS
To answer the first question, we will refer to our experience as creators of UC@MOOC project in building a MOOC project from scratch in an African university. Furthermore, we reinforce our arguments by the findings and recommendations of other researchers who presented similar work. By this qualitative approach we will introduce the motivations that led to building UC@MOOC, our opinions and recommendations.

As for the second question, we will refer to UC@MOOC itself as a case study to unveil whether it worked or not. The source of data we will depend on is the content analytics of the online courses. About six years of stored data regarding 80+ online courses. Content analysis is a widely used qualitative research technique and comprise three different approaches: conventional, directed and summative [31]; the conventional approach is the most suited for this research as there is a limited review of relevant literature.

This empirical research study fosters both quantitative and qualitative methods. If the two are conducted in tandem, the potential – and perhaps the likelihood – of unanticipated outcomes is multiplied [29].

III. DISCUSSION
We will discuss hereafter the main phases to consider in order to start a local MOOC strategy for the students of an African university referring to our return of experience. We will refer to the initiative UC@MOOC as a model to inspire from. This project has been operating since late 2013 leaving behind it a modest cumulated history of data and experience. And being an important initiative of UCA, we will highlight the actions it took to ensure a good accompaniment and care of the told MOOC project.

A. MOTIVATIONS
UC@MOOC simply consists of an initiative whose main goal is to produce Open Educational Resources (OERs) to the students of UCA. What incited the university to take such a decision is presented in the 4 following motivational reasons:

1) MASSIFICATION
Or students' congestion in classrooms. Like any other Moroccan University, UCA is composed of two types of institutions.

Open access and selective access institutions. Being open, the first kind of HEIs attracts more students than the others. Actually, the four open access HEIs constitute 75% of the entire UCA's enrollment while the nine selective access HEIs host 15% of enrollments during the last 7 years. In 2017-18, UCA recorded 163 students learning in 100 places [4], with a ratio of 55.6 students par staff [32]. In result, students' integration in higher education gets hard each year as these ratios grows larger.

This overcrowding phenomenon in amphitheaters/classes led to the following learning obstructions that we could note and were communicated previously [33]:

- The disturbing noise generated by students that make hearing the professor more difficult.
- Unclear and blurred sighting of the course projection on the wall and the explaining table.
- The interrupting questions to the professor during the course.

2) LANGUAGE DIFFICULTIES

It is a fact that some of the open access scientific HEIs present the knowledge to students in French. Another fact is the prerequisites of these students regarding their disciplines are all in Arabic, the Moroccan secondary level uses Arabic as the essential language. In tertiary level, the language changes brutally. Thereafter, this linguistic deviation adds another layer of complexity to students' integration in the open access HEIs.

3) DROP RATE

Due to the previously mentioned integration challenges in higher education, UCA recorded about 25% of drop rates during the last years.

4) UNIVERSITY STRATEGY

Creating a MOOC project in UCA enters within the framework of deploying ICT in education. A strategical vision started by UCA and its researchers having added 2 e-learning platforms widely used by UCA students [34], [35]. Moreover, embedding MOOCs in UCA's HEIs reinforces its position to keep sitting atop the list of highly ranked universities in Morocco.

B. INITIATION PHASE

1) PROJECT IDENTIFICATION

First of all, a framework must be created. The university should approve, support, and announce the creation of the MOOC project to run. This regulates the work within a legally authorized structure that grantees and acknowledge the rights and efforts of the project's staff and professors.

There are three major models of MOOCs to consider as a choice. George Siemens [36] defined earlier the 3 formats: xMOOC, cMOOC, and quasi-MOOC. xMOOC or Extended MOOCs are often based on university courses whereas cMOOC (Connectivism MOOCs) are more about

connecting the participants of the course including the tutors. Instead of being delivered by the tutor only, the participants of the course also work together in a local virtual community and become actors in the online course. Unlike cMOOC, the goal of xMOOC is to mimic the university courses and deliver them online as online courses, in other words; extend the face-to-face lectures by the use of MOOCs. And quasi-MOOCs provide Web-based tutorials as OER, such as those of Khan Academy [37] and MIT's OpenCourseWare (OCW) [38]. These are technically not courses. They consist of OER intended to support learning-specific tasks such as an operation in algebra.

At the start and definition of the MOOC project, however, this orientation has to be considered on the basis of the project goals. The project UC@MOOC of UCA adopted the model xMOOC.

2) TARGETED AUDIENCE

The MOOC project targets the students who need it the most, in our case: students of open access HEIs. We categorized the open access HEIs into two categories. HEIs who entirely present their learnings in French and comprise the Sciences and Polydisciplinary Faculties (FS and FPS), and HEIs that mostly present their learnings in Arabic and comprise Human Sciences and Juridical, Economic, & Social Sciences (FLSH and FSJES). The criteria we took for this split is the difficulty faced by students to survive in these institutions. The HE integration in French open access HEIs is more difficult than the others. This difficulty is also incarnated in the enrollment rates of these HEIs (figure 2).

It is clear that the enrollment of students skews heavily to the open access HEIs with Arabic content, which tends easy to assimilate because Arabic is the native language of Morocco. Furthermore, the drop rate from the scientific HEIs with French content is higher than the others. Moreover, not all the trainings of open access HEIs are open for access, only the trainings of the first year of HE itinerary. The project thereafter aimed to prioritize the support of students enrolled in the entry-trainings of French open access HEIs.

3) CONTENT TO PRODUCE

The fragile layer of students in our university judged the contents that should be produced first. Then, we prioritized the production of the courses presented in open access HEIs with French content to MOOCs. But this doesn't mean to exclude the other HE levels and other HEIs.

One of the findings of Peltier et Al.'s research was that the course content was the most important factor in determining the perceived quality of the online learning experience [39]. Kate and Ghada have found from the empirical results from a survey of 379 learners that MOOC Course Content has a significant effect on retention [40].

In case the project is an xMOOC-based format, the content to produce simply consists of the courses lectured in the halls of the university and transformed to MOOCs, also known by
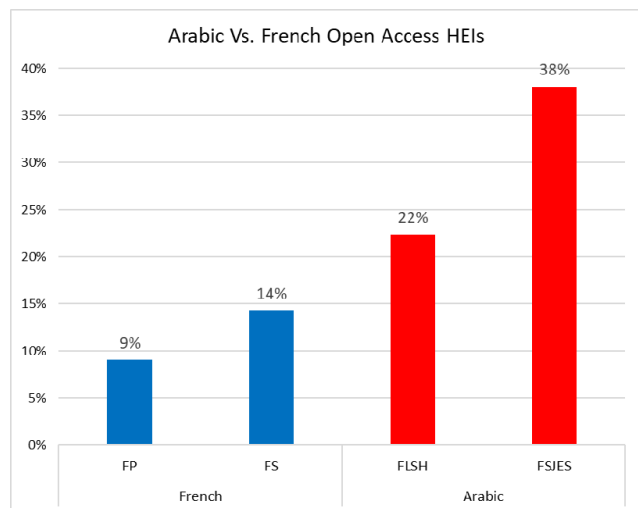
FIGURE 2. Rates of the enrolled students in Arabic vs. French open access HEIs of UCA, 2018-19-statistics from the ministry of higher education [4].

instructivism. It will be irrational to digitize the content of other organisms and present it to university students.

However, in case of cMOOC the instructor, teacher, or professor provide the course materials (MOOC content) and on the base of the instructors suggested materials, learners interact in their preferred social network to develop more of the course content. The research of Mak *et al.* [41] explores how the use of blogs and aggregated blogs, an open choice of media (including discussion forums), and encouragement for learners to exercise autonomy in creating their own learning networks was experienced by participants in a MOOC. Joksimović *et al.* [42] confirmed in their research the idea of learners were primarily focused on the course topics they were interested in, regardless of the topics suggested by the course facilitators, while the technology had a significant impact on how learners discussed certain topics. Blanco *et al.* [43] suggested an adaptive proposal to be applied in MOOC definition and development, with a special attention to cMOOC. Their experience resulted to a high completion rate over the total students that started their MOOC.

Stephen Downes [44] defined the content to create referring to his experience with George Siemens in creating the first MOOC (CCK08), which was a cMOOC: Learning in a MOOC is in the first instance a matter of learning how to select content.

In that capacity, xMOOC appeared to fill the blank for our university needs. We saw wisdom to start with xMOOC, then on the basis of its performance, degree of success and usability we can implement afterwards cMOOC the way it suits our needs.

4) PROFESSORS
Our university MOOC falls into the xMOOC pedagogy. Waard et Al. argued that xMOOCs adopt a more traditional cognitive-behaviorist lecture and knowledge dissemination approach to learning and in some sense only provide a

scalable digitized version of traditional learning where the instructor provides the content [45]. Hence, we can't argue about some other entities other than the professors of the university per se to be the knowledge creators of our MOOC.

In addition, the university professors are the ones who should present the content as it will be ultimately used by their students. Anderson [46] stated that the task of the online course designer and teacher now, therefore, is to choose, adapt, and perfect, through feedback, assessment, and reflection, educational activities that maximize the affordances of the Web. In case of cMOOC the teacher plays a lot of roles [47]: he is an amplifier, tutor, he directs and socially manages creation of meanings, he filters, models and is always present.

A MOOC initiative in an African university has a chance to be initiated by research professors of the university rather than responsible heads. This was the case of UC@MOOC initiative. At the beginning of UC@MOOC in UCA, two professors inspired from the revolution of MOOCs and decided to be part of it. Hence, the first MOOC course produced was a course they were responsible for teaching in UCA. There were those who agreed with this philosophy and others stood against it. Eventually, the detractors joined the project as they observed its success and its potential future achievements.

In the beginning, the professors of UCA volunteered to transfer their lectures to MOOC courses. Later on, the university offered commissions to professors as an encouragement action to incite the production of all its courses.

5) DIGITAL INFRASTRUCTURE
MOOCs were created in an environment rich of ICT tools and access to Internet (Americas). In 2019, Internet users, for instance, in Africa recorded a penetration rate of 36% while the rate of Americas reached 78% [48], Africa's rate is the lowest amidst the other continents. To integrate these revolutionary courses in the African university, the low Internet penetration rate should be taken into consideration to the extent of not fully relying on MOOCs in African HEIs.

Nonetheless, as another sign of showing the university's perseverance towards the success of its project, it reinforced its campus with another project allowing students to gain free Internet access in campus.

In partnership with Microsoft, UCA had launched an important project to cover its institutions in the same city, Marrakech, with wireless Internet access using the latest Wi-fi technology back at that time. The project was completed in June 2015. In addition to that, Maroc Telecom (Internet & communications provider in Morocco) and the ANRT (National Agency of Telecommunications Regulation) as project partners, helped UCA to establish an infrastructure for data centers, optical fibers, wireless access points, etc., enabling it to link all the institutions located in Marrakech. More than 180 Wi-Fi access points spread over 9 institutions and can support up to 170,000 simultaneous users. This digital infrastructure is still established and fully operational up to current date.

One phase of this project was dedicated to equipping the institutions with radio access points called TV White Space (TVWS). Students also benefit from a bundle of free services (Outlook, Office 365, OneDrive) for better collaboration and productivity.

C. PRODUCTION PHASE
1) TECHNICAL ASPECTS
The university could seek a service provider to digitize its content to MOOC courses. Or it could, and preferably, exploit its resources that assemble competent brains from all its affiliated HEIs.

UCA has set three studios of about 24 m^2 each, which contain the basic equipment listed below:

- A green screen for embedding PIP (picture-in-picture).
- Five light sources for lighting both backgrounds and teachers.
- An UHF mono-directional tie microphone (256 kb/s broadband).
- Two high-resolution flat-screen TVs (one as a TV prompter and another one for monitoring).

2) CONTENT PRODUCTION
a: MOOC DESIGN & ELEMENTS
A design to produce the MOOC course content should be identified right before digging into the production process. There are some design models to follow that have been already tested, identified, or recommended by other researchers. In a different context, the MOOC producers may draw their own design of MOOC depending on their needs and environment where they are presenting their MOOCs.

Guàrdia *et al.* [49] ran an explorative study for the purpose of having qualitative insights regarding which are the main design elements that students consider critical when getting involved in MOOC experiences. From their preliminary study, ten initial principles emerged: Competence-Based Design Approach, Learner Empowerment, Learning plan and clear orientations, Collaborative learning, Social networking, Peer assistance, Quality criteria for knowledge creation and generation, Interest groups, Assessment and peer feedback, and Media-technology-enhanced learning.

Kukharenko [50] recommended the method ADDIE (Analyzing, Designing, Developing, Implementing, Evaluating) to design a cMOOC. His recommendation was based on the accumulated experience on designing the cMOOC of his institute. Yousef at Al. identified in their study [51] 74 criteria for effective MOOC environments classified into the dimensions of pedagogy and technology, distributed into 6 categories, namely instructional design, assessment, user interface, video content, social tools and learning analytics. Veletsianos *et al.* [26] as well agreed that the design of each course also appeared to impact the ways learners consumed MOOC content.

In UCA, the biggest challenge its MOOC project is responding to is massification and its effects on students.

UC@MOOC was set then to serve the university students by providing an environment of support. The researchers we cited unanimously agreed on the presence of video content in MOOC. Therefore, we gave the content production to videos a high order of preference. Limiting the fact that lectures are only available in campus. Thereafter, for UC@MOOC videos we deployed a simple design that consists of transforming the face-to-face lectures as they are to separate videos. Each video corresponds to a course chapter. In case a course chapter is too long, it can be divided into more than one video.

b: MOOC VIDEOS
The videos in a MOOC are very important to provide. "Circuits and Electronics" (6.002x), which began in March 2012, was the first MOOC developed by edX, and was composed of video lectures, interactive problems, online laboratories, and a discussion forum. This course had been subject of a study [52] that has found that students spent the majority of their time watching videos. Chauhan and Goel [53] centralized their study on videos, explored the learner perspective and proposed a checklist on how MOOC video should be produced.

The professors of UCA recorded their lectures to videos. The total duration set to present a course before students in campus during 1 semester takes about 40 hours. After transforming the same course to recorded videos, the total duration takes less than 3 hours in general. In our case, the professors record the courses they lecture in campus by separate chapters. The duration of each chapter goes generally from 10 to 50 minutes. After recording the course, a team of experts in the same field of study review the output videos.

Many approaches and teaching configurations have been tested and used by professors during the recording process of their courses. In the studio, the professor is free to take the position that fits him the best in a specific area within the camera's reach (seated or standing) with a slideshow embedded in his background.

It is possible to record a dialogue between students and their teacher. We filmed an optical microscope for biological experiments, and tried other scenarios.

In addition, lectures are not the only courses presented to students in classes, there are practical laboratories and directed works (or tutorials). Some of the professors of our university recorded these educational resources on tablets drawings like Khan Academy style [37].

A study on MOOC edX platform ran by Guo *et al.* [54]. In their study they used data from 6.9 million video watching sessions across four courses. They measured engagement by how long students are watching each video, and whether they attempt to answer post-video assessment problems. They have found that students engage more when the professor is sitting in a desk than standing at podium. Moreover, the engagements are low when there is only slides/code in video, and they engage more when the instructor appears. As for the tutorials, the khan-style harvest more engagement

than Slide/code tutorials. More importantly, shorter videos are much more engaging.

The analytics of UC@MOOC affirmed those findings. The longer the video gets the lesser engagement it receives as shown in the third figure.

In terms of presentation, the videos should meet 3 essential characteristics: high quality, low size, and short duration that doesn't exceed 7 minutes. On edX platform, they communicated that the optimal video length is 6 minutes or shorter [55].

D. PRESENTATION PHASE

At this stage, we will get into the important considerations to make the MOOCs accessible to students.

1) VIDEO HOSTING

There are several video streaming providers online. For UC@MOOC we have chosen YouTube to host the recorded videos. Founded in 2005 by Chad Hurley, Steve Chen and Jawed Karim, YouTube is the biggest online video-sharing service. Although it is not the only video-sharing website on the Internet, YouTube's rapid rise, diverse range of content, and public prominence in the Western, English-speaking world make it useful for understanding the evolving relationships between new media technologies, the creative industries, and the politics of popular culture [56]. It is undeniable that YouTube is part of the mainstream media worldwide. In numbers YouTube recorded in 2019 over one billion users meaning almost one third of the internet, localized in 91 countries and can be accessed in 80 different languages, one billion of hours watched on a daily basis generating billions of views [57]. This website offers a variety of content categories including education. In mid-2019 YouTube was ranked number 2 in the list of top websites on the Internet [58].

YouTube is free to use and benefit from its services. It requires a Google account being a propriety of Google. Each Google account owner has the right to have a YouTube channel where he can upload unlimited videos freely. An important functionality offered by YouTube is channels analytics allowing any user to continuously visualize and even export the history of analytics for each of the videos uploaded to his channel. The YouTube analytics is provided to users for free as uploading videos and provides the same analytics service offered by the giant online analytics, Google Analytics [59]. The university located a dedicated YouTube channel to host UC@MOOC videos [60].

The university doesn't have a similar server to offer the same functionalities as YouTube does, such as embedding YouTube videos outside YouTube for free, various possibilities of video-sharing, colossal community, customer support, user analytics, etc. In spite of the existence of capable human resources in the university, thinking of carrying an online service like YouTube will definitely consume gigantic resources. It is impressive as a fact that the annual cost of running and maintaining YouTube is about \$6.35B and Google's annual revenue generated from YouTube is around \$4B [61]. When

a video attracts millions of visitors, the host or website of the video is obviously paying for the infrastructure. In 2012, the Forbes calculated an estimate of how much costs YouTube to host and stream the top visited video at that time, Gangnam Style. It had cost YouTube \$296,360 and an estimated revenue from the ads of \$348,285 [62], up to October 2012.

2) MOOC PLATFORM

The term 'MOOCs' represents open access, global, free, video-based instructional content, videos, problem sets and forums released through an online platform to high volume participants aiming to take a course or to be educated [63].

Alario Hoyos [64] proposed a Canvas of 11 issues to be contained in a MOOC. In which the platform is one issue and by its turn it contains 7 other issues. Most MOOCs (especially xMOOCs) are deployed in platforms that centralize learning contents and interactions.

A platform is mandatory to deploy and host the produced courses of the MOOC project. In the early stages of UC@MOOC the courses were deployed in a static website [65]. However, only 3% of learners used this website to access the courses. The other 97% watched the courses directly from YouTube, because the videos are left accessible to the public. Knowing there is a possibility for hosting the videos on YouTube and prohibit them from being accessed from YouTube per se. The website, however, offers a listing of the courses with a filtering by organization and disciplinary field. Yet the website is not being used by students like YouTube. This latter can be described as a less professional learning platform for education because it is not used for that purpose only [33], the top 4 content categories watched by YouTube users are comedy, music, entertainment/pop culture, and how to [61]. In result, some of the irrelevant suggestions may redirect learners to some unrelated floods. Consequently, the average viewing duration spent by learners on YouTube is less than the website, by average YouTube recorded 4.7 minutes whereas the website holds the learners by 5.2 minutes.

A platform is a must have tool to present MOOCs for it provide many MOOC-related services, as mentioned before, rendering a qualitative learning experience. We didn't run over any MOOC providers who don't deliver their courses via online MOOC platforms. George Siemens said: MOOCs are really a platform. However, an unexploited platform's resources still just an ordinary website.

IV. INSIGHTS & PROSPECTS
A. ACHIEVEMENTS

The milestones achieved during the project lifetime (6 years) are summarized in:

- +406 course-videos, making;
- +98 full courses, including;
- +10 tutorials, and;
- +12 laboratory experiences, all recording;
- +200 hours of content, equivalent to;
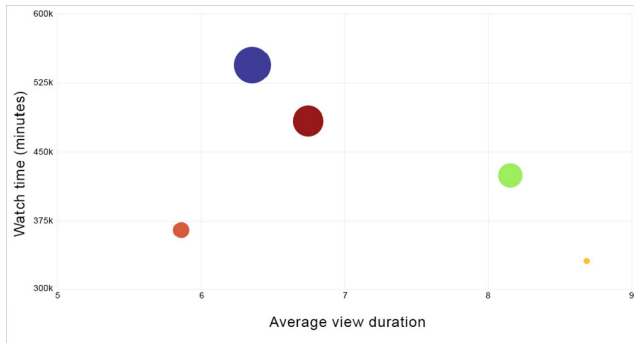- 8 days and a third of continuous playback.

FIGURE 3. Viewing time per video duration of UC@MOOC courses - Analytics of UC@MOOC's official YouTube channel.
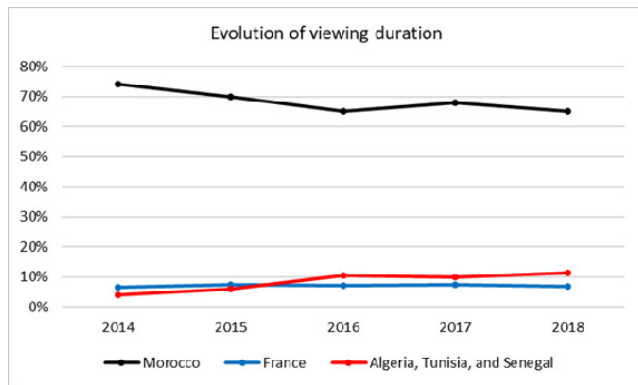

FIGURE 4. Recorded yearly viewing duration of sessions opened by learners in other countries than Morocco during the project's lifetime-analytics of UC@MOOC's official YouTube channel.

B. KNOWLEDGE DELIVERY

The online achievements of the entire produced courses during 6 years since the projects' start in November 2013 are:

- A number of views exceeding 8,433,980;
- Watch time exceeding 29,935,210 minutes, equivalent to;
- 57 years of viewing duration;
- The average viewing duration is 4min 44s;
- 129,542 shares in social media;
- Learners integrated 53,736 videos in playlists;
- The courses generated about 95k subscribers.

In the last academic year, the courses recorded about 982 years of viewing duration dressing an increase of about 20% compared to the previous year. Be that as it may the stats increases on a yearly basis since the start of UC@MOOC for two main reasons; an obvious audience growth and the continuing courses production. The courses are produced in successive series one after another with a rate of one course per month, during the months of work.

Figure 4 represents the percentage change in viewing rates in Morocco, and the total of the four other countries (Algeria, Tunisia, France and Senegal) from 2014 to 2018.

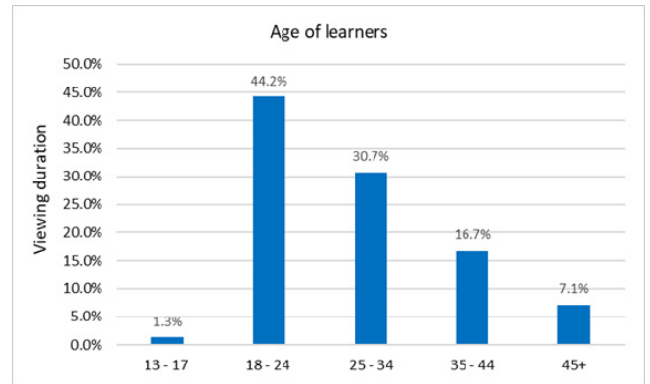This figure shows that views from Morocco slightly decreased, while they increased for all the other

FIGURE 5. Age of learners recorded during the project's lifetime-analytics of UC@MOOC's official YouTube channel.

four countries. We can interpret this increase as a worldwide opening of UC@MOOC towards an African public.

The courses of UC@MOOC were specifically created by professors of UCA to serve the students they teach in classes. No other audience was targeted by this project. The African countries whom we detected learning from our courses all have one thing in common, French, the language used to present the courses. This could signify a shortage of this kind of online knowledge provided to the francophone African learners. The other courses presented in Arabic detected learners from Morocco and other Arab countries, not all from Africa. These learners who we assume students were redirected to learn from UC@MOOC courses because they are either identical, complete their programs, or beneficial for general culture.

Figure 5 revealed the age of learners detected watching the online courses. In the graph, the age pillars of learners are similar to the age of learners enrolled in UCA and the Moroccan University in general. The analytics made by Moroccan learners are:

- A number of views exceeding 5,684,844;
- Watch time exceeding 19,751,474 minutes, equivalent to;
- 37 years and 7 months of viewing duration;
- The average viewing duration is 4min 21s;
- 17,068 shares in social media;
- Learners integrated 53,736 videos in playlists;
- The courses generated about 3,744 subscribers.

These stats are satisfying in terms of courses usability and they mean that these courses eventually did what they were created for.

C. APPLICATION OF MOOCS IN AFRICA

The insights of UC@MOOC we communicated so far show the reach of the project's online learning delivery. Not limited to the Moroccan audience only, which was the main target, but the courses lured learners from other countries. These learners came from specific countries sharing a similar background to the Moroccan HE. The main encouraging magnet is the language, without it learners wouldn't follow the courses

even if they catch their interest for the simple reason: they couldn't understand the materials if they were presented in an incomprehensible language. The courses presented in French recorded learnings from Francophone community whereas the others cast in Arabic recorded learners from the same or another Arabic community.

However, will MOOCs work in African university? Even though the ICT infrastructure in Africa is not as strong as that of the developed countries, there is at some extent a capability of online learning by the African learner, referring to the case of UC@MOOC.

Based on the experience UC@MOOC and following the quantity of achieved online learning delivery, it is straightforward that this MOOC modal has proven its usability in the Moroccan University, an African entity. For sure MOOCs are working in the Moroccan university and they will certainly continue, unless other or better alternatives appear.

The recent analytics of the project courses (figure 4) exhibited a rate of sessions opened by outside learners of about 18%. Whereas more than 10% are initiated by other learners from Africa, excluding Morocco. This latter is not the best African country in HE. According to the World University Rankings of 2019 reported by THE, other African universities outranked the universities of Morocco, such as the University of Cape Town in South Africa that was ranked 156 in a list of 1258 university and the top university in Africa. The top-ranked university in Morocco (UCA) [3] was 801- in this list.

In this direction, if a University like Cape Town initiated a similar project, its results are likely to be around these of UC@MOOC or better, although there are other factors to be calculated in the equation (targeted learners, nature of courses, language, etc.).

It is important to draw a line under the fact that UC@MOOC is a low-cost project for which minimal financial and human resources were allotted. Its potential and reach could have been larger if it was fed generously. As the ICT and Internet penetration in African society increases on a yearly basis, it is logical that the capability of African learners to have a wider access to Internet with the proper ICT tools will also increase.

Therefore, we expect that MOOCs have their place in the African university. But certain limits are expected. A higher probability that the application of MOOCs in Africa will start as a supporting mean for university students, giving the example of UC@MOOC.

V. LIMITATIONS & RECOMMENDATIONS
A. FINANCIAL CAPABILITIES
The project UC@MOOC was designed as a low-cost model, and it cost UCA minimal human and financial resources.

B. UC@MOOC PLATFORM
To consider an online course a MOOC it must apply to a certain criteria [66], [67]:

- Scheduled by a start and ending date.

- The course delivery, learnings and all interactions (student-student, moderator-student …) operates 100 per cent online.
- Open to anyone.
- Unlimited learners' enrollment without any admission requirements.

The courses of UC@MOOC are open to anyone for free open access requiring no registration from learners. The courses in face-to-face start and end at the launching and finish of each academic semester, but their online versions are kept open throughout the year. In result, this project is mostly conforming with the previously stated nomenclature of MOOCs even if its online delivery isn't granted by a MOOC platform.

Nonetheless, other researchers as mentioned above including G. Siemens [63], [64] all insist on a platform for the MOOC delivery. A MOOC platform should be installed to deliver the courses of UC@MOOC. In addition, a MOOC platform grants the ability to provide a more tailored learner experience via the online analytics which is a strong pillar in research. This paper [68] showed how MOOC data can be analyzed in qualitatively different ways to address various issues of importance: attrition/retention, distribution of students' time amongst resources, fractional use of those resources, and use of resources during problem solving.

In response to this limitation, a MOOC platform based on edX [69] was created for the project UC@MOOC. It was created to conduct research on MOOCs at UCA. In which we hosted all the project courses and only one course was transformed to an xMOOC format [70]. The other courses are all about videos only. This platform is not the official project's platform for the time being. It has been used for research purposes only.

One man's tool is another man's weapon. If the platform is to be used for the project, its resources need to be exploited properly. The results of Fidalgo-Blanco et Al. suggest that MOOC completion rate relates more to methodology than to the platform, theme or profile of enrolled participants [71]. Following the line of reasoning, as cited by [72], the architectural design of a virtual campus should manifest the pedagogy–related features of a given university in order to encourage a desired educational approach among students and staff.

C. COURSES' RESOURCES
The majority of the courses produced by UC@MOOC comprise videos only. A MOOC with only videos doesn't exclude it from this domain. But as stated by many researchers [41], [42], [49], [52], [63], not only the videos that shape the MOOC, other knowledge resources should be provided as online assessments that are only possible via a MOOC platform.

D. RESEARCH
The MOOC project of UCA has not been subject of research until recently. As the MOOC domain has a nascent literature

review, scientific research needs to be conducted especially in the fields that haven't been reached by these courses yet, or at least in the developing countries like in Africa. One of the advices of Doherty *et al.* [73] in carrying out a MOOC project, research on MOOCs should be conducted to understand its challenges.

E. WEAK ICT INFRASTRUCTURE

It is indeed promising what the project has achieved in knowledge delivery. But the ICT infrastructure available for students is considered a barrier towards the success of such a project. Meanwhile, the Internet penetration in Africa increases each year and the ICT tools become easy to acquire as time passes. Which makes this a limitation for the time being only. And we expect UC@MOOC to flourish in the future.

Altogether and inspiring from UC@MOOC experience, the MOOCs are undoubtedly forecast to integrate the HE in African countries. It is a duty of researchers to take the initiative and implement MOOCs in African HEIs.

F. CERTIFICATES

MOOCs are known to deliver certificates for completion as an optional service, not obligatory yet incentive. All the achievements of UC@MOOC were made by learners following their own will to seek knowledge only without any return from the project. Therefore, was it a completion-certifier project, its online learning delivery, achievements, and reached learners would definitely be larger.

VI. CONCLUSION

Starting a MOOC project in an African university is faced by many challenges. The simplest is the weak ICT and Internet penetration in African countries in general. But the massification phenomenon is the most aggressive challenge that motivated our university to offer its materials online.

This paper must be seen as a guide to inspire from in launching a MOOC in a university overtaken by massification. The better model to adopt is xMOOC because its traditional mode of delivery corroborates with the need of students who have issues to access the courses of their professors in classes. This audience of university students must be prioritized by the MOOC project. Being an xMOOC it will provide to these students an online copy of the face-to-face courses, a mixture of courses, labs, and tutorials. Providing MOOCs is a simple cure to the hard integration challenges faced by this audience in HEIs. As an owner of its MOOC, the university holds the responsibility of ensuring a fair accompaniment of its project. Covering its HEIs with Internet is a simple example.

Moreover, the Moroccan ministry of HE inaugurated a national strategy based on MOOCs in 2019. Holding the name MUN (Maroc Université Numérique) [74] inspired from FUN [30] that was initiated by France in 2013. Other two testimonies on the importance and potential of MOOCs in making knowledge available to everyone.

Being an incomplete MOOC in its form, UC@MOOC showed a shortage and need of MOOCs in Africa. Other audiences than the Moroccan students learned from this project courses. We conclude that MOOCs are favorable in the HE environments that suffer from the overcrowding of students.

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