Massive Open Online Courses : A New Dawn for Higher Education?

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Abstract— **Accessibility has emerged as a fundamental characteristic in the approach and exertion of higher education recently as has its capability to introduce creativity in teaching and learning practices. The emergence of the Internet along with the potentials it offers to allow the publication and distribution of resources, the astonishing evolution in online educational content, and the introduction of open content license for such content have all integrated to generate new means of elaborating and delivering teaching resources and techniques. Recently, a new concept, MOOC (Massive Open Online Course) presented itself as a novel way to exploit and share teaching expertise and learning resources through a global online presence taking advantage of the possibilities that cloud computing offers. In this paper, first, we will present an overview of different known MOOCs platforms, then we will focus on Harvard and MIT initiative, edX, the MOOC platform that offers widened access to quality educational materials and courses supported by legendary professors and hosted by prestigious universities participating in the edX program such as Harvard, MIT, and Berkeley at California. Literally, we will describe a learning experience of a Software Engineering for Software as a Service course through edX platform.**

MOOC; higher education; cloud computing; edX.

I. INTRODUCTION

Novel class of learning has emerged in regard to the recent innovative technologies and the high-priced education costs. This recent innovative technologies have placed diverse, mutual, connected, remote learning on a higher rank of utility and appeal. These technologies incorporate smart phones, high speed Internet, Wi-Fi, and cloud computing, which have given the opportunity for a wider learning space and a more connected and interactive learning environment [1]. Using a simple device connected to the Internet, anyone, anywhere, anytime, can produce and diffuse knowledge, a fact that contradicts the conventional classroom arrangement where a teacher transmits knowledge to a passive student in an allocated classroom.

In 2012, new endeavors such as edX, Coursera and Udacity introduced more than 200 online costless college courses made accessible to any person connected to the Internet [2]. These courses are called MOOCs, Massive Open Online Courses, and they exploit web technologies to offer free online education to as many persons as possible. In May 2012, Harvard and MIT inaugurated the non-profit edX and, since then, The University of Texas and the University of California Berkeley have joined them [2]. The for-profit MOOC platform, Courseara, was initiated after the joint of 33 colleges and it exposes contributions from Princeton, Stanford, Penn, Duke, Ohio State, the University of Virginia and other colleges. Another for-profit MOOC platform, Udacity, was co-created by Stanford professor Sebastian Thrun, David Stavens, and Mike Sokolsky [2].

The rest of the article is organized as follows. First, we will present an overview of different known MOOCs platforms, then we will focus on Harvard and MIT initiative, edX, the MOOC platform that offers widened access to quality educational materials and courses supported by legendary professors and hosted by prestigious universities Eventually, we will describe a learning experience of a Software Engineering for Software as a Service course through edX platform.

II. MOOCS: MASSIVE OPEN ONLINE COURSES

The progress of both information technologies and the education context run in a parallel course. In particular, educational exchange means knew an exponential growth around the end of the 20th century. By the 21st century, these means became more sophisticated and innovative [3]. Basically, Internet-based learning stood in lieu of any

educational transfer means used antecedently. Lately, mobile technologies joined the learning environment virtualizing classrooms and education sources. In this virtual numeric learning environment, the responsibility of the instructor has become an administrative one, and the educative material is simply advocated based on a general interesting context. Moreover, the number of students that an instructor can successfully manage, the main instructor's capacity indicator, is no more an issue of significance. The use of sophisticated information technologies for information transfer and student activities evaluation destroys the obstacles of human competences' limitedness, and makes the concept of unlimited class sizes achievable [3].

Massive Open Online Courses were perceived by Stephen Downes, and George Siemens, as an approach to address information excess, react to students' inquiries for pertinent knowledge, integrate IT progress, and decrease education's fee [4]. The intended objectives of this suggested online educational model was to gather unlimited number of learners, course materials, and information transfer means. The proposed model would not be subject to any limitations except for technological capabilities and their related costs.

In 2008, the first MOOC class was launched. The class incorporated 2300 participants and was funded by Manitoba University, Alberta, Canada. Siemens and Downes advocated reexamining the proposed model, as it reflected a strongly supervised learning environment. They believed that the model should allow perspective learners to personalize their learning processes [2]. The new model considered educational materials as clusters of topics, from which learners were able to choose materials in agreement with their own wishes and ambitions. Fundamentally, materials allowed learners to promote individual viewpoints about information. Communicating with other learners and apprehending their learning experiences belong to the customization process. Figure 1 reflects the evolvement of MOOCs platforms.
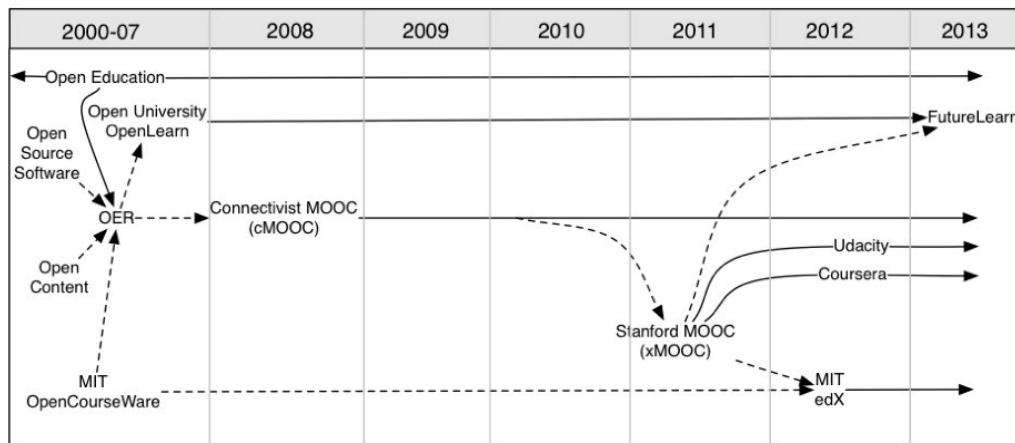

Figure 1. MOOCs Timeline.

A MOOC system is consisted of five main elements [2]: Instructors, learners, topic, material, and context.

- Instructors: Simplify the learning process via making available appropriate material, initiate communication between learners, and manage evaluations with regards to intended learning outcomes.

- Learners: Anyone who wants to learn about the topic. Learners could be pursuing a formal degree or not. Learners who are simply interested with no precise objective are as well authorized to enroll.

- Topic: The topic is discovered through the learner, instructor, material, and context. It is introduced all over the learning system and not just residing in a warehouse. It is adequately limited to allow emphasis but adequately wide to provide extensive coverage.

- Material: Resides in diverse sites and is of multiple types and is accessed via various technological solutions.

- Context: Represents the different actors forming a learning environment. This can incorporate online social networks, IT solutions, conventional information origins, diverse kinds of information transfer schemes, communication systems, intended learning outcomes, and the group constituting every course offering.

In MOOC platforms, information provided to learners is considered starting points from which they can jump off and pursue an information trajectory in accordance with his/her concerns. Accordingly, learners are able to communicate with one another through forums set up to help them discover common fields, find help and extra

materials, and constitute particular groups so as to investigate shared topics more thoroughly. Indeed, the objective is to conceive a community of learners whereby everyone contributes by information and perspectives besides those provided by the instructor, and to get in an exploration ride. A course offered through a MOOC platform can be subject to a predefined time schedule or not, and can incorporate videos of different sources, links to websites and other online resources, some extra study materials, support forums, and all this can be accessed through multiple devices connected to the internet over wired, wireless, or cellular connections [4]. The learner chooses through which mean information in transferred may it be class forums, online social networks, or any other virtual domain. The strongest feature of a MOOC platform is elasticity [2].

III. MOOCs Platforms Overview

Throughout the last few years, investigating MOOCs has been raising and particularly within a limited number of distinguished non-profit universities. The prevalent pioneers driving this novel learning environment are Massachusetts Institute of Technology, Harvard University, Stanford University, University of Illinois, University of Michigan, University of California-Berkeley, Georgia Institute of Technology, Udacity, Udemy, and Coursera [5]. These endeavors are targeting individuals of all ages and expertise arguing that learners are looking for something that is more significant to their lives and learning objectives.

EdX is a non-profit MOOCs platform established by Massachusetts Institute of Technology and Harvard University through a joint contribution of $60 million by the two colleges to finance the project [5]. Presently, the platform offers few courses such as chemistry, computer science, electronics and public health, but it is projected that the number will increase to reach between 20 and 30 course offerings by 2013. The aforementioned courses will not be offered for credit. However, learners who certify a certain level of subject proficiency will be able to obtain a certificate of completion in exchange of a symbolic fee.

Coursera is a for-profit business. The initial investment amounted to $22million contributed by project entrepreneurs, involving New Enterprise Associates and Kleiner, Perkins, Caufield & Byers Education [5]. They have a partnership with four universities, notably Stanford University, Princeton University, Michigan University, and Pennsylvania University. Current courses offered by Coursera account for 197 courses in 18 topics, covering diverse field like computer science, mathematics, business, humanities, social science, medicine, engineering and education. In exchange of an extra fee, certain aforementioned universities accord credit for their classes offered through Coursera.

Udacity is another for-profit business. It was co-founded by Sebastian Thrun, David Stavens and Mike Sokolsky. The initial investment amounted to $21.1 million from contributed by project entrepreneurs, including Charles River Ventures and Andreessen Horowitz [5]. Udacity currently accounts for 18 online course offerings and covering various fields like computer science, mathematics, general sciences, programming and entrepreneurship. Upon course completion, learners obtain a certificate of completion specifying their accomplishment's status. The corresponding instructors, at no cost, sign the certificates.

Insight Venture Partners, Lightbank, MHS Capital, 500 start-ups and other investors founded Udemy in 2010 [5]. The initial investment amounted to $16 million. Udemy offers a learning platform which objective is to enable basically anybody to both teach and learn through online video classes. Currently, Udemy provides more than 5000 course offerings, 30 percent of which are prices between $20 and $200 per course offering.

In 2009, the Hewlett Foundation and the Shuttleworth Foundation founded P2Pu. P2PU does not provide all of the characteristics of a MOOC platform. Essentially, P2PU allows anybody who intends to learn or teach online to do so by making use of a community focused methodology. Indeed, courses' quality evaluation is done through community criticisms and feedback [5]. Currently, more that fifty course offerings are available at P2PU and neither fees nor credits are applied.

Khan Academy is also a notorious not-for-profit educational organization with noteworthy sponsorship from the Foundation of Bill and Melinda Gates as well as Google [5]. In 2008, Salman Kahn launched The Khan Academy. The platform accounts for more than 3600 video lectures covering various topics and provides programmed exercises and permanent evaluation.

While edX provide just Harvard and MIT's courses, Coursera emphasizes on offering a platform that whichever university will be able to make use of and Udacity provides its curriculum solely with specific fields. Further online learning proposals, like Udemy, P2PU and Khan Academy offer prospects for everybody to study with specialists, colleagues and communities from non-traditional colleges [5]. Figure 2 reveals the main dissimilarities between the initiatives described.

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Initiatives	For profit	Free to access	Certification fee	Institutional credits
eDX	x	✓	✓	x
Coursera	✓	✓	✓	x ✓
Udacity	✓	✓	✓	x ✓
Udemy	✓	x ✓	✓	x ✓
P2PU	x	✓	x	x

Figure 2. Comparison of MOOCs platforms.

IV. HARVARD AND MIT INITIATIVE: EDX

EdX is not-for-profit organization founded by MIT and Harvard University. The aim of edX is to provide an online free learning platform to offer educational courses [6]. Through course materials and laboratory sessions, edX assists Harvard and MIT professors in performing research concerning learning as well as teaching. Meanwhile, edX communicates with learners around the globe via offering online learning materials [6]. Initially, edX offered MIT and Harvard courses, but with the course of time other universities joined the venture and started to offer their course through the platform.

Essentially, EdX is a free online learning platform. Accordingly, it features some key characteristics: learners can start and finish the program according to their convenience, learners are able to communicate and collaborate through online discussion groups and wikis, and learners' accomplishment is evaluated continuously [7]. Additionally, edX is considered as a crucial source from which data is collected and analyzed to better comprehend the learning process. Beyond, edX enables learners to learn in an interactive manner, overpassing the conventional online learning whereby passive video contents are provided. Besides, the platform is open-source allowing other institutions to adapt it to offer their own courses.

The main goal of edX is to   enhance education both internally and externally [8]. From one hand, edX shall enable us, through data gathering and analysis, to better assimilate how students learn and how IT can be employed to ameliorate teaching and learning processes. On the other hand, edX provides a broad access to education worldwide. Fundamentally, edX is available to anyone around the globe (with an Internet connection), anywhere, anytime.

Over the course of time, edX intends to appeal other institutions and join MIT and Harvard in offering courses. Grouping educational materials from many institutions and universities shall allow learners all over the world to reach the course materials offered by every contributing institution from one platform [5].

V. THE EXPERIENCE OF THE SAAS COURSE THROUGH EDX

The SaaS course offered through edX platform aims at providing the basics for engineering software by making use of extremely constructive active methods to develop Software as a Service (SaaS) using Ruby on Rails. By the end of the course, learners will be able to point out the different difficulties and advantages of SaaS against rigid software. Essentially, the goal is to enable the learners to comprehend essential programming techniques to design, develop, test, and deploy public cloud of a basic SaaS application. In this course, students use the best systems that implement modern development techniques. The class consists of lecture videos some of which might integrate quizzes. Each week, learners have to complete a programming assignment independently. At the end of the course, each learner who manages to effectively finish each programming project and get a passing grade will receive a certificate form Berkely [6].

VI. CONCLUSION

Recently, higher education requires new fundamental characteristics, mainly accessibility and creativity. Undeniably, new means of developing and delivering teaching resources and techniques have emerged; this is mainly due to the astonishing progress in Information technologies. Lately, a new concept, MOOC (Massive Open Online Course) was introduced as an innovative approach to share teaching expertise and learning resources through a global online attendance. In this paper, we first introduced the MOOC concept and then presented an overview of different known MOOCs platforms. Afterwards, we focused on Harvard and MIT initiative, edX. Finally, we described a learning experience of a Software Engineering for Software as a Service course offered through edX platform.

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