

Usage of Blackboard and Academic Performance of University Students: A Partial Least Square Approach

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Abstract

Blackboard as a learning management system (LMS) is rarely used in Malaysian universities as it always seen as pricy. In addition, there is little research on blackboard usage among the students in Malaysia. Hence, this study adopted the Technology Acceptance Model (TAM) and aimed to determine the relationship between usage of blackboard (perceived ease of use, perceived usefulness) and students' academic performance in one of the private universities in Petaling Jaya. A total of 100 valid responses were obtained. Researchers analyzed the data using Partial Least Square Structural Equation Modelling (Smart-PLS 3.2.7). The study found that perceived ease of use have a positive and significant relationship with students' academic performance. However, there is no significant relationship between perceived usefulness and academic performance. The ramifications of this study to blackboard developers and university administrators are discussed; in terms of understanding how to improve academic performance through the usage of LMS and social networks site (SNS). Implications of the study, as well as suggestions for future studies are also discussed in this article.

Key words: Academic performance, blackboard, computer-mediated communication, e-learning, Technology Acceptance Model (TAM)

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Introduction

Social media sites and learning management system (LMS) has been utilized in the field of education as primary learning tools (Ansari and Khan, 2020; Siew, Ooi, & Wee, 2016). In terms of positioning, Nyabawa (2016) defined LMS as a tool being tailor-made for online programs that allows students to learn from different part of the world. This LMS is also a platform designed for teachers to upload learning materials, which students can access through it to enhance the learning effectiveness.

However, many previous studies have shown that whether a technology works or vice versa depends on users' attitudes and perceptions (Nyabawa, 2016). As a result, the successful implementation of the LMS depends on the students' and instructors' and their ability to accept the particular system (Al-Drees, Khalil, Meo & Abdulghani, 2015).

For instance, Vrielink (2015) mentioned that Technology Acceptance Model (TAM) was used to investigate the use of blackboard by teachers and students in Dutch police schools, and it was found

that teachers' behavioral intention to adopt blackboard was significantly lower than students, hence, it showed that blackboard was more popular among the students. Vrieling's (2015) research investigated the use of blackboards, but his conclusion was only to determine the behavioral intention of teachers and students to use blackboard, but there is a lack of investigation on other factors affecting students' use which undoubtedly motivate further examination of this topic by researchers. Therefore, this study aims to fill this gap and use TAM's elements namely, perceived ease of use and perceived usefulness to test on the academic performance as an outcome.

In another words, the current study investigating the use of blackboard related to perceived ease of use and perceived usefulness, whether the interaction of blackboard system is clear and determining the specific functions that affect students' perceptions of the LMS itself as being useful and easy to use.

In addition, Moonsamy and Govender (2018) found some staff who have been for blackboard training have also subsequently shifted to other alternative LMS and indicated that blackboard might not be user friendly and it is difficult to use. Although there are studies on the usage of blackboards by staff in the past, the use of blackboard in the university setting is still predominantly among students, hence, more research on the usage of blackboards from the students' viewpoints is needed.

Besides, the findings of the past studied yielded different results, for instance, scholars like (Agholor, Agholor, & Aborisade, 2020; Cho & Yanase, 2020; Ravichandran, 2019; Upadhyay & Sedain, 2019) found that SNS reduces academic performance of the students. However, based on past literature, numerous studies such as (Ansari & Khan, 2020; Ekechukwu, 2017; Chan, Yong, & Harmizi, 2020; Malik, Ahmad, Kamran, Aliza, & Elahi, 2020; Lavauri, Navulla, & Yamin, 2019; Sivakumar, 2020) found that SNS positively influence student's academic performance in term of encouraging discussions, more frequent communication with lecturers, enhance the interpersonal communication skills of students, and to facilitate and manage assignments.

Based on the gaps highlighted, therefore, the current study aims to determine the relationship between usage of blackboard (i. e., perceived ease of use and perceived usefulness) and academic performance of university students.

Literature Review

Theoretical Foundation

Technology Acceptance Model (TAM) was proposed by Davis (1989), and it has been extensively used in technology adoption and has emerged as a prominent model for predicting the user intention and acceptance behavior. Based on the assumption provided by TAM, the model provides pertinent information regarding which design choices would influence user acceptance and should therefore be useful in predicting and assessing user acceptance of technology in the environment (Davis, 1993). TAM introduced two concepts, namely perceived usefulness (the belief that using an application can improve performance), and perceived ease of use (the belief that the application is easy to use). TAM's model holds that the actual use of the system by individuals is determined by behavioral intention, which is determined by perceived usefulness and perceived ease of use (Vrieling, 2015).

Relationship between usage of social networks/ online learning applications and academic performance

Several studies have established the use of TAM in examining the adoption and use of new technology in the education context. For instance, Hamid, Razak, Bakar, and Abdullah (2016) studied the relationship between perceived ease of use and the intention of continuous use of e-government in Malaysia setting and it was conducted on the teaching staff in public schools. The results found that perceived ease of use is positively correlated with the intention of continuous use of e-government.

In addition, Elkaseh, Wong, and Fung (2016) analyzed the influencing factors of perceived ease of use on social media usage in Libyan higher education institutions. The sample of this study are teachers and students from four universities in Libya. The results showed that perceived ease of use is an important factor in predicting the behaviors and intentions of college teachers and students to use social media for learning purposes.

Next, Falode (2018) investigated the impact of perceived ease of use on the virtual experimental suites in the application of physics concepts in Nigerian secondary schools. The questionnaire for this

study was filled out by 66 physics teachers, and results demonstrated that pre-service physics teachers perceived ease of use and usefulness of virtual laboratory package favorably. Based on the above discussion, it is necessary for school administrators to prepare adequate communication technology facilities, which can help teachers and students to use virtual learning environment in their learning process.

Ismail (2016) investigates the influence of perceived ease of use on the usage intention of smartphone users. 92 teachers of AKI University in Semarang City were chosen as the respondents. This study finds that perceived ease of use has a significant and positive impact on the intention of smartphone users, but perceived usefulness has no significant impact. The authors found that this may be due to the smartphones users did not use it frequently.

Nugroho, Dewanti, and Novitasari (2018) investigated the impact of perceived ease of use on student performance on e-learning. In this study, 247 respondents participated in this study, and questionnaire was collected through Internet survey. This study found that perceived ease of use had no effect on students' performance. This study concluded that perceived ease of use had no effect on students' performance when they were forced to use e-learning.

In the study of Camilleri and Camilleri (2019), TAM was used to investigate the difference between the attitudes and pressures of primary school students when playing educational games in school and at home in the Australia setting. The results showed that perceived usefulness was associated with the use of learning games, and they considered learning games was useful. In addition, there is no correlation found between the enjoyment of primary school students in using learning games and the playability of learning games.

Daneji, Mohd Ayub, Wan Jaafar, and Md. Khambari (2017) investigated the impact of perceived ease of use on the intention of students in higher education to continue using massive open online courses (MOOCs) in Malaysian public universities. A total of 447 questionnaires were collected. The results showed that the perceived usefulness of higher education students' intention to continue using MOOCs was significantly correlated. The author believes that this study can provide references for providers to improve MOOCs, as to improve users' willingness to use the platform.

Zogheib (2019) used TAM to investigate the acceptance of college students in the Middle East to use IPAD as a learning tool in class. The respondents of the study were 150 undergraduate students at U.S. private universities in the Middle East. The results revealed that perceived usefulness affects students' attitudes towards IPAD use. Students accept and enjoy using the IPAD as a teaching tool. Based on the discussion above, it urged that university educators should pay more attention to the use of technology in the teaching and learning process.

Dzandu, Boateng, Agyemang and Quansah (2016) investigated the influence of gender and perceived usefulness on social media adoption. The sample were mainly young adults and the findings proven that use of social media can be predicted by perceived usefulness, as there is a significant relationship between the two, but there are no significant differences between the use of social media and gender.

Abdullah, Mohamad Sharif, Azman, and Mohd Arshad (2019) intended to examine the mobile learning adoption and academic achievement of students in higher learning institution. The findings found that perceived convenience/ easy to use has a positive and significant result with student's academic achievement. However perceived information accuracy and perceived mobility found otherwise.

In Indonesia, Rahmat (2019) investigated the factors (perceived usefulness and perceived ease of use) on the attitudes of students regards the academic registration system using TAM model. The results showed that perceived usefulness and ease of use had a positive and significant influence on the user's attitude towards the system. However, it was contrasted with the findings of Akinde and Adetimirin (2017), where they found that perceived usefulness was found negatively related to the use of ICT for teaching in Nigeria universities.

Dulkaman and Mohamad Ali (2016) aimed to investigate the factors related to LMS that influence students' academic performance. Findings showed that effectiveness of the LMS system and students' motivation significantly correlated with their academic performance. The findings suggest that instructors need to pay a greater role in motivating students to use the LMS via innovative and creative means.

Based on the above discussion, and findings from past literature, the study hypothesized that:
H1: There is a significant relationship between perceived ease of use and academic performance.
H2: There is a significant relationship between perceived usefulness and academic performance.

Research Methodology

Research Design

Aliaga and Gunderson (2002) defined quantitative research as an explanation of a phenomena done by collecting numerical data that are analyzed using mathematical techniques. According to Babbie (2015), survey design is the suitable method to apply in this study as it allows the researchers effectively to measure attitudes and opinions of respondents in a large population. Survey method was selected because it was more cost-effective and time-efficient to gather large responses from the identify population (de Leeuw, 2008).

Sampling procedures

The study was performed using convenient sampling procedure to solicit the responses from the students in a private university that use the blackboard as their LMS system through an online survey. A non-probability sampling procedure was used in this study as researchers were unable to get the population list. In relation to the sample size, Sekaran and Bougie (2016), stated that a sample size ranging from 30 to 500 is sufficient and acceptable for social science studies. Hence, this study have 100 valid sample, and it deems sufficient for the data analysis.

Measurement

The survey was divided into three parts. Part A is the demographic profile of respondents who aims to solicit information regard gender, nationality of the student, age groups, race, education, year of study, and likelihood to use the blackboard. Part B are the items regard perceived usefulness and perceived ease of use of blackboard which adopted from Vrieling (2015), and part C is the items on students' academic performance which adapted from (Martha, 2009; Tan & Yates, 2007). Items for Section B and C were measured using the Likert-type scale, where response items range from 1 (strongly disagree) to 5 (strongly agree).

Statistical Significance

All the hypotheses developed were tested using Structural Equation Modelling (SEM). The two-stage analytical procedures were performed using Smart-PLS 3.2.7. SEM is deemed as a suitable statistical tool for this study as PLS-SEM can handle the data from non-probability sampling, with accommodate to the small sample size and from non-normal distribution data (Hair, Risher, Sarstedt, & Ringle, 2019).

Results of the study

Based on Table 1, there are relative equal number of male (54.0%) and female (46.0%) respondents. In terms of age groups, more than half (60.0%) of the respondents aged from 18-22 years old, which indicated that the respondents of this study are young and have high IT literacy. Majority of the respondents are Bachelor's degree students (76.0%) which reveals that the respondents are educated. Furthermore, half of the respondents are currently in the Year 3 of their study (50.0%), which reflected that they are already familiar with the use of the blackboard as a LMS system. For the likelihood to use blackboard application, majority of the respondents (86.0%) are in favour to use blackboard and 14.0% of the respondents are not in favour of using it.

Table 1: Profile of respondents (n=100)

Variable(s)	Category	Frequency	%
Gender	Male	54	54.0
	Female	46	46.0
Nationality	Malaysian	46	46.0
	International	54	54.0
Age groups	18-22	60	60.0
	23-27	33	33.0
	>27	7	7.0
Race	Malay	8	8.0
	Chinese	62	62.0
	Indian	14	14.0
	Others	16	16.0
Education	Foundation/ Diploma	18	18.0
	Bachelor's degree	76	76.0
	Postgraduate degree	6	6.0
Year of study	Year 1	12	12.0
	Year 2	27	27.0
	Year 3	50	50.0
	Year 4	9	9.0
	Year 5	2	2.0
On daily basis, how likely do you use Blackboard?	Not at all likely	2	2.0
	Not so likely	12	12.0
	Somewhat likely	35	35.0
	Very likely	36	36.0
	Extremely likely	15	15.0

Before testing the model, this study examined the common method variance (CMV) which is the method bias or same source bias that may arise using self-report measures from the similar sample in survey method (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In this study, the correlation matrix procedure was used as one of the methods to detect CMV (Bagozzi, Yi, & Phillips, 1991; Tehseen, Ramayah, & Sajilan, 2017). CMV occurs when there is a substantially high correlation is found among latent variables ($r > 0.9$). The outcome of the correlation test indicated that none of the latent variables correlated more than 0.90 (See Table 2). Hence, CMV was not an issue in this study.

Table 2: Correlation matrix among the variables

	PEOU	PU	AP
PEOU	1		
PU	.674**	1	
AP	.414**	.378**	1

** Correlation is significant at the 0.01 level (1-tailed).

Measurement Model

For the measurement model, convergent validity and discriminant validity were assessed. The convergent validity of the measurement model was ascertained through factor loadings, average variance extracted (AVE) and composite reliability (CR) (Hair, Hult, Ringle, & Sarstedt, 2017).

As presented in Table 3, the factor loadings were all greater than 0.7 which suggested by Hair, Ringle, and Sarstedt (2011). In addition, the CR and AVE obtained were also higher than 0.7 and 0.5 respectively (Hair *et al.*, 2017). Hence, all the convergent validity criteria were met for this study.

Discriminant validity is established if all the HTMT values obtained are less than the required threshold of HTMT_{.85} as per suggested by Kline (2011). As shown in Table 4, all the HTMT values less than HTMT_{.85} indicating that discriminant validity is ascertained. Collinearity issue was assessed using variance inflation factor (VIF) with a cut-off value of 3.3 as suggested by Diamantopoulos and Sigauw (2006). The VIF values as presented in Table 5 were all less than 3.3 indicating no collinearity issues.

Table 3: Convergent validity

Variable(s)	Items	Loadings	Cronbach's Alpha	rho_A	CR	AVE
Perceived ease of Use (PEOU)	PEOU1	0.851	0.926	0.945	0.943	0.769
	PEOU2	0.895				
	PEOU3	0.923				
	PEOU4	0.848				
	PEOU5	0.866				
Perceived Usefulness (PU)	PU1	0.912	0.906	0.928	0.930	0.729
	PU2	0.897				
	PU3	0.923				
	PU4	0.816				
	PU5	0.703				
Academic Performance (AP)	AP1	0.767	0.860	0.872	0.905	0.704
	AP2	0.856				
	AP3	0.824				
	AP4	0.905				

CR= Composite reliability; AVE = Average Variance Extracted

Table 4: Discriminant Validity Using HTMT Ratio

	AP	PEOU	PU
AP			
PEOU	0.453		
PU	0.433	0.737	

Structural Model

The structural model was tested using bootstrapping procedures with a resample of 5,000 (Hair *et al.*, 2017) to assess all the relationships between the constructs, its corresponding beta and t-values. The results are shown in Table 5.

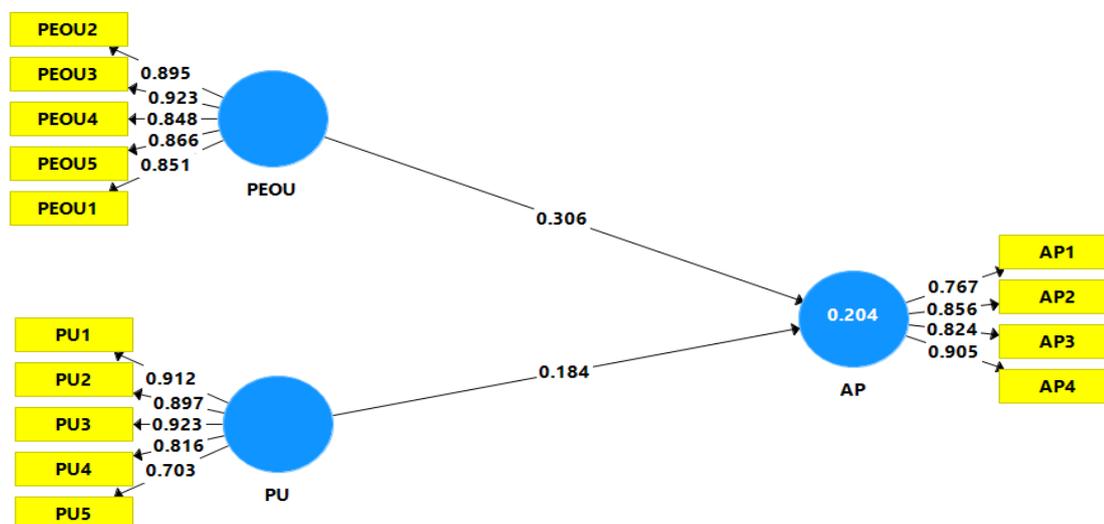


Figure 1: Path Coefficient Structural Model

Perceived ease of use ($\beta = 0.306, t = 2.261, p = 0.012$) was found to have a positive relationship with academic performance. However, perceived usefulness showed no significant relationship with academic performance. This gives support for H₁, where H₂ was rejected. R^2 of 0.204 suggests that there is 20.4% of the variation in academic performance was explained by the perceived ease of use and perceived usefulness. In this study the Q^2 values are more than zero for academic performance ($Q^2 = 0.122$) suggesting that the model has sufficient predictive relevance.

Table 5: Direct Effects

	Relationship	Std. Beta	Std. Errors	T value	P	LL (5%)	UL (95%)	Decision	R ²	Q ²	f ²	VIF
H1	PEOU -> AP	0.306	0.135	2.261*	0.012	0.041	0.496	S	0.204	0.122	0.064	1.856
H2	PU -> AP	0.184	0.136	1.354	0.088	-0.075	0.376	NS			0.023	1.856

** $p < 0.01$, * $p < 0.05$

*S = Supported; NS = Not supported

Discussion

Overall, this study provides some supports for TAM, where perceived ease of use emerged as a significant predictor of academic performance. This finding also parallels with research by numerous past studied (Ansari & Khan, 2020; Ekechukwu, 2017; Malik, *et al.*, 2020; Lavauri, *et al.*, 2019; Sivakumar, 2020) who found that the use of different types of SNS has a strong impact on learners' performance.

This finding also supports previous research by Al-Naibi (2016), where to improve users' understanding of the different functionalities of blackboard, blackboard developers can provide more training to the customers, or add solution system where there are no clear plugins, so as to improve blackboard interactions (Vrieling, 2015). When users perceive that the system is easy to use, they are more likely to use it in the future, and consequently, this will improve their academic performance (Abdullah *et al.*, 2019) as well as intention to use (Ismail, 2016).

In addition, this study believes that how users utilize the wide range of functionalities available on blackboard will become a trend in the future. Therefore, findings from this study can be a point of reference for blackboard developers, where they should take into account future training for users to improve users' perceived ease of use and use efficiency. Finally, this study finds that blackboard, as an online LMS, has a positive impact on students' academic performance during the COVID-19 pandemic

period. As teaching and learning transitions from face-to-face to fully online and by having LMS that is easy to navigate and encourage students' independent learning will definitely lead to more enjoyable learning experiences, as well as increased academic performance (Han & Shin 2016). Therefore, this study demonstrates that the use of blackboard as an online LMS can positively influence student's academic performance during the pandemic period.

Furthermore, the results of this study aligned with Akinde and Adetimirin's (2017) findings that perceived usefulness was found negative related to the use of ICT for learning, however, the findings of Daneji *et al.*, (2017) found that perceived usefulness can enhance the intention to use LMS platforms. First of all, this study finds that university administrators and lecturers can improve the perceived usefulness of blackboard by encouraging students to use it. According to Dulkaman and Mohamad Ali (2016), teachers can motivate students to use blackboard to get better results. Improving the scores using blackboard will make students feel it more useful, which in turn will improve blackboard's perceived usefulness. In addition, the study found that the university allows students to use blackboard more frequently to achieve better academic results. This supports the notion of Nyabawa (2016), which shows that frequent use of LMS is conducive to improve students' academic performance. In addition, this study finds that students need better understanding of the different functionalities of blackboard through training and teaching, so as to improve the efficiency and ease of use. This will provides reference value for university administrators on how to promote blackboard's usability and students' learning efficiency, through relevant trainings and workshops, and enforcement of blackboard use through teaching and learning policies.

Conclusion & Recommendations

In conclusion, this study applied the TAM model to investigate the students' use of blackboard based on perceived usefulness and perceived ease of use, and to determine the relationship between these variables with the academic performance. The results showed that perceived ease of use of blackboard have a significant positive impact on students' academic performance, but perceived usefulness did not have a significant relationship with academic performance.

Implications of the Study

In term of theoretical contributions, this study utilized the perceived ease of use and perceived usefulness in the TAM model, and supported the association between perceived ease of use, perceived usefulness and academic achievement. This correlation supports the results of this study and indicates that the TAM model can be used to measure usage of LMS and to enhance the academic performance.

This study proposes several implications for blackboard development and schools. In terms of blackboard development, this study finds that blackboard can be improved in terms of being more user friendly; functions being difficult to manage in blackboard is a common problem in students' use, which will affect students' perceived ease of use, thus, affecting academic performance and blackboard's popularity among students. Therefore, this study believes that it is very important to improve the functional friendliness of the blackboard system.

In addition, this study suggests that the repairing of blackboard technical problems will become a trend in the future. Based on this study, having the relevant personnel to repair the blackboard technical problems will improve the user's perceived ease of use and perceived usefulness. In turn, this will have reference value, where improving the function of these will promote the integration of blackboard as a LMS system and its popularity. Thus, this will also help to promote the use of blackboard in other educational institutions in Malaysia. Also, although this study found that it was easy for users to learn how to use blackboard, the results also indicated that users felt that the interaction of the blackboard was not clear and when that occurred, blackboard does not demonstrate efficiency in terms of use. Therefore, this shows that users are lacking understanding and no interest of learning more advanced functions of the blackboard, leading to situations where they think the interaction in the blackboard system as unclear and inefficient.

Limitations and recommendations for future research

The first limitations of this study were due to the small sample size and the use of non-probability (convenience) sampling. Future studies could increase the sample size in order to obtain more accurate results, and to generalize the findings to the population.

Another limitation of this study is that most of the sample are undergraduate students, which comprises of 71 % of the sample. It would be also interesting to compare findings across different universities in Malaysia, i.e., public or private higher educational institutions that have utilize blackboard as their LMS, in order to provide more conclusive support to the use of TAM in understanding adoption of blackboard as a LMS in higher educational institutions across Malaysia.

The third limitation of this study is the current study only applied quantitative method, which limits the exploration on the individual's feelings, views on the usability of blackboard, and how it contributes to academic performance. Therefore, future studies can use qualitative methods to obtain a deeper understanding regards the adoption of LMS.

Last but not least, this study only include perceived ease of use and perceived usefulness in the TAM model, where only 20.4% of the dependent variable manage to be explained by these two variables. Hence, for future studies, researchers can include more variables, such as the perceived reliability, perceived functional ability, perceived trust, perceived enjoyment, privacy concerns to name a few to add to the current model, and to test the mediating and moderating effects to obtain a more robust results in explaining the usage of technology in the education setting.

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APPENDIX

Perceived Ease of Use

1. Learning how to use the Blackboard is easy for me.
2. The interaction with the Blackboard is clear and understandable.
3. I find Blackboard is easy to use.
4. All features provided in the Blackboard are user friendly.
5. It is easy for me to become skillful at using Blackboard.

Perceived Usefulness

1. Using Blackboard would improve my performance in the subject/course.
2. Using Blackboard would increase my productivity in the subject/course.
3. Using Blackboard would enhance my effectiveness in the subject/course.
4. I find Blackboard is useful in the subject/course.
5. The Blackboard complements and enhances my face-to-face classes.

Academic Performance

1. Since the starting of university studies, I have never failed an examination.
2. I manage to perform in my past semester examinations.
3. I am good in most of my university modules.
4. I am able to achieve the academic goals I have set.