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## Conference Paper

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# **A Review of Massive Open Online Courses: MOOC's Approach to Bridge the Digital Divide**

Jisoo Lee, Ahreum Hong, Junseok Hwang †

## **Abstract**

This paper reviews the on-going research trends of the ongoing researches conducted in various disciplines on Massive Open Online Course, or MOOC. The background overview on MOOC is organized descriptively and chronologically from the materials collected from the late 2000s to the current days. The paper then focuses on the usage of MOOC as an e-Learning open education platform in the context that it deals with the problems related to the digital divide. MOOC allows many users to participate with no cost, without spatial or temporal limitations, in online courses via the web. Thus institutes and organizations are currently showing interest in utilizing MOOC. On the contrary, there rise concerns that MOOC needs technology infrastructure and for the learner to have digital skills and language fluency. Therefore, the doubts on the linkage between MOOC and the possible solutions for digital divide arise. In this sense of MOOC having both the positive and negative influence on providing solutions for bridging the digital gap, this paper next tries to identify the current research trends of MOOC, and narrow down to what recent publications on MOOC are focused. Finally, future research proposal and the methodology is presented to pull and guide the direction of relevant studies. We propose more in-depth case studies, along with AHP method and Delphi analysis on experts' survey as future research in need.

## **Contents**

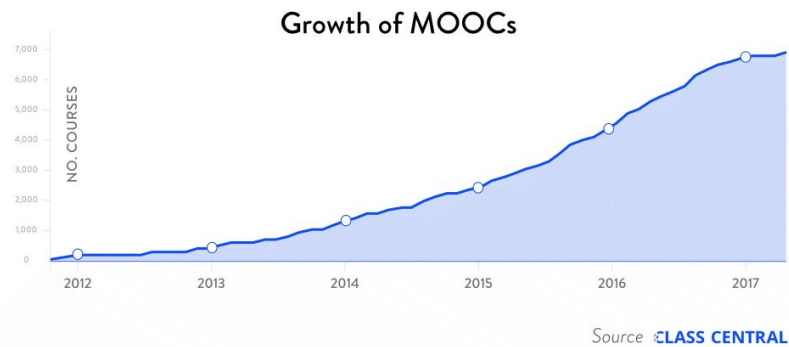
1. Introduction
2. Research Materials and Methods
3. Literature Overview
4. Analysis of Research Trends
5. Conclusion
6. References

# 1. Introduction

With the help of the development of internet technology and the diffusion of IT infrastructure, a newly formed type of e-Learning platform draws worldwide attention in that it makes use of IT resources to help facilitate students and faculty members in education. MOOC, terminology first coined in 2008 by Dave Cormier and Bryan Alexander, stands for massive open online courses. (Daniel J., 2012) From the meaning, it generally means that MOOCs target personnel of interest on a massive scale; it is open to anyone; everyone can view the resource online; and last, it deals with educational materials to form a course available to learners. (McAuley et al., 2010)

This type of e-Learning system shows a considerable amount of difference than the traditional classroom style education because it enables learners to overcome the spatial, temporal and environmental limits. For example, MOOCs are available online at any time, regardless of the daily life hours, which implies that students can get access to all the course materials other than the official school hours. Not only can the learner retrieve readings, texts, and video contents, but also live forum based interaction from other students and instructors around the globe is made possible thanks to the assistance of the network, even solving the spatial limitation issue.

Therefore, many widely predicted that the number of organizations which include the adoption of MOOC applied education framework will increase in the future. Organizations that include both private and public sectors have plans to facilitate MOOC for the improvement of intellectual skills of their employees. In a broader context, a report from Class Central (2016), a MOOC aggregating enterprise which expertise is stacking statistics related to MOOC, shows some number increase behind MOOC. The report indicates that the number of students who have experience in enrollment of MOOC has increased up to 58 million worldwide, distributed among more than 7,000 courses, with more than 700 participating universities.



**Figure 1 Growth of MOOC (Class Central, 2016)**

The year 2012, designated as the year of MOOC (New York Times, 2012). However, the popularity growth of MOOC has hit the ceiling, resulting in many questions over the limitations on MOOC. Once praised as “the low-cost substitute of higher education,” the disappointing drop-out rates show that there were some problems with the participation of the platform. The phenomenon implied that the underlying pedagogy inside the e-Learning platform faces issues with the performance of learning. Even more, the view of MOOC as being open and free turned out to be having problems as well. Some researchers point out that the real application of the educational platform requires a certain level of IT infrastructure for the users. Also, the leading enterprises of MOOC are diversifying their business models because the revenue from providing free educational contents itself is not sustainable. Instructor and the platform provider had to gather a considerable amount of initial fund to get the courses going. The concept of open and free educational resources was questioned fundamentally, whether MOOC is both sustainable and effective.

The discussion on the future of MOOC is still on-going. With new participants steadily experiencing in the next-generation education platform, researchers’ expectation varies from MOOC’s dominance over the traditional tertiary education to slow degradation from the controversy of performance. MOOCs are still in the development process, as various schemes of business model come out and diverge. Therefore, a clear distinction between the hype and the real usage and empirical results is needed to carve out the reality of MOOC carefully. Reasons for this research is justified in those manners.

## **2. Research Materials and Methods**

The body of this paper consists of mainly two parts; the former which represents the overview of “until-now” publications on MOOC, and the latter which contains the controversial issues of MOOC’s approach on bridging the digital divide. Numerous cases of MOOC applications are mentioned in the above overview, whereas the categorization and the summary, especially issues on the digital divide made within the following content.

The collection of previous literature was made purely from publications and bibliographic searches. The representing keywords used to find these texts were, e.g., “MOOC,” “e-Learning,” “Open Educational Resources,” “Blended Learning,” and some secondary keywords such as “Adaptive,” “Empirical,” to capture the specific disciplinary of research papers.

Many scholars have made previous overview researches on MOOC. Rha (2015) published a compilation of reports written by experts in educational institutions comprising professors, senior researchers, directors of the educational initiative, to form an overview on MOOCs. Min (2016) categorized the recent issues of MOOC into ten dimensions, and makes case study level approach; the aspects are innovation, effectiveness, economics, democracy, practicality, disruptiveness, extensiveness, variety, sustainability, and limitation. In the context of the recent systematic reviews, Zhu et al. (2018) collected data on empirical studies from Scopus and categorizes them in their research focus. This paper is also an overview, but conducts a selection of the research topics, describes the details in each section, and makes an implication on the MOOC’s contribution to bridging the digital divide.

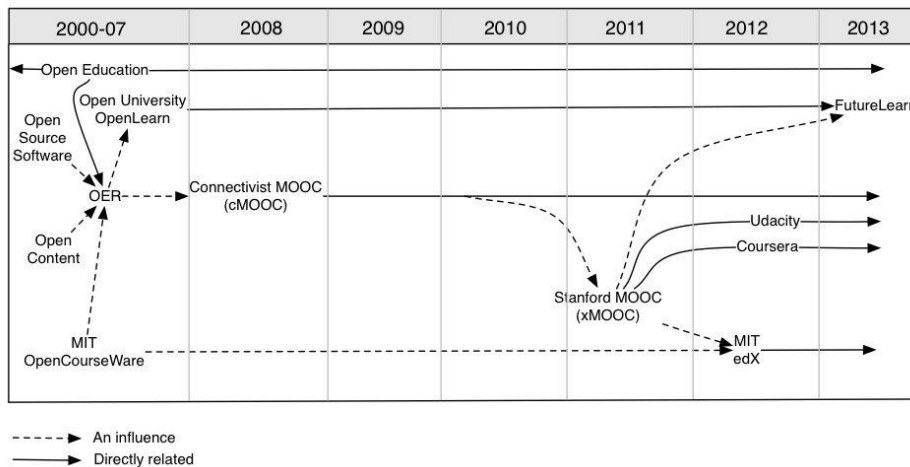
### **3. Literature Overview**

In this section, we depict the development of MOOC in chronological order. This way of description is to ensure the readers' understanding of MOOC's development takes place in organizing the logical flow of what happened. From the concept of Connectivism and Open Educational Resources, MOOC's trajectory starts from its emergence and leads to its branching of cMOOC, xMOOC. The section later illustrates the current diversion of business models, as different cases and models of educational platform diverge.

#### **The Emergence of the First MOOC**

The introduction of MOOC originated from an experimental design, which had the purpose of testing out whether the close connection between pupils and teachers created a community of education, resulting in enhanced performance of learning. Proof from empirical studies was required to make people believe that online teaching, learning under virtual reality was also possible. This concept of E-learning and distance education had a long history, since the days of television and videotapes. However, apart from the traditional media, the new online platform allows people to interact in a bidirectional way; instructors may answer questions may through forums, and the contents are available in various types of devices, providing real-time participation to learners.

With the help of the development of internet technology, increased network infrastructure allowed students to get access to digital resources. The primary way of transferring knowledge gradually shifted from libraries to the web. Under these circumstances, some online platforms or websites that were designed to service materials began their pioneering experiment for interactivity. Meanwhile, OER or Open Educational Resources was the terminology used in the 2002 UNESCO Forum, focusing on the movement providing education for all. (UNESCO, 2002) MIT OpenCourseWare was one of the services which had both the above concepts installed. This type of MOOC is later to be recalled as cMOOC, or connectivist MOOC. Conceptually, people began to utilize cMOOC in supplementary material for university classrooms, where people can view class materials, post questions and receive answers by means of self-activity.



**Figure 2 The History of MOOC (Yuan & Powell, 2013)**

### Branching of MOOC

This brings us to the next question; how did MOOC get so popular? As cMOOC tends to focus on the interaction between the members of the virtual classroom, xMOOC gives attention to online lectures, better content composition, and course syllabus. The idea of design was mainly to create a virtual classroom environment with students enrolling these courses and take their credits for the devotion to attendance and coursework. Building a virtual university started from Stanford which spread to other prestigious academic institutions, drawing attention from the fact that educational material produced by eminent professors were to be shared freely. Clayton Christensen, a father of disruption theory, once estimated that half the university might be demolished within 15 years. (Christensen, 2010)

Competition between MOOC platforms took place, as the “Big Three” MOOC providers, Coursera, edX, Udacity went on looking for ways of finding sustainability. Business Models began to diverge among the platforms. The education contents itself remain freely open, in contrast to other additional services that platform provides. For the learners to get their certificate of enrollment, they would have to pay the appropriate amount, sometimes in which the certification would act as approval of credit transfer. The extension of this would be the degree-level approach of MOOC platforms. Other schemes include tuition fees to individual courses with advanced topics that are taken into account for enterprises.



## Revenue Streams for MOOC Startups

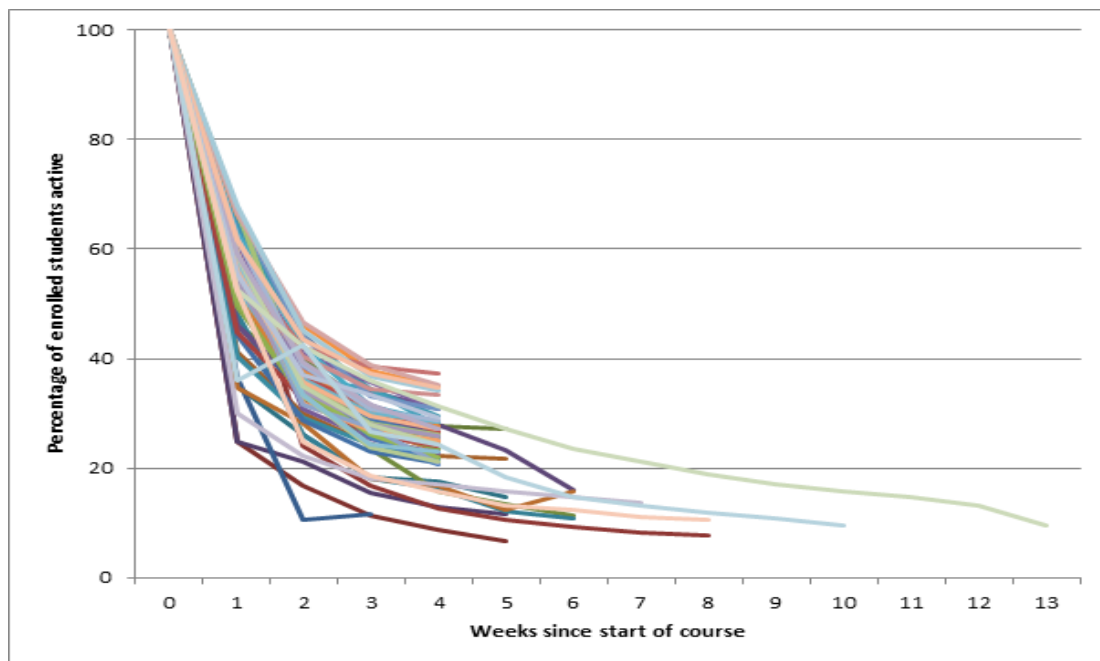
edX	Coursera	UDACITY
<ul style="list-style-type: none"> <li>• Certification</li> <li>• Shared revenue with universities</li> <li>• Charges \$250,000 for each new course, \$50,000 for recurring course</li> </ul>	<ul style="list-style-type: none"> <li>• Certification</li> <li>• Secure assessments</li> <li>• Employee recruitment</li> <li>• Applicant screening</li> <li>• Human tutoring or assignment marking</li> <li>• Enterprises pay to run their own training courses</li> <li>• Sponsorships</li> <li>• Tuition fees</li> </ul>	<ul style="list-style-type: none"> <li>• Certification</li> <li>• Employers pay for recruit talent student</li> <li>• Students résumés and job match services</li> <li>• Sponsored high-tech skills courses</li> </ul>

JISC cetis

Figure 3 Revenue Streams for MOOC Startups (Yuan & Powell, 2013)

### Reassessment on MOOC, Problems and Solutions

However, along with the popularity, many papers have shown doubts about the effectiveness of MOOC. The low percentage of course completion is essentially the most crucial factor of hesitation to use MOOC in an educational environment. For example, Katy Jordan's report (2013) shows that only 6.5% of 43,000 students completed the course, among the 279 courses. Similar results come out from Harvard & MIT, only 5% completed the course. In the meantime, Ho, A.D. (2013) suggests that it is not appropriate to measure the performance of MOOC by the percentage of enrollment/completion because no actual interaction between instructor and learner has been made. Low participation of MOOC is depicted in the following figure, each line standing for each MOOC courses. (Rivard, 2013) Some interpretations point out that even with the numbers of drop-outs, due to the massiveness of MOOCs, the absolute number of students who benefit from the free service will increase dramatically, which later creates social value.



**Figure 4 Low Participation of MOOC (Rivard, 2013)**

As MOOC being a platform, a comprehensive study is conducted based on the incentive that set off the participation of platform providers, instructors, and learners. University, in this case, acts as the platform providers, setting up plans for establishing programs. The reason behind university's participation relies on the expansion of influence among other institutions by advertising the quality of education it possesses, and internally, hoping MOOC to renovate long-lasting congestions on improving higher education. (Min, 2016) The students' and instructor' use of MOOC is also investigated based on survey questionnaire; the instructors are motivated by a sense of intrigue, the desire to gain some personal (egoistic) rewards or a sense of altruism, meanwhile the students have the desire to learn about a new topic or to extend current knowledge they were curious about MOOCs, for personal challenge, and the desire to collect as many completion certificates as possible. (Hew, Cheung 2016)

### **MOOC of Today**

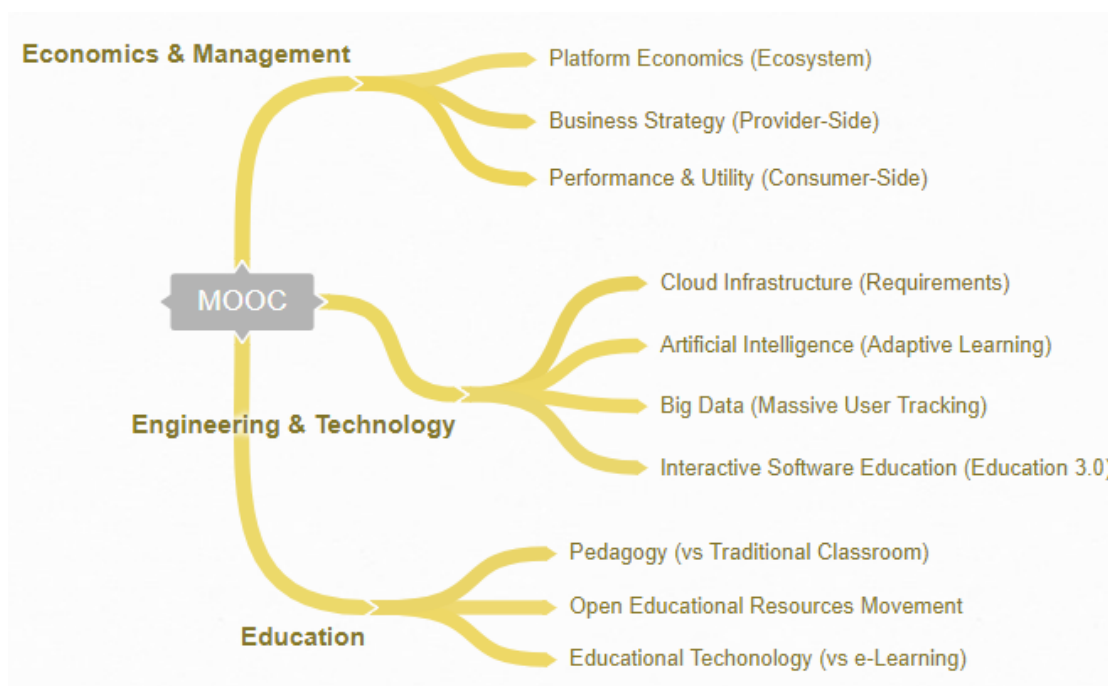
According to reports from MocoLab (2017), it is estimated that Coursera, edX, Udacity each has 23 million, 10 million, and 4 million registered users worldwide. Besides the three platforms, diffusion and adoption to other countries were consistently taken in place. Miriada X was released as the Spanish language based MOOC provider, meeting up with

the request for localization. Government initiatives enabled country-based MOOC providers, such as XueTangX, JMOOC, and K-MOOC. Currently, the most widely used MOOC platforms are as the following; Coursera, edX, Udacity, Khan Academy, Merlot, Udemy, FutureLearn, Iversity, OpenUpEd, Open2Study, Linda.com, pluralsight, CodeAcademy, Miriada X, XueTangX, JMOOC, K-MOOC. (KOCW, 2018)

## 4. Analysis on Research Trends

### Division of MOOC related Disciplines

This section illustrates the categorization of MOOC related papers from the past five years of publications. Liyanaguanwardena (2015) suggests that eight research topics can be distinguished as the following; overview concept, characteristics, case studies, instructional design, technology, participant’s perspective, provider’s perspective, and the rest. Some topics may be comprehensive, but they fall into this categorization. Some simplified classification can be simplified as the following.



**Figure 3 Disciplines of MOOC studies proposed**

The branches imply that some techno-centric approaches to enhance MOOC platforms will occur. In each discipline, additional research questions are to be studied.

- **Economics & Management**

From the providers' perspective, is it cost-effective and sustainable?

How will the future business model converge?

Can the firms apply MOOC in Human Resource Development or HRD?

- **Engineering & Technology**

What are the minimum requirements to implement MOOC platforms? Can cloud infrastructure lower the technical requirements for setting up platforms?

What is the current level of technology applied on MOOC; technology such as Virtual Reality (in Learning environment projection) or Block Chain (Security in assessment)?

Can artificial intelligence perform adaptive learning environment from a significant amount of big data collected from massiveness of users?

- **Education and Instructional Design**

Does MOOC have a clear distinction between e-Learning and LMS systems?

How can MOOC cope with the traditional credit system? Will blended learning be the future of MOOC?

Can learner motivation be amplified enough for the students to participate?

We have organized a list of important questions which still are controversial issues to be covered in each disciplinary fields. Of course, many publications' main interest may be not among the above-classified topics, however, mostly they deal with at least one of the questions in some manner.

## **Implications on MOOC's Approach on Bridging Digital Divide**

### **Education Platform and Digital Literacy**

Since MOOCs have the motto of “free education for all,” it complies with the concept of open educational resources, which have been mentioned earlier in this text. Digital technology enables redistribution of resources, under the premise of learners having access to digital devices. The learners must also have their familiarity with digital technology, with environments having easy access to digital media, digital contents, and so on. The capability of an individual on digital literacy plays a crucial role in the self-sustained regular access of online-based educational material. Through MOOC, education is open now, however only the “ones who know how to use it.” can benefit from the state. The fact reveals an essential notion that improving the overall digital literacy on society will provoke positive effect on education, creating opportunities for the actual participants.

### **Developing Country's Perspective**

Governments supporting public institutions in developing countries have a vast amount of interest in the adoption of such educational platform. The potential of such platform, when cleverly well-made and prepared, giving guidance to a large number of students attract officials in not just education departments, but also almost every area of studies. The percentage of people having higher education in developing countries is growing, but still, have a long way to go. MOOCs offer courses mostly taught as university subjects, some with prerequisites on topics from secondary education. Recently, using the same principles of MOOC, innovative types of MOOCs have drawn attention in that those platforms provide the elementary and secondary school. The revolutionary Khan Academy represents a primary math-learning platform, filling in the students' need for better knowledge on math. Sometimes MOOC works on not only students but also on the teachers in educational institutions in that MOOC gives inspiration on the ways of teaching. Instructors can learn “how to teach” from the sample MOOC courses, providing an opportunity to rethink and improve their way of teaching. Especially in developing countries, where not many human resources are present, MOOC can play a role in

reducing the size of the educational gap, bring in more knowledge into society, and thus reach a state of the digital equity.

## **5. Conclusion**

### **Future Remarks**

We organize the contents of next promising as the following. Because the diversity of MOOC exists, the increase in numbers will naturally create the need to identify what characteristics of MOOC make the platform cost-efficient and effective.

In our future research, MOOC Platforms will be divided into categories by analyzing the features of each online educational platform, also covering the topics on the attributes that distinguish MOOC from existing education systems. We will conduct surveys on a carefully selected group of experts that include researchers, instructors, and entrepreneurs in the field of management of technology, educational technology, institutional economics, and related areas of work. AHP (Analysis Hierarchy Process) methodology will be selected in the sense that it is commonly used in multiple criteria decision making, which the fundamental idea is to identify and organize the final objectives into a hierarchy. Also, this method enables researchers to efficiently rank the attribute's significance by cross-analyzing between a small number of respondents. The future research will provide the importance of the characteristics in comparison with each other, along with the explanation of the result of each key parameter. We will organize the comments from the specialists, as a Delphi method to improve the reliability of the analysis. As a closing remark, suggestions for approaching and solving each problem will be taken into consideration.

### **Limitations and Contributions**

As an introductory statement of the whole flow of on-going research, this paper has a restriction on its coverage on this topics. Some MOOC experts might find disappointment in that they see no novelty on this review paper. However, it has the meaning of organizing the recent phenomenon of MOOC, which people is and will be using such platforms on

and on. So, as for the contribution, this research presents its unique way of describing the overview of MOOC, tries to promote understandings of the whole concept, while connecting to the issue of the digital divide.

The future research proposed above will shed light on the opportunity to expand the knowledge of MOOC's approach on the digital divide, leading to the on-site application of well-thought-out e-Learning system. More effort on this matter will identify the key factors that prevent the e-Learning platform from forming education equity by analyzing empirical data collected from experts in related fields. The suggestions made in future proposed research will provide a helpful, possible way of adopting open educational movement in MOOC, which will draw more attention about breaking the digital divide.

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