

Quality of MOOCs: A review of literature on effectiveness and quality aspects

Dilrukshi Gamage* , Shantha Fernando#, Indika Perera+

Department of Computer Science and Engineering *University of Moratuwa*
Katubedda, Sri Lanka

*dilrukshi.gamage@gmail.com, #shantha@cse.mrt.ac.lk, +indika@cse.mrt.ac.lk

Abstract— Massive Open Online Courses (MOOC) is a trending phenomenon in online education. Number of participants in a MOOC and the number of MOOCs by platforms and courses are appearing to be increasing at a tremendous level. Although MOOC found to be the “buzz” word, latest reports claim that the hype of the MOOC is fading. One reason to this is because many MOOCs offered and created despite of evaluating the effectiveness of it. Therefore the qualities of MOOCs are under criticism. It is essential to seek possible solutions to balance the learner goal while offering a quality service. Working towards the direction, this literature review focuses on past researches carried out in identifying the success factors, best practices, and effectiveness of a MOOC. We focused literature published between 2012 and 2015 and found significantly less number of empirical evidence in discovering MOOC quality factors. Out of 4745 peer reviewed publications which met with the search terms, only 26 literatures found to produce highly relevant in deciding a quality of a MOOC. Out the 26 literatures, only 3 provided a quality dimensions with empirical evidence and 7 provided with proposal frameworks based on past literature. We discuss the concerns arising from the review and identify issues including lack of evidence in identifying the critical success factors, absence of social interactions, networking, anthropological and ethnographic view in determining a quality MOOC.

Keywords—Effectiveness; Quality; MOOC; online learning

I. INTRODUCTION

MOOC or Massive Open Online courses attract wide spread attention and rapidly changed the attitude towards online learning. Although constructivist or cMOOC existed since 2008 the xMOOC became the “buzz” word since 2012 due to the emergent of Couesra, Udacity, and edX and as a result of that, the New York Times called year 2012 as “the year of MOOC” [1]. Since then many number of MOOC courses and MOOC providing platforms were emerging at a high rate. MOOCs are special due to the massive number of participants and open to any user who is interests to learn. Although many MOOC courses offer free of charge, some MOOCs are issuing credentials or verify the authenticity at a considerable lower cost. MOOCs by nature have some common characteristic; short videos, quizzes, peer base or/and self-assignments and online forums [2] yet there are pedagogical differences in courses even in the same platform [3]. Offering or participating in a MOOC has benefits to each party, however concerns are arising on the real value behind MOOCs and the consequences of it. It is mainly because there are higher dropouts in MOOC, which means only 7-13% of pass rate or sometimes less than that complete the courses [4].

On the other hand researchers found MOOCs has higher gain than the students taking a class on campus [5]. At the same time some researchers doubt whether there is active learning taking place in MOOC [6]. The situation rise from this background leads a requirement of quality or effective MOOC where it meets all the learning goals of a participant.

Effectiveness or quality factors for online learning are widely available with empirical evidence. However those factors will not be suitable for MOOC due to the unique features of MOOC. Hence the critical success factors or factors affecting effectiveness of a MOOC required to research with in the MOOC participants [7]. This literature review determines to explore the previous studies which have been focusing on identifying the factors leading to an effective xMOOC & recognize quality factors. Primary focus is to classify the literature with dimensions, elements and factors relating to xMOOC quality based on empirical evidences.

This paper is organized such that firstly it describes the objective of this literature review followed by the methodology we followed in order to identify the relevant literature. Next we distinguish the literatures which provide empirical evidence and which do not provide empirical evidence yet propose frameworks dimensions or categories to evaluate MOOC quality. Next we analyze the results and discuss the concerns arise from the findings. Finally we provide the conclusion based on the relevant literature.

II. OBJECTIVE

The main objective of this literature review is to produce the factors, dimensions or elements which affect the effectiveness of MOOC. In other words, to identify the quality metrics which need to assess any MOOC. This mainly due to the difficulties arise with the increase number of MOOCs with different platforms and the perceptions, satisfaction and pass rates depends on the quality provided by MOOC courses. Apart from that as stated by Siemens, Irvine & Code [8] states amount of peer reviewed literature is limited in MOOCs. The MOOC providers need to pay greater attention to already known learning results. At the same time Creelman, Ehlers and Ossiannilsson [9] states it is important and timely to discuss on the quality since MOOCs are not yet mature enough to come to conclusions on a sustainable model for quality in MOOCs. Hence the objective of this paper is to summarize the evidence based results and proposal quality frameworks which can be used by the MOOC providers and learners. Our intention is to empathize these quality aspects to MOOC providers and

students in creating or participating or selecting a MOOC for learning.

III. METHODOLOGY

In a literature review process, the important step is to identify the most relevant papers to review. There are several methods to identify papers; searching from databases or search engines and chaining from known research papers which is called “snow balling” method [10].

In this research, papers were located through series of search attempts. The relevancy of the paper was determined by examining their primary focus whether it identifies quality of a MOOC, provide solutions for quality MOOC or effectiveness factors in a MOOC and provide empirical evidence of identifying the factors. It is important to identify the verified and validated results as at this stage it is very much lacking in this direction due the earliness of the MOOC concept.

The search terms used were “MOOC Quality”, “MOOC effectiveness”, “MOOC Success factors”, “MOOC dropout reasons” and the period narrowed to 2012 to 2015. We used the search terms in selected number of educational and distance educational journals: British Journal of Education Technology, Distance Education, American Journal of Distance Education, Journal of Online Learning and Teaching. At the same time, we expand our coverage of journals by searching from publisher online databases, academic and bibliographic databases: Wiley Online library, SpringerLink, Elsevier’s ScienceDirect, IEEEExplore, ISI Web of Knowledge, Scopus, CiteSeerX, ERIC and Google Scholar.

IV. RESULTS AND ANALYSIS

Table 1 illustrates the search sources, results of the search terms and number of relevant literature followed by the access date.

TABLE I. LITERATURE AND THE SOURCE

Journal name	No of results with search terms	Relevant to the review	Access date
Education Specific Journals			
British Journal of Education	121	2	19-2-2015
American Journal of Distance Education	8	1	19-2-2015
Journal of Online Learning and Teaching	26	2	19-2-2015
Distance education	14	1	19-2-2015
International Journal of Distance education	12	0	
Publisher Databases			
Wiley Online database	89	3	21-2-2015
SpringerLink	209	4	23-2-2015
Elsevier’s ScienceDirect	155	2	23-2-2015
Research Databases			
ERIC	156	2	25-2-2015
CiteSeerX	373	2	25-2-2015
Google Scholar	3509	5	25-2-2015
IEEEExplorer	73	2	25-2-2015
Total	4745	26	

Although the search results match with the search terms, it was evidence that majority of the literature was not relevant to this review and did not support by empirical research to find the quality metrics in MOOC. Empirical evidence was the primary focus of this literature review. However we revealed many literatures were at proposing stage of quality aspects to consider in MOOCs. At the same time we observed some literature proposing to use quality metrics which has already explored before emergent of MOOCs. Yet there is a strong argument by Yousef et al [7], which claims that any quality metric in online learning should not be taken for assessing MOOC. It is mainly because MOOC has unique pedagogical features and those metrics were not discovered and validated using MOOC participants. Nevertheless, this review divert the focus in searching for quality metrics frameworks, factors or dimensions based on empirical researches as well as quality metrics without empirical researches yet proposed to evaluate MOOCs with strong arguments supported by literature.

A. Proposed quality strategies, dimensions, metrics and frameworks for MOOC

A 10 dimensional proposal to evaluate quality in MOOC found in a publication edited by Sir John Daniel and Stamenka “A guide to online learning”. It was produced to address the rapidly growing quality issues from an international perspective. This brings together best practices and practical tools from around the world organized based on 16 key questions. Some of these questions are as follows: “what constitutes quality in online learning?, How can institutions assure quality?, How can students judge quality of online courses, How can instructional design, learning materials, and course presentation contribute to quality online learning?, How can the structure of the virtual environment facilitate quality online learning?”. The authors of the publication produced 10 quality benchmarks based on previous literature - Institutional support (vision, planning, & infrastructure), Course development, Teaching and learning (instruction), Course structure, Student support, Faculty support, Technology, Evaluation, Student assessment, Examination security [11]. It states that the benchmarks are based on extensive review of literature.

The framework provided by “Quality Matters” program proposes to use its metrics rubric in assessing MOOCs. This program consists with the latest quality dimensions for online learning [12]. The rubric contains 8 dimensions – Course Overview and Introduction, learning objectives, Assessment and measurement, Instructional materials, Learner interaction and engagement, Course Technology, Learner support and Accessibility. The program has evaluated 21 peer reviewed journals and other academic databases such as ERIC, ProQuest and Google Scholar in order to produce the elements in the rubric. Although the 8 dimensions appear to provide a reasonable argument for online learning, it does not specifically address the context of MOOC. The primary focus of this literature is to be focus on MOOC literature and study based on MOOC participants in particularly.

However the MOOC quality project which is an initiative of European Foundation for Quality eLearning attempted to identify quality issues specifically focusing to MOOC. In this project series of blog post by experts relating to quality of MOOC were taken into consideration to produce a quality report of MOOC [9]. The report of this project highlight some factors related to the perception of MOOC quality: the notion of choice, what pre-course information is provided, the pedagogical approaches supported in a course, the level of student commitment required, is a course scheduled or not, technical requirements, the role of the teaching team, availability and level of interaction, whether certification is availability. An expert in the project, Downes [13] argues success of a MOOC will not depend on number of drop outs, counting test scores, adding up students satisfaction and states four success factors: Autonomy, Diversity, Openness & Interactivity. Another expert Conole [14] in her research argues that xMOOCs simply based on the interactions between content by following the behaviorists learning approach. Her research introduced the 7c's approach to bring enhancements in leaner experience and quality assurances. In order to achieve effective learning Conole argues it is essential to meet characteristics of good learning; Encourages reflection, Enables dialogue, Fosters collaboration, Applies theory learnt to practice, Creates a community of peers, Enables creativity, Motivates the learners. Further her argument is to incorporate 7C to make effective learning experience in MOOC. The 7C's are Conceptualize (what is the vision for the course?), Capture (a resource audit), Communicate (mechanisms to foster communication), Collaborate (mechanisms to foster collaboration), Consider (assessment strategies), Combine (overarching views of the design), Consolidate (implementing and evaluating the design in a real learning context).

The importance of determining success factors for Open Education Initiatives (OEI) was researched by Nagashima [15]. The research found six factors: Brand, Reputation, Funding, Subjects, Interactivity social view of open education and Localization. These factors were defined under three categories: Organizational, Pedagogical and Social factors. Although this research does not reveal any empirical exploration behind selecting the factors, it was evident that these factors were based on analysis of previous literature. The research evaluated MIT OCW, OpenLearn OER Africa, Coursera, OpenLearn, Udacity using the 6 factor model. Among all the results, it emphasizes the factor "interactivity" was found low in MIT OCW and OER Africa but higher in other 3 platforms.

The research carried by Margaryan, Bianco & Littlejohn [16] propose 10 dimensional instructional design criteria to evaluate MOOCs quality. The research is highly focuses in pedagogical perspective of a MOOC by arguing that the instructional design quality of a course is a critical indicator and prerequisite of the potential of the course for effective learning. It states that a learner or participants experience with opinions may not reflect the effective result of a MOOC quality because learners typically do not have the expertise to

assess instructional design. Therefore the paper states it is critical to evaluate the quality of MOOC design by drawing on the knowledge of expert instructional designers. The 10 evaluation criteria's were drawn from First Principles Instructions - interrelated prescriptive criteria for effective instruction abstracted from key instructional design theories and models [17]. Those are 1) Problem Centered, 2) Activation, 3) Demonstration, 4) Application, 5) Integration, 6) Collective Knowledge, 7) Collaboration, 8) Differentiation, 9) Authentic recourses, 10) Feedback. Although this dimensions do not provide an empirical evidence to be applied to MOOC, the researcher evaluated 76 MOOC courses using dimensions by focusing on the pedagogical importunacy for quality in instructional design in learning. Their results reflected as instructional design quality of MOOCs is essentially low by arguing out of 72 possible total points that each course could score according to the Course Scan instrument, none of these MOOCs scored above 28 points.

A framework named mesoMOOC proposed by Schoenak [18], addresses several challenges that hinder current effective delivery of MOOCs. The framework utilizes proven strategies in online learning to better implement MOOCs by addressing the orientation process, embed a connectivist synchronous component to the classroom, provide online formative and summative assessment, and develop subsections within classes. Although the criteria for the framework were explained in narrative literature yet it was not evidence that the framework was being tested and validated using MOOC participants.

B. Quality Metrics based on empirical research using MOOC participants

The literature search resulted limited number of empirical evidence in MOOC quality related research. Empirical research is a way of gaining knowledge by means of direct and indirect observation or experience. In this case the empirical evidence (the record of one's direct observations or experiences) can be analyzed quantitatively or qualitatively straight from MOOC participants and/or MOOC courses.

The researches toward this direction, Walker and Loch [19], explored the quality of a MOOC in academics perception. In their research, they have distributed a survey among academics who are taking part in MOOC courses via twitter, e-mails, and personal networks using the snow ball sampling technique. Although the research focused on pedagogical aspects of the MOOC, it was evident with the results that the participants were empathizing the technological aspects also to be considered as to deliver quality in MOOC. However, their research does not directly quote quality metrics in MOOCs, yet their survey resulted with some aspects with video quality, assessments, workload, and social interactions.

The research conducted by Yousef [7] categories MOOC quality criteria in to 2 dimensions and 6 categories. Their model is depicted in the Fig 1.

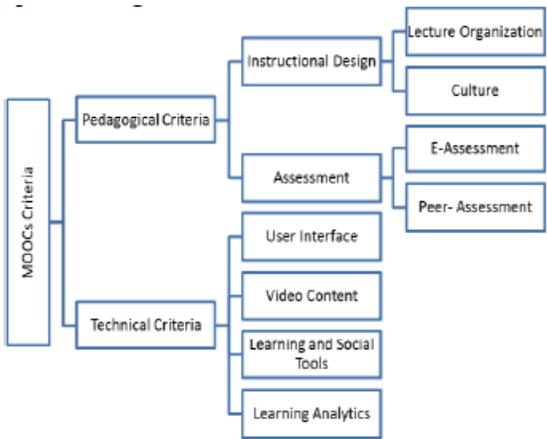


Fig 1: Classification of MOOC Criteria according to Yousef [7]

The research has used 107 students and 98 professors who take part in MOOC courses. Since they did not find a significant difference in 2 categories, they have merged the dimensions and found scaffolding, collaboration & self-organizing as categories which they should consider. The final results of the instrument found 74 criteria for effective MOOC environment classified in to 2 categories. The statistic results of the survey showed that, learning analytics and assessment have obtained the highest average mean scores. Although there is a wide agreement that usability, content, collaboration, and instructional design play a major role in achieving effective MOOCs, in this research, these categories were identified as less important compared to the learning analytics and assessment categories.

The research conducted by Gamage, Perera and Fernando [20] used the grounded theory methodology in order to observe the MOOC participants to explore the quality dimensions in a MOOC. In their research, participants from 5 MOOC platforms with in a period of 2 years from 2012 were observed. Their results revealed 10 dimensions model to evaluate MOOC quality: 1.Interaction, 2.Collaboration, 3.Motivation, 4.Network of Opportunities/ Future directions, 5.Pedagogy, 6.Content, 7.Assesment, 8.Usability, 9.Technology, 10.Support for Learners. The research argues to pay attention in the dimensions mention & it will increase the users' sustainability in the MOOCs. It is evidence that this result will be a benchmark and a guide to any MOOC user or MOOC developer attempting to produce or participate in an effective eLearning experience.

C. Analysis of relevant search results

Overall search resulted 4745 literatures eliminating duplicates found in academic databases such as Yousef's [7] quality model appeared in IEEEExplore and Google scholar database, Conole's 7C strategy for effective learning experience has multiple entries within Google Scholar database [14], [21] & Espada et al's user experience as a factor of MOOC quality resulted in IEEEExplore as well as Google scholars [22].

However out of 4745 majority (little more than 99%) of papers did not support to the quality of a MOOC directly and were not within the scope of our search indentation. Our goal was to determine "What factors affects effectiveness of MOOC?, What dimensions/categories/elements makes a quality MOOC?". Only 26 literatures were selected for analysis and it reflects the requirement of exploring more into this research area. Since the number of MOOC courses and platforms increases rapidly, it is important to consider the quality of a MOOC course. As depicted graphically in Fig.2, out of the 26 literatures only 3 literatures found to produce empirical data taking MOOC participants and MOOC courses as the primary source of collecting data. & 7 proposals, strategies & frameworks found in order to design quality MOOC experience.

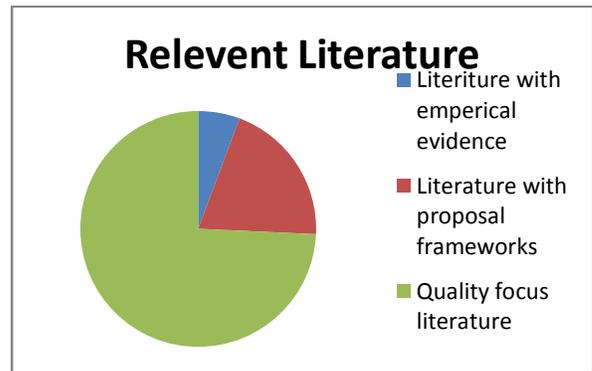


Fig 2: Analysis of Quality related MOOC literature

V. DISCUSSION

Our motive in this literature review was to identify the factors affect to quality of MOOC. Although the focus was to review and analyze the empirical researches based on MOOC participants, we found there is limited attention given to action base research in quality research area. The search resulted 99% of other quality areas in MOOC, and 1% in the highly focused literature to evaluate quality in a MOOC. Out of the 1%, only 0.3% was found in experimental evidence where researchers used and interact with MOOC and MOOC participants directly to conduct the research. Many other researches were proposing strategies based on previously researched instruments (found before the emergent of MOOC) and literature and their own personal arguments. Other than that, we found literature evaluating MOOCs based on one factor, such as Espada et al [22] evaluating MOOCs based on User experience as a quality factor.

In holistic view to literature found Interactivity, collaborativeness, pedagogy and technology has a significant role in making a MOOC effective to a learner. It is stated by Yang, Wen and Rose [23] in their research that peer interactions and bonds impact on the dropout rates. They discovered that fostering a supportive and positive peer influence will reduce the drop outs.

Quality challenges were being identified by Gaskell & Mill [24] and reflects on current and future developments in

MOOCs as how far do they have the potential to address the challenges identified? As stated by Fischer [25] the challenges are to understand what drives motivation and interest, handling overloaded information and participation and changing the culture “have to learn” to “want to learn”. It is visible and claimed by Paul Stacy, a senior manager at Creative Commons in MOOC Quality Project [9], the direction of MOOC pedagogy is focusing more in to transformation or adapting the class room based didactic pedagogies in to online learning. The class room base pedagogies are facing tremendous quality issues where it does not provide the potential for truly open collaboration and peer learning. He advocates the collaborative learning and states true learning occurs via relationships and social interactions. The research conducted through the grounded theory, confirm that networking, relationships and future directions leads to effective and meaningful learning [20].

Other than the above facts, we found the evaluations carried by the proposal frameworks depicted very low quality in many MOOCs [17]. Many resulted poor quality interactions between students although the interactions were high in student to content. Nevertheless it is early to predict quality of MOOC, yet we emphasize the impotency of paying attention in the quality of learning experience. It is important to examine the MOOC behaviors from various perspectives, such as anthropological, ethnographical and with enhance technological view with big data. Though it has been just 3 years from the year of MOOC [1], it is vital to identify the role of learner and influence the network of learning via MOOC to receive quality of learning [26], [27].

VI. CONCLUSIONS

In this literature review we tried to elaborate the quality dimensions which affect the effectiveness of MOOC. It was necessary to explore these metrics and frameworks due to the rapid increments in MOOC courses and platforms. The search resulted only 26 relevant literatures highly focus on quality aspects of MOOC out of 4745 hits in search terms. Among those, only 2 literatures found with empirical data providing dimensions for quality of a MOOC and 7 quality frameworks and categories proposing to evaluate MOOC. The less empirical data should trigger researchers to work in the direction to fill the significant gap in research related to produce and evaluate quality MOOCs.

REFERENCES

- [1] L Pappano, "The Year of the MOOC," New York, 2012. [Online]. <http://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html>
- [2] D. G Glance, M Forsey, and M Riley, "The pedagogical foundations of massive open online courses," *First Monday*, vol. 18, no. 5, 2013.
- [3] M Bali, "MOOC Pedagogy: Gleaning Good Practice from Existing MOOCs," *Journal of Online Teaching and Learning (JOLT)*, vol. 10, no. 1, pp. 44-57, 2014.
- [4] K Jordan, "Initial Trends in Enrolment and Completion of Massive Open Online Courses," *The International Review of Research in Open and Distributed Learning (IRRODL)*, vol. 15, no. 1, February 2014.
- [5] K F Colvin, J Champaign, A Zhou, C Fredericks, and D E Pritchard, "Learning in an Introductory Physics MOOC: All Cohorts Learn Equally, Including an On-Campus Class," *The International Review of Research in Open and Distributed Learning (IRRODL)*, vol. 15, no. 4, September 2014.
- [6] J Daniel, "Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility," *Journal of Interactive Media in Education*, 2012. [Online]. <http://www-jime.open.ac.uk/jime/article/viewArticle/2012-18/html>
- [7] A F Yousef, M, A Chatti, U Schroeder, and M Wosnitza, "What Drives a Successful MOOC? An Empirical Examination of Criteria to Assure Design Quality of MOOCs," in *Advanced Learning Technologies (ICALT) IEEE14th International Conference*, 2014, pp. 44-48.
- [8] G Siemens, Valerie Irvine, and Jillianne Code, "An Academic Perspective on an Emerging Technological and Social Trend," *Journal of Online Learning and Teaching*, vol. 9, no. 2, June 2013.
- [9] A Creelman, U Ehlers, and E Ossinnilsson, "Perspectives on MOOC quality -An account of the EFQUEL MOOC Quality Project," *INNOQUAL - International Journal for Innovation and Quality in Learning*, vol. 2, no. 3, pp. 78-87, 2014.
- [10] D Ellis, "A behavioural approach to information retrieval system design," *Journal of Documentation*, vol. 45, pp. 171-212., 1989.
- [11] N Butcher and M Wilson-Strydom, "A Guide to Quality in Online Learning," *Acedemic Partnership*, Dullas, 2014. [Online]. <http://contactnorth.ca>
- [12] K Shattuck. (2014) Quality Matters Programe. [Online]. <https://www.qualitymatters.org/rubric>
- [13] S. Downes. (2013) The Quality of Massive Open Online. [Online]. <http://mooc.efquel.org/week-2-the-quality-of-massiveopen-online-courses-by-stephen-downes>
- [14] G Conole, "MOOCs as disruptive technologies: strategies for enhancing the learner experience and quality of MOOCs," *Revista de Educación a Distancia*, vol. 39, no. 1-17, 2013.
- [15] T Nagashima, "What Makes Open Education Thrive? Examination of Factors Contributing to the Success of Open Education Initiatives," *INNOQUAL - International Journal for Innovation and Quality in Learning*, vol. 2, no. 3, pp. 10-21, 2014.
- [16] A Margaryan, M Bianco, and A Littlejohn, "Instructional quality of Massive Open Online Courses (MOOCs)," *Computers & Education*, vol. 80, pp. 77-83, January 2015.
- [17] M D Merrill, "First principles of instruction," *Educational Technology Research and Development*, vol. 50, no. 3, pp. 43-59, 2002.
- [18] L Schoenak, "A New Framework for Massive Open Online Courses (MOOCs)," *Journal of Adult Education*, vol. 42, no. 2, pp. 98-103, 2013.

- [19] W Lyndon and B Loch, "Academics' Perceptions on the Quality of MOOCs: An Empirical Study," INNOQUAL - International Journal for Innovation and Quality in Learning, vol. 2, no. 3, pp. 53-63, 2014.
- [20] D Gamage, I Perera, and S Fernando, "Effectiveness of eLearning through MOOC: lessons learnt in selecting a MOOC," in The 22nd International Conference on Computers in Education (ICCE 2014), Nara, Japan, 2014.
- [21] G Conole, "MOOCs as disruptive technologies: strategies for enhancing the learner experience and quality of MOOCs," *Revista de Educación a Distancia*, vol. 39, pp. 1-17, 2013.
- [22] J Pascual Espada, V García-Díaz, C Rodríguez, and R González Crespo, "Method for analysing the user experience in MOOC platforms," in International symposium on Computer education (SIIE), Logrono, 2014, pp. 157-162.
- [23] D Yang, M Wen, and C Rose, "Peer influence on attrition in massive open online courses.," in 7th International conference on Educational Data Mining., 2014, pp. 405-406.
- [24] A Guskell and R Mill, "The quality and reputation of open, distance and e-learning: what are the challenges?," *Open Learning: The Journal of Open, Distance and e-Learning*, January 2015.
- [25] G Fischer, "Beyond hype and underestimation: identifying research challenges for the future of MOOCs," *Distance education*, vol. 35, no. 2, pp. 149-158, April 2014.
- [26] M Liu et al., "Understanding MOOCs as an Emerging Online Learning Tool: Perspectives From the Students," *Americal Journal of Distance education*, vol. 28, no. 3, pp. 147-157, July 2014.
- [27] S J Marshall, "Evaluating the Strategic and Leadership Challenges of MOOCs," *Journal of Online Learning and Teaching*, vol. 9, no. 2, June 2014.