End-User Perspectives on Effectiveness of Learning Performance Through Massive Open Online Course (MOOCs)

Mohd Shahizan Othman[(✉)], Guligeina Tashimaimaiti,
Lizawati Mi Yusuf, and Waleed Mugahed Al-Rahmi

Faculty of Computing, Universiti Teknologi Malaysia,
81310 Johor Bahru, Johor, Malaysia
shahizan@utm.my

Abstract. The phenomenon of using Massive Open Online Courses (MOOCs) in Malaysia higher education has raised questions regarding its effectiveness in improving the learning performance of students. The researchers have attempted to bridge the gap between MOOCs and learning performance in this study. Thus, this study has explored the factors that able to contribute to the use of MOOCs among university students by promoting learning performance. A total of 513 students received the survey and used in this study. Using the research model, seven predictors have proposed to study the effectiveness of MOOCs' use. Upon analysis, the study revealed that students' satisfaction, perceived enjoyment, and their attitude towards use are the strongest predictors in the context of MOOCs. Therefore, this paper provides insights into students' use of MOOCs that leads to its effectiveness in improving their learning performance.

Keywords: Massive Open Online Courses (MOOCs) · Effectiveness · Learning performance

1 Introduction

Massive Open Online Courses (MOOCs) is a web-based platform offering various courses to students, accessible anywhere, for free. It is reported that 160,000 students from over 190 countries have joined these courses as a proof of their accessibility [1]. The interaction among participants facilitated by discussion forums is the success of MOOCs. Despite its significant role, the problem is manifested in its fading attractiveness to students. There is a lack of research addressing the different incentives behind the students' decision of using MOOCs. The current study attempts to explore and examine the factors that lead to the effectiveness of using MOOCs. The results of the current study are expected to provide invaluable insights into the students' motivation and engagement which should be taken into consideration when designing and improving MOOCs.

2   Literature Review

One of the well-known advantages of MOOCs is that MOOCs offer online learning to a great number of users. The problem is that there is a lack of research on the potential factors related to the behaviors in using MOOCs. Study [2] examined the relation between the participants' interaction behavior in online discussion forums and the rates of completion. Monitoring learners' participation and interaction within MOOCs has been the most common technique followed by researchers [3]. The widely used model in predicting the user behaviors is Technology Acceptance Model (TAM). In an attempt to understand the conditions of accepting or refusing a certain technology, researchers in [4] created Technology Acceptance Model (TAM). TAM model highlights the individuals' acceptance and approval in using the technology. This study is interested in examining both perceived usefulness and ease of use. Hence, utilizing TAM seems to fit this investigation. Study [5] introduced Expectation-Confirmation Theory (ECT) and certain factors from ECT will be utilized.

3   Research Model and Hypotheses

Utilizing TAM and ECT as the foundation of the research model, this research propose a research model with several constructs as shown in Fig. 1.
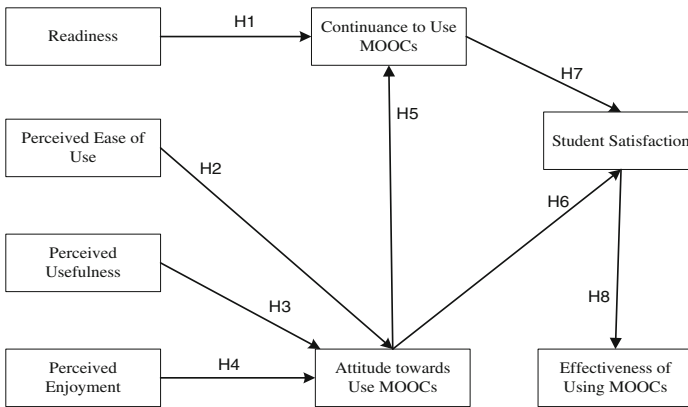

Fig. 1. Proposed research model

The basic assumption of the proposed research model is the effectiveness of using MOOCs and is determined by student satisfaction. In this research model, the research is proposed with eight hypotheses.

3.1   Readiness (RE)

Readiness refers to the extent of preparedness of an organization to embrace new things [4]. The following are the hypothesis proposed in this research:

H1: Readiness (RE) has a positive effect on the continuance (CI) in using MOOCs.

3.2   Perceived Ease of Use (PEU)

Perceived ease of use (PEU) in MOOCs is the degree of believe of an individual that MOOCs' use will be effortless. A study conducted by [6] revealed the positive influence of PEU on perceived usefulness (PU) and attitude in systems' use. The research proposes the following hypothesis:

H2: Perceived ease of use (PEU) has a positive effect on the attitude (AT) towards using MOOCs.

3.3   Perceived Usefulness (PU)

In MOOCs, PU is the degree of believe in MOOCs in helping to meet learning goal targets. Hence, this research proposes the following hypothesis:

H3: Perceived usefulness (PU) has a positive effect on attitude (AT) towards using MOOCs.

3.4   Perceived Enjoyment (PE)

In the context of MOOCs, perceived enjoyment is defined as the active participation in MOOCs, which influences the attitude behavior of the participants. Hence, this research proposes the following hypothesis:

H4: Perceived enjoyment (PE) has a positive effect on attitude (AT) toward using MOOCs.

3.5   Attitude (AT)

The extent where a person feels positive or negative of MOOCs is known as attitude. In the continuance of the use of MOOCs, attitude has not been used as the predictor. Additionally, recent study of attitude was only present in [7], there were no recent studies which show that the attitude is able to confirm the student's satisfaction toward the use of MOOCs. Hence, this research proposes the following hypotheses:

H5: Attitude (AT) of use has a positive effect on the continuance (CI) of use of MOOCs.

H6: Attitude (AT) of use has a positive effect on the student's satisfaction (SS) in using MOOCs.

3.6   Continuance of use of MOOCs (CI)

Previous studies showed that satisfaction brings positive effect on continuance of using MOOCs [8]. However, no previous study showed relationship of continuance of using MOOCs that will influence student satisfaction. Thus, this research proposes the following hypothesis:

H7: Continuance (CI) of use has a positive effect on student's satisfaction (SS) on MOOCs.

3.7   Student Satisfaction and Effectiveness

Effectiveness of use of MOOCs is measured by satisfaction that is driven by intrinsic motivation. However, student's satisfaction to influence on the effectiveness in using MOOCs had not been studied. Thus, this research proposes the following hypothesis:

H8: Student's satisfaction (SS) has a positive effect on the effectiveness (EF) of use of MOOCs.

4   Research Method

Pre and post, manual and online surveys were conducted in MOOC to provide qualitative data for the study. The survey was distributed and collected, targeting 513 students. As for the questionnaire, it was a 48 item questionnaires and Likert-scale was used where 1 denotes 'strongly disagree' and 5 denotes 'strongly agree', adapted from [9].

4.1   Data Collection

The study constructs under investigation were examined through these 48 questionnaire items. As for the 'readiness', the ten items used to examine it were adapted from [10, 11]. Another five items of the questionnaire were used to measure collaborative learning adapted from [12], while six items were used to measure intention adapted from [13]. As student satisfaction is an important construct, it was measured using six items adapted from [14] while the final seven items were used to measure the effective use of MOOC for learning and were adapted from [15]. Upon the distribution of these questionnaires, students were asked to rate the items based on a 5-point scale provided. The measurement in the instrument is validated using the reliability, discriminant validity, and principal factor analysis with high alpha reliabilities [16].

4.2   Data Analysis

The respondents of the current study were distributed based on four criteria: Gender, Age, Country of Origin and their Level of Education. 225 of the respondents were male

and the rest of 288 were females with the percentages of 43.9% and 56% respectively. As for age, a majority of the students forming 87.5% (449) were between 20 and 25 years old while 9.4% (48) of the population were between 26–30 years old. Only 5 participants forming 1.0% of the respondents were between 31 and 35 years old. The final group regarding age was above 35, and that included 11 respondents forming the rest 2.1% of the study. As for the nationalities of the respondents, 469 of them were Malaysians, 29 were Middle Easterners, 8 were Africans, and 7 were Indonesians with the percentages of 91.4%, 5.7%, 1.6%, and 1.4% respectively. As to study level distribution, 4.3% of the respondents were PhD students, 13% were Master students, 71.7% were undergraduates students, and 10.9% were diploma students with the numbers 22, 67, 368, and 56 respectively.

5 Measurement Model Analysis

Structural Equation Modelling (SEM) is the primary tool for analysis and it was utilized in the current study to analyze the quantitative data collection. Together this tool, Amos 23 and Confirmatory Factor Analysis are used in this research. While, Fit Indices are used to identify the overall goodness of fit. The result revealed and accepted the overall model fit. Table 1 shows the fitness of the measurement model.

Table 1. Fitness of measurement model (N = 513)

Model	χ^2	df	χ^2/df	RMR	IFI	TLI	CFI	RMSEA
Base	946.909	532	1.780	0.028	0.925	0.916	0.925	0.053

According to [17], it is acceptable when confirmatory factor analysis results factor loading 0.5 or higher, Cronbach's Alpha $\geq$ 0.70, and Composite Reliability $\geq$ 0.70. Correlation index, crematory factor analysis, and Composite Reliability were used to assess discriminant validity [17]. Correlation index variable should be less than 0.80 [17]. Average variance extracted (AVE) for each component are being the same or higher than 0.5 and its square root should be higher than inter-construct correlations (IC) in association with that element (Table 2).

Table 2. Discriminant validity

	RE	PEU	PU	PE	AT	CI	SS	EF
RE	0.769							
PEU	0.432	0.735						
PU	0.449	0.690	0.754					
PE	0.481	0.549	0.494	0.805				
AT	0.349	0.694	0.657	0.566	0.735			
CI	0.523	0.482	0.327	0.614	0.482	0.745		
SS	0.342	0.531	0.525	0.518	0.597	0.547	0.676	
EF	0.331	0.538	0.583	0.542	0.607	0.609	0.613	0.747

Table 4 illustrates the results of the eight hypotheses proposed in this study. H1 was accepted because the relation between Readiness (RE) of using MOOC and the continuance to use MOOC (CI) is significant. Similarly, H2 was accepted with the relation between perceived ease of use (PEU) and attitude (AT) towards using MOOCs. H3 suggests a structural relation between perceived usefulness (PU) and attitude (AT) towards using MOOCs. The positively significant relation between perceived enjoyment (PE) and attitude (AT) towards using MOOCs approved the accuracy of H4 (Table 3).

Table 3. Item loadings on related factors (N = 513)

Factor	Item	Standard loading	AVE	CR	Cronbach' alpha
RE	RE 1	0.573	0.592	0.878	0.898
	RE 2	0.742			
	RE 3	0.777			
	RE 4	0.781			
	RE 5	0.605			
	RE 6	0.749			
	RE 7	0.745			
	RE 8	0.707			
	RE 9	0.512			
	RE 10	0.695			
PEU	PEU 1	0.708	0.540	0.824	0.843
	PEU 2	0.736			
	PEU 3	0.782			
	PEU 4	0.672			
	PEU 5	0.705			
PU	PU 1	0.765	0.568	0.868	0.868
	PU 2	0.757			
	PU 3	0.758			
	PU 4	0.761			
	PU 5	0.727			
PE	PE 1	0.642	0.592	0.878	0.879
	PE 2	0.780			
	PE 3	0.826			
	PE 4	0.854			
	PE 5	0.756			
AT	AT 1	0.686	0.540	0.779	0.846
	AT 2	0.614			
	AT 3	0.552			
	AT 4	0.544			
	AT 5	0.641			
	AT 6	0.704			

(*continued*)

Table 3. (*continued*)

Factor	Item	Standard loading	AVE	CR	Cronbach' alpha
CI	CI 1	0.705	0.555	0.861	0.858
	CI 2	0.718			
	CI 3	0.776			
	CI 4	0.711			
	CI 5	0.585			
SS	SS 1	0.664	0.500	0.711	0.776
	SS 2	0.605			
	SS 3	0.569			
	SS 4	0.625			
	SS 5	0.596			
EF	EF 1	0.705	0.558	0.883	0.895
	EF 2	0.753			
	EF 3	0.729			
	EF 4	0.717			
	EF 5	0.692			
	EF 6	0.676			
	EF 7	0.708			

H5 is approved because of the relation between AT towards using MOOCs and CI which results in $\beta = 0.731$, $p < 0.001$. H6 is approved as well because the relation between attitude (AT) towards using MOOCs and student satisfaction (SS) results in $\beta = 0.663$, $p < 0.001$. While, H7 is also approved with the relation between CI and SS with the result of $\beta = 0.154$, $p < 0.001$. Final hypothesis, H8 is also accepted as the relation between SS and effectiveness (EF) is significant with the result of $\beta = 0.809$, $p < 0.001$.

Table 4. Hypotheses testing results (general; N = 513)

H	Relationship	Path	Estimate β	SE	CR	P	Result
H1	RE → CI	0.124	0.116	0.053	2.194	0.028	Supported
H2	PEU → AT	0.179	0.184	0.065	2.827	0.005	Supported
H3	PU → AT	0.289	0.289	0.060	4.796	0.000	Supported
H4	PE → AT	0.698	0.688	0.083	8.273	0.000	Supported
H5	AT → CI	0.734	0.731	0.078	9.416	0.000	Supported
H6	AT → SS	0.663	0.663	0.089	7.442	0.000	Supported
H7	CI → SS	0.151	0.154	0.077	1.991	0.047	Supported
H8	SS → EF	0.814	0.809	0.082	9.860	0.000	Supported

6 Conclusion

This study proposed through interaction provided by MOOCs, students can communicate well with their peers leading toward effective learning. TAM theory is utilized in this research for the enhancement of MOOC by highlighting the two concepts which are the intention to use and satisfaction Hence, the students have reflected satisfaction which able to improve the skills through MOOCs. Therefore, this research proves that MOOCs features can be utilized for collaborative learning, communication, and interaction. The results from this research also confirm that the effectiveness in students' learning performance can be influenced by MOOCs. It has the advantage to facilitate the learning process through resource offerings and information sharing. In future, this research can be extended in different ways in order to enhance the MOOCs technology in enriching the learning process. Lecturers and instructors are introduced in MOOCs environment to improve their learning and teaching techniques. As a proposal for future studies, the researchers able to explore the end-user perception of learning performance, for example, the nascent e-learning models such as Siemens' MOOC Framework, Khan's MOOC Framework, and Embi's ADDIE Instructional Design Framework.

References

1. Wildavsky, B.: Evolving toward significance or MOOC ado about nothing? Int. Educ. **23**(3), 74 (2014)
2. Gillani, N., et al.: Communication communities in MOOCs. arXiv preprint arXiv:1403.4640 (2014)
3. Breslow, L., et al.: Studying learning in the worldwide classroom: research into edX's first MOOC. Res. Pract. Assess. **8**, 13–25 (2013)
4. Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technologies. MIS Q. **13**(3), 319–340 (1989)
5. Oliver, R.L.: A cognitive model of the antecedents and consequences of satisfaction decisions. J. Mark. Res. **17**(4), 460–469 (1980)
6. Chiu, C.M., Hsu, M.H., Sun, S.Y., Lin, T.C., Sun, P.C.: Usability, quality, value and e-learning continuance decisions. Comput. Educ. **45**(4), 399–416 (2005)
7. Gütl, C., et al.: Attrition in MOOC: lessons learned from drop-out students. In: International Workshop on Learning Technology for Education in Cloud. Springer International Publishing, Cham (2014)
8. Hone, K.S., El Said, G.R.: Exploring the factors affecting MOOC retention: a survey study. Comput. Educ. **98**, 157–168 (2016)
9. Bruner II, G.C., Kumar, A.: Explaining consumer acceptance of hand-held internet devices. J. Bus. Res. **58**(5), 553–558 (2005)
10. Glynn, L.G., et al.: The prevalence of multimorbidity in primary care and its effect on health care utilization and cost. Fam. Pract. **28**(5), 516–523 (2011)
11. Lau, S.-H., Woods, P.C.: Understanding learner acceptance of learning objects: the roles of learning object characteristics and individual differences. Br. J. Edu. Technol. **40**(6), 1059–1075 (2009)

12. So, H.-J., Brush, T.A.: Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: relationships and critical factors. Comput. Educ. **51**(1), 318–336 (2008)
13. Lee, T.H.: The Design of CMOS Radio-Frequency Integrated Circuits. Cambridge University Press, Cambridge (2003)
14. Moore, B.: Emotional intelligence for school administrators: a priority for school reform? Am. Secondary Educ. **37**(3), 20–28 (2009)
15. MacGeorge, E.L., et al.: Student evaluation of audience response technology in large lecture classes. Educ. Technol. Res. Dev. **56**(2), 125–145 (2008)
16. Murphy, C.A., Coover, D., Owen, S.V.: Development and validation of the computer self-efficacy scale. Educ. Psychol. Measur. **49**(4), 893–899 (1989)
17. Baxter, J.A., Haycock, J.: Roles and student identities in online large course forums: implications for practice. Int. Rev. Res. Open Distrib. Learn. **15**(1), 20–40 (2014)