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Impact Of Moocs Usage On Academic Learning: A Moderating Role Of Academic Streams

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Introduction

Historically, the evolution of the Indian higher education system in modern times since the British era through 1950s, 60s, 70s and 80s succeeded in producing quality output in terms of trained personnel/ persons with higher education degrees from a few select institutions. However, a huge vacuum had been developing in the system over the years with respect to scalability – the elitist system had not kept pace with the demographic reality of burgeoning upper and lower middle classes of India in the 1980s and 90s and led to a yawning gap between the aspirations and the few higher educational opportunities in the country. Evidently incumbent universities and Institutes of 'historical repute' known for providing 'quality' education in the country could only serve a small segment of the population primarily due to their limited intake. A large number of incumbent universities in the remote areas were 'lack-lustre', in a dilapidated state and needed up gradation and rejuvenation at various levels. This fact had been at the heart of the exodus of students from semi-urban, tier 2 and 3 cities to 'urban centres' for college/university education every year through 1980s and 90s.

The challenge of information and knowledge delivery in developing countries and the potential of eLearning as a viable approach have been acknowledged since long (Abdon, Raab, &Ninomiya, 2008). The Massive Open Online Course (MOOC), in particular, is a specific eLearning artefact that was (at least initially) promoted by the providers as a significant development for extending education in developing countries (Koller, 2012). The utility and promise of the MOOC was recognised in the Indian context too (Jain et al., 2014). In an interview with the researcher an online HE expert Pradeep Varma noted, 'The whole concept of MOOCs is predicated on two major factors, especially true in the Indian context. These are a lack of brick-and-mortar colleges/class rooms (and a lack of resources to create these to meet the vast need in India), and secondly, a dire lack of good faculty. The faculty shortage in India is so bad that in many cases, persons just out of college are being utilised to teach college classes. For example, AICTE has mandated that

an engineering institution may hire a person who is at least an M. Tech as a faculty member. However, we find that many private institutions are making do with B. Tech graduates. One reason for this situation is that Indian students prefer to take up a job right after graduation rather than go in for a PG or a Doctorate… MOOCs, by definition, are in the online space and hence can cater to learners all over the country as well as anywhere in the world.'

Thus value and potential of the MOOC, MOOC adoption by a potential user and MOOC-users' subgroups and their perceived satisfaction as a way of assessment of the learning technology of MOOC are important topics to be explored in the Indian context as having diverse, accessible forms of quality education is vital for India.

If MOOCs are to become a part and parcel of the future of higher education in India, being able to discover similarities and differences between MOOC users and non-users and further various subgroups of MOOC user community and their potentially new demands is essential as is an assessment of MOOC's learning technology through an examination of the MOOC-users' satisfaction.

2. Literature Review

2.1 Impact of MOOCs

The term 'online' means the course is available digitally and that is why participants can access it from anywhere. The term 'Course' indicates it has a structure, a syllabus, a design. It provides participants an opportunity to join learning community. The term MOOC has all these characteristics. Hence we can term courses under edX as MOOCs while Khan Academy is a provider of free educational content. Several courses available online which require learners to pay, or hybrid or partial degree courses which use a blend of online and face to face learning cannot be termed as MOOCs. According to current data, over 800 universities are offering MOOCs in subjects varying from music, history, language studies, narrative writing, and film production to artificial intelligence. Platforms such as MOODLE, edX, FutureLearn, Canvas Network, Udemy, XuetangX, and others provide around 9400 courses that are either free to use or offer a free version. MOOCs' popularity may be gauged by the fact that around 23 million new learners signed up for their first MOOC in 2017, bringing the total number of learners to 81 million. (Shah, 2018).

India has also joined the bandwagon and "Indian students are the second largest pool globally who are attending the Coursera MOOCs, second only to USA" states Coursera founder Daphne Koller (Nair, 2013). MOOCs can offer an unprecedented mechanism that can enable the educators to reach learners sitting in remote areas of the country with a passion to learn. MOOCs have the capacity to meet the objective of making education world class; available equally to all irrespective of caste, creed, location, socioeconomic background, is scalable and creates future ready citizens.

According to Census (2011), about 70% of population is still settled in rural India. In a geographically extensive country like India, where getting quality education is a distant

dream due to geographical and economic barriers, MOOCs have the potential to be a game changer. MOOCs take education into the homes of the learners. A click of a mouse can take the motivated learners to top quality education at no cost.

The Indian government and academic institutions have also taken MOOCs seriously, and an ambitious platform called Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) has been established. 2016 (MHRD) The MHRD has appointed eight National MOOCs Coordinators (NMCs), whose primary level is to design, produce, and deliver MOOCs on a variety of disciplines ranging from senior high school to post-graduate level. The UGC and AICTE have authorised up to 20% of MOOCs delivered through SWAYAM to be recognised for credit under the 'Credit Framework for Online Learning Courses via SWAYAM, Regulation 2016'. (MHRD, 2017).

The best universities in the world are collaborating with MOOC platforms to provide participants with additional credit options in MOOCs (Lequerica, 2016). (Lequerica, 2016) Whereas the course is provided free of charge, certification, mentorship, and, on occasion, grades are paid services. The University plans and produces the programme, the credits are given by the University, and the course is delivered by the platform provider. Georgia Institute of Technology, for example, is using Udacity to provide a Master's degree in Computer Science. (Udacity, 2016). The University of Illinois has partnered with Coursera to offer a "iMBA" programme, while edX has partnered with Arizona State University to offer the Global Freshman Academy, a foundation programme targeted at high school graduates and others planning to attend undergraduate studies. (Shah, 2015).

HarvardX and MITx were launched in the summer of 2016 and since then 245 thousand certificates have been issued until fall of 2016. The total course participation has been a staggering 4.5 million out of which 2.4 million were unique users who have participated in one or more HarvardX and MITx open online course (Chuang &Ho, 2016).

Although the Universities are charging the participants for the certified and degree courses (charges for assessment and certification), the cost is substantially low. This monetization of MOOCs will expand traditional as well as alternative mode of education offered through MOOCs.

MOOCs which began in 2008 came into prominence in 2012, are still in their infancy. Academia, researchers are still working and researching to test their effectiveness in imparting quality education to the masses and whether they are going to be the disruptive phenomena, many are claiming it to be. Though MOOCs have lakhs of enrolments, many questions are being raised for the high dropout rates, quality of assessment, plagiarism etc. (Conole, 2013; Admiraal, Huisman & Van de Ven 2014; Clarà&Barberà 2014; Tatiana, 2016).

Subjects:

The inaugural cMOOC focused on connectives and connective knowledge (Downes, 2012). Artificial Intelligence was the subject of the inaugural xMOOC. Over the next 9 years, numerous other subjects were offered, ranging from English language to online

guitar lessons. MOOCs are currently offering courses on a variety of subjects. (Shah, 2016).

Extending Geographically

In western countries, like Canada, USA Massive Open Online Courses (MOOCs) were successful and dramatically increased every year (Levy, 2014). Other parts of the world caught on soon. A course known as "Asia's first MOOC" given by the Hong Kong University of Science and Technology through Coursera starting in April 2013 registered 17,000 students (Sharma (2013); Education's digital future (2013) and was the first Asian MOOC. 2013 is called a year of 'Chinization of the MOOC (Narsimham, 2014), this is the year when Universities in Mainland China took first step in the field of MOOCs. Tsinghua University released its own MOOC platform, "XuetangX", which became one of the best Chinese MOOC platforms and provided morethan 400 courses in just one year. At present XuetangX is the third largest MOOC platform with over six million users and it also has the distinction of being the only non-English language platform in the top 5 MOOC platforms. (Marsh, 2017).

On 15th September 2013, the Saudi citizens named Fouad Al Farhan and Sami Al Hussayen launched Rwaq platform, a fully Arabic massive open online course (Brahimi&Sarirete, 2015).

At present 700+ Universities located in various corners of earth are offering MOOCs, the list includes countries like India, Mexico, Italy, South Africa, and Japan (Shah, 2018).

Languages

Though the first MOOC was in English, more than 1500 MOOCs are now available in seventeen additional world languages, including Chinese, Turkish, German, French, and others, covering a wide range of subjects such as Mathematics, Education, Computers, Calculus, and Nursing, to name a few. 95 percent of all courses are taught in one of five languages: English, Spanish, French, Chinese, and Arabic. (Barcena& Martin-Monje, 2017).

Platforms

The year 2012 saw the debut of several platforms for the seamless delivery of MOOCs, such as Coursera, Udacity, edX, Futurelearn, and others. The majority of these platforms are non-profit. In addition to non-profit platforms, commercial platforms such as One Month, Novoed, open2study, and others were launched successfully in 2013. In 2017, there were over 40 platforms offering MOOCs all around the world. (Mundus, 2016).

Corporate Training

MOOCs are increasingly valued by top universities, start-ups, and Fortune 500 companies such as Google, Yahoo, AT&T, SAP, Coursolve, and others. They are using MOOCs for more than simply workforce training; they are also using them for brand marketing, customer education, self-directed career development, and building career pipelines (Dodson,

Kitburi, & Berge, 2015; Savino, 2014). Dodson, Kitburi, and Berge (2015); Savino (2014) In reality, 2014 is regarded as "The Year of the Corporate MOOC."

2.2 Academic Learning Outcomes

Learning outcomes and 'outcomes-based methodologies' strongly impact on program configuration, instructing and learning assessment, just as quality affirmation. Learning outcomes carry more transparency to higher education systems and qualifications. They comprise a significant piece of modern day ways to deal with higher education. They are worried about the accomplishments of the student instead of the expectations of the instructor. A learning outcome is a statement of what skills a student is expected upon to have because of the learning procedure (European Commission 2004).

Academic Learning outcomes centre consideration around unambiguous and detailed articulations of what students learn – the aptitudes, understanding and capacities and seek to additionally develop and test them. It is necessary to stress that learning outcomes structure an important part educational change that is abbreviated as student focused learning' (Adam, S. 2006).

In 1956 Benjamin Bloom with associates Max Englehart, Edward Furst, Walter Hill, and David Krathwohl published a framework for categorizing educational objectives, the Taxonomy of Educational Objectives. The examination concentrated on approaches to gauge learning outcomes and along these lines six levels were framed. The Bloom's taxonomy classification levels are set as models for evaluation of students' performance (Deshmukh, Mangalwede, and Rao 2018). Thus, to contemplate the learning outcomes we have utilized these six levels of learning given by Bloom.

Blossom distinguishes six degrees of learning excellence, namely Knowledge, comprehension, application, analysis, synthesis and evaluation. The given six levels in the scientific categorization, moving from the lowest order to the most elevated order, is portrayed as follows:

- Knowing-Remembering: Recovering, distinguishing, and reviewing appropriate information from long term memory. For example discover, learn phrasing, confirmations, techniques, forms, thoughts.
- Comprehension-Understanding: Making importance from oral, written, and express messages through comprehension, demonstrating, arranging, and briefing, closing, associating, and clarifying. Understanding use and importance of terms, realities, techniques, forms, thoughts.
- Application: Carrying out or utilizing a procedure through performing, or applying. Utilize, apply practice hypothesis, illuminate glitches and use data in new situation.
- Analysing: Contravention of material into fundamental parts, characterizing how the parts identify with each other and to a general circumstance or reason through recognizing, arranging, and doling out. Dismantled ideas, separate them, analyse structure, perceive desires and poor rationale, assess comparability.

- Generating-Evaluating: Making choices dependent on criteria and morals through assessing and reprimanding. Set criteria, judge utilizing rules, sign, guidelines, acknowledgment or dismissal based on criteria.
- Synthesis - Creating: Putting parts together to frame an unmistakable or functional entire; revising components into another plan or game plan through making, advancement, or producing. Keeping things together; unite various parts; compose topic, present discourse, and plan experimentation, club data together in a unique and imaginative manner.

Therefore, the Blooms scientific categorization was utilized to gauge the academic learning of students.

2.3 Academic Stream

Advanced education involves streaming students into academic subjects based on their areas of intrigue and choices of subject they want to study further. The method of selecting a specific stream according to the ability and tendency conveys various focal points. It encourages them not only to spare time yet additionally decreases the additional burden on the students. Academic Streams implies the course of study. It is the course a student chose to study during their higher education and makes a career in the same field ahead. Academic streams comprises of different domains of study like engineering, management, commerce, humanities, etc. In view of these streams different MOOC program are planned. A lot of universities has come up with specialised MOOC program in particular stream and it has additionally helped the students in finding the correct course in their areas of intrigue. In this paper we further tried to study if different academic streams moderate the relationship between MOOCs usage and academic learning outcomes.

Based on the literature review we propose this conceptual model:

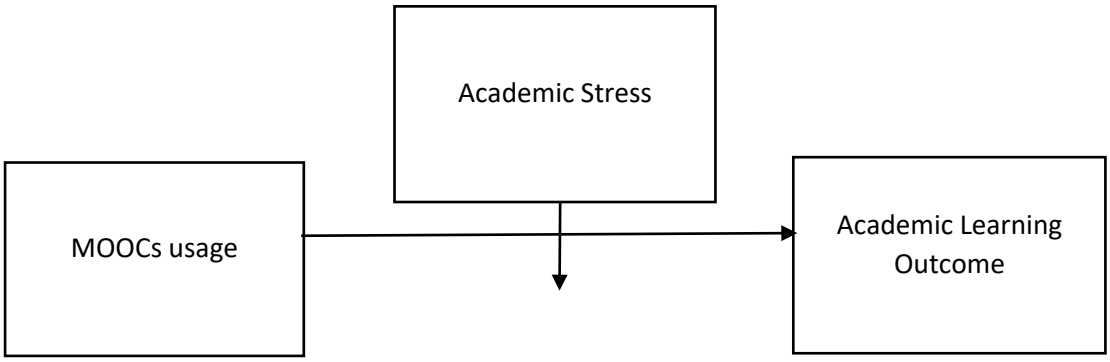


Figure1: Conceptual Model

Based on the conceptual model the following hypotheses were developed:

Hypotheses 1: There is a positive relationship between MOOCs usage and academic learning.

Hypotheses 2: Various academic streams moderates the relationship between MOOCs usage and Academic learning.

4. Research Methodology

4.1 Participants and procedure

Survey research method was adopted for data collection. The questionnaire was administrated through e mail, by sending it to students of Bachelors and Master's program who have enrolled in at least one MOOC program, followed by a personal follow up (Eby, Butts &lockwood, 2003; Coetzee &Potgieter, 2014). The students were of secondand final year and most of them had already completed 1 or 2 MOOC program.

4.2 Measures

The MOOCs usage was measured using the UTAT theory model along with some other constructs that were identified from literature and the questionnaire was developed based on the same. The questions were on MOOCS usage intentions, technical aspect, system quality, instructional quality, and social influence. A total of 14 statements were used. To measure academic learning outcomes, levels of blooms taxonomy were used and items were generated for the same. Random sampling technique was used for data collection.

4.3 Scale development Procedure

As we did not find any relevant scale for measuring academic learning in higher education we worked on developing a new scale on academic learning outcomes in higher education. For the scale development we did the literature review and identified that Blooms taxonomy's level can be used for measuring academic learning outcomes (Krathwohl, 1956). Based on the levels given by Bloom the constructs were identified and the statements were made. The statements were cross checked by an industry expert and the face validity of the questionnaire was done. The questionnaire was then floated to the respondents of higher education institutes of different streams for the pilot study. A total of 222 responses were received. The data was then checked for normality and was found to be within range.

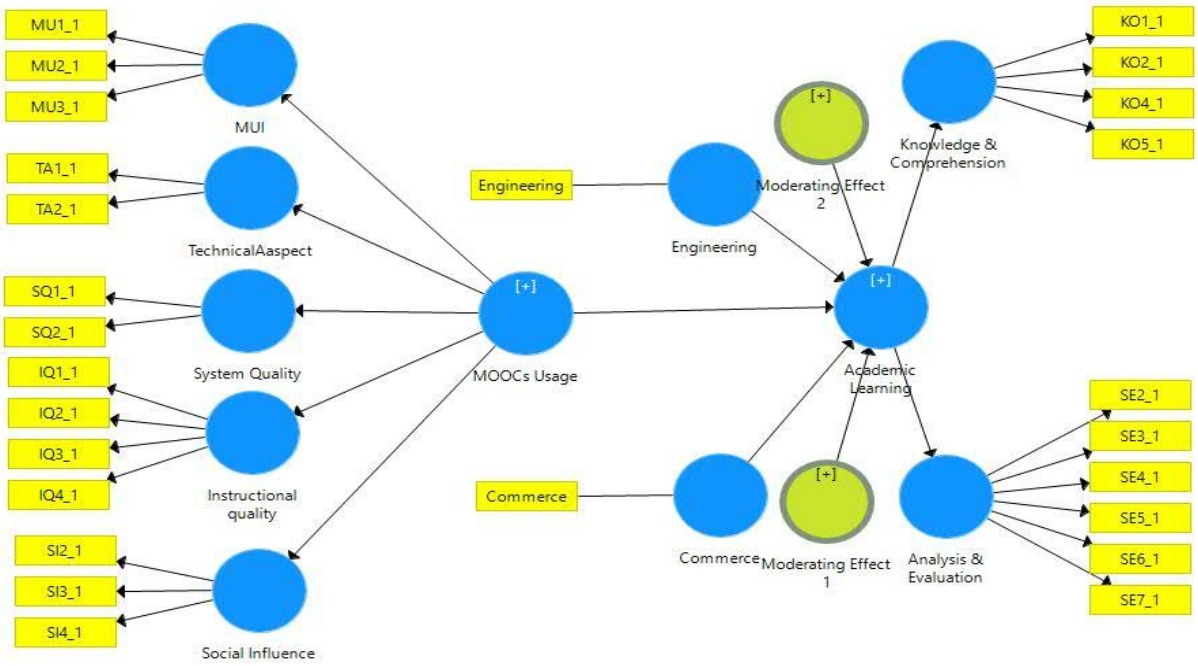
After checking the normality, computation of reliability (cronbach's alpha) was done (see Table 1). The factor analysis was then performed to identify underlying factors. The results demonstrated identification of two underlying factors explaining 78 percent variance. The factors identified were named as knowledge and comprehension, and analysis and evaluation. Further, the results of confirmatory factor analysis confirmed it. The results of composite reliability revealed values between the suggested value i.e. between 0.7 and 0.95 (Hair Jr., Hult, Ringle, &Sarstedt, 2014). The convergent validity was

tested using average variance extracted (AVE). Items with outer loading more than 0.7 were retained for further analysis.
However, the authors ensured that the deletion of items having outer loading less than 0.7 and cross loading as well did not have an adverse effect on composite reliability of the scale. Four items were deleted in total leading to final scale of 10 items only. This 10-item scale of academic learning was used for further analysis and hypotheses testing.

The factor loadings are as given below:

	Instructional quality	MUI	Social Influence	System Quality	Technical Aspect	Knowledge & Comprehension	Analysis & Evaluation
EE1_1	0.744						
IQ2_1	0.795						
IQ3_1	0.77						
IQ4_1	0.834						
MU1_1		0.723					
MU2_1		0.8					
MU3_1		0.687					
SI2_1			0.872				
SI3_1			0.866				
SI4_1			0.808				
SQ1_1				0.637			
SQ2_1				0.891			
TA1_1					0.789		
TA2_1					0.705		

KO1_1						0.881	
KO2_1						0.875	
KO4_1						0.847	
CO1_1						0.871	
AO2_1							0.845
AO3_1							0.829
SE2_1							0.87
SE3_1							0.818
SE4_1							0.859
SE5_1							0.843



5. Analysis

Partial Least squares (PLS) approach was used to evaluate the model. Smart Pls 3.0 was used to analysis the data. Since we did not have a big samples size, we used SmartPls as it is considered to be good to handle small sample sizes.

5.1 Measurement Model

Convergent validity was assessed with help of factor loadings, composite reliability and average variance extracted (AVE). Convergent validity is ensured if factor loading and AVE are above the threshold value of 0.5, and composite reliability (CR) should be > 0.7. Table 1

Shows that the results of the measurement model exceeded the recommended values, thus shows convergent validity.

Table 1: Factor Loadings, Cronbach Alpha, Composite Reliability, and AVE

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Analysis & Evaluation	0.937	0.937	0.713
Knowledge & Comprehension	0.925	0.925	0.754
MUI	0.78	0.782	0.545
Social Influence	0.885	0.886	0.721
System Quality	0.724	0.745	0.6
Technical Aspect	0.715	0.717	0.56
Instructional quality	0.865	0.866	0.618

5.1.2 Discriminant Validity

In the wake of affirming the convergent validity, we continued to evaluate the discriminant validity utilizing the Fornell and Larcker, 1981 technique. Discriminant validity is assessed by matching the AVE and the squared correlations or the square root of the AVE with correlations. As appeared in Table 2, we have utilized the subsequent strategy, which is to compare the square root of the AVE with the correlations. The criteria is that if the square root of the AVE, appeared in the diagonals are more prominent than the values in the row and columns on that specific construct than we can conclude that the measures discriminant. From Table 2, it very well may be seen that the values in the diagonals are greater than the values in their particular row and column hence indicating the measures utilized in the study are different, in this way exhibit satisfactory discriminant validity

Table 2: Discriminant validity

Constructs	Analysis & Evaluation	Instructional quality	Knowledge & Comprehension	MUI	Social Influence	System Quality	Technical Aspect
Analysis & Evaluation	0.846						
Instructional quality	0.776	0.787					
Knowledge & Comprehension	0.845	0.709	0.869				
MUI	0.701	0.693	0.681	0.738			
Social Influence	0.763	0.728	0.818	0.736	0.849		
System Quality	0.679	0.573	0.657	0.486	0.633	0.763	
Technical Aspect	0.403	0.352	0.438	0.457	0.46	0.705	0.749

5.3 Structural Equation Modelling

Partial Least Squares: To evaluate the structural models' predictive power, we calculated the R2. R2 indicates the amount of variance explained by the exogenous variables (Barclay, Higgins, & Thompson, 1995). Table 2 shows the structural model analysis. From the analysis it was found MOOCs usage was positively related to Academic Learning ($\beta = 0.883$, $p < 0.01$). However the no moderating effect was found between MOOCs usage, academic learning and academic streams 1 ($\beta = 0.011$, $p < 0.01$), and MOOCs usage, academic learning and academic streams 2 ($\beta = 0$, $p < 0.01$).

Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Commerce -> Academic Learning	-0.018	-0.019	0.053	0.342	0.733
Engineering -> Academic Learning	0.035	0.036	0.055	0.647	0.518

MOOCs Usage -> Academic Learning	0.883	0.885	0.035	25.5	0.001
Moderating Effect 1 -> Academic Learning	0.011	0.008	0.051	0.22	0.826
Moderating Effect 2 -> Academic Learning	0	-0.002	0.073	0.005	0.996

6. Discussions and Limitations

Our findings reveal that in this digital era the usage of Massive open Online Education or MOOCs as they are popularly known as, are impacting the learning of the students. The factors that were identified based on UTAT theory, identified the MOOCs usage in higher education. The different levels of Bloom's taxonomy used to measure the academic learning showed positive results for academic learning outcomes. However, no moderation was found between MOOCs usage, academic learning outcome and academic streams, this proves that the MOOCs usage among the students prevails in higher education despite of the academic streams i.e. students in higher education are using MOOCs irrespective of the stream be it engineering or commerce. This study reveals that MOOCs have transformed the ways of learning. The students are benefitting from this new technology and learning outcomes are improving. MOOCs provide students with more flexible and convenient ways to learn at their own pace and availability. The forums have helped the clear their doubts and queries. It has boosted their confidence and has also improved their performance. However, the high dropout rate from the MOOCs program is a major drawback that it is facing, thus this effects the learning outcomes as students leave the program without completing it.

No study is free from limitation, as this study also comprises of some limitations. Firstly, the study on a larger sample size might show some moderating effect, hence the study can be conducted on a larger sample size. Secondly, the research confines to only commerce and engineering students, thus including data from other streams might affects the results, hence another research can be undertaken considering the students of humanities, management, arts and various other streams.

References

Abuaiadah, D., Burrell, C., Bosu, M., Joyce, S., &Hajmoosaei, A. (2019). Assessing Learning Outcomes of Course Descriptors Containing Object Oriented Programming Concepts. New Zealand Journal of Educational Studies, 54(2), 345-356.

Aharony, N., & Bar-Ilan, J. (2016). Students' perceptions on MOOCs: An exploratory study. Interdisciplinary Journal of e-Skills and Life Long Learning, 12, 145-162.

Artino, A. R. (2008). Motivational beliefs and perceptions of instructional quality: Predicting satisfaction with online training. Journal of computer assisted learning, 24(3), 260-270.

Ayub, E., Wei, G. W., & Yue, W. S. (2017, January). Exploring Factors Affecting Learners' Acceptance of MOOCs Based on Kirkpatrick's Model. In Proceedings of the 8th International Conference on E-Education, E-Business, E-Management and E-Learning (pp. 34-39). ACM.

Bates, T. (2014). MOOCs: Getting to know you better. Distance Education, 35(2), 145-148.

Brahimi, T., &Sarirete, A. (2015). Learning outside the classroom through MOOCs. Computers in Human Behavior, 51, 604-609.

Barnes-Mauthe, M., Arita, S., Allen, S. D., Gray, S. A., & Leung, P. (2013). The influence of ethnic diversity on social network structure in a common-pool resource system: implications for collaborative management. Ecology and Society, 18(1).

Bloom, B. S., Engelhart, M. D., Hill, W. H., &Furst, E. J. Krathwohl (1956). Taxonomy of educational objectives. Handbook I: Cognitive domain.

Bruff, D. O., Fisher, D. H., McEwen, K. E., & Smith, B. E. (2013). Wrapping a MOOC: Student perceptions of an experiment in blended learning. Journal of Online Learning and Teaching, 9(2), 187.

Chang, S. C., & Tung, F. C. (2008). An empirical investigation of students' behavioural intentions to use the online learning course websites. British Journal of Educational Technology, 39(1), 71-83.

Coetzee, M., &Potgieter, I. L. (2014). The relation of cognitive learning strategies to psychosocial employability attributes amongst black adult learners in the economic and management sciences field. SA Journal of Human Resource Management, 12(1), 12

Conole, G. (2014). A new classification schema for MOOCs. The international journal for Innovation and Quality in Learning, 2(3), 65-77.

Conference on Electrical, Electronics, Communication, Computer, Mechanical and Computing (EECCMC). IEEE.

Cooper, S., &Sahami, M. (2013). Reflections on stanford'smoocs. Communications of the ACM, 56(2), 28-30.

DeVellis, R. F. (2016). Scale development: Theory and applications (Vol. 26). Sage publications.

De Freitas, Sara. "MOOCs: The final frontier for higher education." (2013).

Deshmukh, V. B., Mangalwede, S. R., & Rao, D. H. (2018). Student performance evaluation model based on Bloom's Taxonomy using fuzzy logic. In International European Commission. Directorate-General for Employment. (2004). Employment in Europe 2004:

Recents Trends and Prospects (Vol. 11). Office for official publications of the European Communities.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. Journal of management information systems, 19(4), 9-30.

Downes, D. (2013). The Delinquent Solution (Routledge Revivals): A Study in Subcultural Theory. Routledge.

Eby, L. T., Butts, M., & Lockwood, A. (2003). Predictors of success in the era of the boundaryless career. Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 24(6), 689-708.

Fornell, C., &Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics.

Gardner, J., Brooks, C., Andres, J. M., & Baker, R. (2018, June). Replicating MOOC predictive models at scale. In Proceedings of the Fifth Annual ACM Conference on Learning at Scale (p. 1). ACM.

Gillani, N., &Eynon, R. (2014). Communication patterns in massively open online courses. The Internet and Higher Education, 23, 18-26.

Gore, H. (2014). Massive open online courses (MOOCs) and their impact on academic library services: Exploring the issues and challenges. New Review of Academic Librarianship, 20(1), 4-28.

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., ...&Calantone, R. J. (2014). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). Organizational research methods, 17(2), 182-209.

Hattie, J. (2009). The black box of tertiary assessment: An impending revolution. Tertiary assessment & higher education student outcomes: Policy, practice & research, 259, 275.

Iqbal, S., Zang, X., Zhu, Y., Chen, Y. Y., & Zhao, J. (2014, December). On the impact of MOOCs on engineering education. In 2014 IEEE International Conference on MOOC, Innovation and Technology in Education (MITE) (pp. 101-104). IEEE.

Jenkins, A., & Unwin, D. (2001). How to write learning outcomes.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. Theory into practice, 41(4), 212-218.

Koukis, N., &Jimoyiannis, A. (2018). MOOCs and Teacher Professional Development: A Case Study on Teachers' Views and Perceptions. International Association for Development of the Information Society.

Li, Y., Sun, J., & Sun, M. (2018). Analysis of the Development Status and Impact of MOOCs in American Higher Education. KuramveUygulamadaEgitimBilimleri, 18(6), 3442-3448.

Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A systematic study of the published literature 2008-2012. The International Review of Research in Open and Distributed Learning, 14(3), 202-227.

Margaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of massive open online courses (MOOCs). Computers & Education, 80, 77-83.

Martin, F. G. (2012). Will massive open online courses change how we teach?. Communications of the ACM, 55(8), 26-28.

Milligan, C., & Littlejohn, A. (2017). Why study on a MOOC? The motives of students and professionals. International Review of Research in Open and Distributed Learning, 18(2), 92-102.

Nath, A., Karmakar, A., & Karmakar, T. (2014). MOOCs Impact in higher education institution: A pilot study In Indian context. International Journal of Engineering Research and Applications, 4(7), 156-163.

Nordin, N., Norman, H., &Embi, M. A. (2015). Technology Acceptance of Massive Open Online Courses in Malaysia. Malaysian Journal of Distance Education, 17(2).

Oechslein, O., Fleischmann, M., & Hess, T. (2014, January). An application of UTAUT2 on social recommender systems: Incorporating social information for performance expectancy. In 2014 47th Hawaii international conference on system sciences (pp. 3297-3306). IEEE.

Ong, C. S., Lai, J. Y., & Wang, Y. S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. Information & management, 41(6), 795-804.

Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. Research and Practice in Technology Enhanced Learning, 12(1), 22.

Rabin, E., Kalman, Y. M., &Kalz, M. (2019). An empirical investigation of the antecedents of learner-centered outcome measures in MOOCs. International Journal of Educational Technology in Higher Education, 16(1), 14.

Ramayah, T., Ahmad, N. H., & Lo, M. C. (2010). The role of quality factors in intention to continue using an e-learning system in Malaysia. Procedia-Social and Behavioral Sciences, 2(2), 5422-5426.

Touve, D. (2012). MOOC's Contradictions. Inside Higher Ed. 11 September.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Vázquez-Cano, E., Fombona, J., &Fernández, A. (2013). Virtual attendance: Analysis of an audiovisual over IP system for distance learning in the Spanish Open University

(UNED). International Review of Research in Open and Distributed Learning, 14(3), 402-426.

Wilson, L. O. (2016). Anderson and Krathwohl–Bloom's taxonomy revised. Understanding the New Version of Bloom's Taxonomy.

Yang, M., Shao, Z., Liu, Q., & Liu, C. (2017). Understanding the quality factors that influence the continuance intention of students toward participation in MOOCs. Educational Technology Research and Development, 65(5), 1195-1214.

Yuan, L., & Powell, S. J. (2013). MOOCs and open education: Implications for higher education.

Zhenghao, C., Alcorn, B., Christensen, G., Eriksson, N., Koller, D., & Emanuel, E. (2015). Who's benefiting from MOOCs, and why. Harvard Business Review, 25, 44.