

DRIVERS OF THE MOBILE-LEARNING MANAGEMENT SYSTEM'S ACTUAL USAGE: APPLYING THE UTAUT MODEL

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ABSTRACT. *Higher education institutions need to understand the factors that support students to use mobile-LMS for online learning. Therefore, this research aims to identify and analyze the factors that promote the actual use of the mobile-LMS by students that take online learning programs. The unit of analysis involved 500 students using such programs as the target sample, and they were filtered based on using the mobile-LMS for at least two semesters. This study used a quantitative approach with multivariate SEM-PLS analysis to answer the research hypothesis, and the factors examined employed the concept of the Unified Theory of Acceptance and Use of Technology (UTAUT). Subsequently, it was validated and confirmed that performance and effort expectancy, social influence, and facilitating conditions positively and significantly affect behavioral intention. Facilitating conditions and behavioral intention also positively and significantly influence the actual use of the mobile-LMS. Consequently, the UTAUT concept displays a motivating factor for students to continuously use the mobile-LMS in online learning.*

Keywords: UTAUT, Mobile-learning management system, Online learning, Higher education, SEM-PLS

1. Introduction. Learning to use mobile technology is becoming a fast-growing trend in the distance education system because of cellular technology's flexibility, which allows students to study freely anywhere and anytime, without time and space limitations. Therefore, the Indonesian government recommends that every university open an online learning program to allow mobile-LMS to become the primary tool and investment to support the system's success. Presenting a mobile-LMS is very relevant to sustain the educational activities of online learning students and other individuals, such as workers and professionals that spend time at their jobs [1,2].

Mobile learning is a new learning tool backed by mobile devices, alongside the ever-present communication technology and a smart user interface [3]. The coming of mobile learning enables students to experience personalized education through their portable devices. Realizing mobile-LMS is a strategic action to improve students' and lecturers' learning process and interaction in university institutions. As a tool, mobile-LMS, functions to espouse education management and make interactions between learners and teachers more comfortable. Consequently, students and lecturers can communicate with each other anytime and anyplace by applying this technology.

Online learning initially used website-based LMS, which eventually developed into a service that can be accessed from mobile devices [4]. The presence of a mobile-LMS makes the online learning system more flexible, gives lecturers access to lessons, and allows students to take classes without time and location limits [5].

Although mobile-LMS makes it easy for students to learn with their mobile devices, research on their intentions to use this system is still lacking, as studies focus on the level

of intention to utilize the technology. The key problem is that the high investment of universities in providing the mobile-LMS is not accompanied by students' desire to use it for academic purposes. Learners may have different opinions about this system, as, for instance, some did not realize the possible value of the system before adopting it [6]. Although there are few existing empirical studies on mobile-LMS adoption by students in Indonesia [7], they discuss the level of intention to utilize a mobile-LMS and not the system's actual use. Therefore, this study traces the actual usage, even though it is based solely on students' perceptions of mobile-LMS. Indonesia is a country with a high cellular penetration rate, and university undergraduates can readily obtain many mobile services with the support of excellent wireless network.

This study's scope was to examine the actual usage of a mobile-LMS, BINUS Mobile for Students by BINUS Online Learning students in Bina Nusantara University. The research adopted the Unified Theory of Acceptance and Use of Technology (UTAUT) as the testing model and involved six hypotheses to be proven. Meanwhile, the model was tested empirically using survey data collected from 500 students at BINUS Online Learning, which were then analyzed via SEM-PLS. From the results obtained, performance expectancy, effort expectancy, social influence, and facilitating conditions significantly influence behavioral intention, while facilitating conditions and behavioral intention were also shown to significantly affect the actual usage of the mobile-LMS.

2. Literature Review.

2.1. The adoption of the mobile-LMS technology in academic environments.

Prior studies by several scholars reveal the development of a new technology acceptance model based on consumer behavior theory, i.e., attitudes and behavior. These models include the Technology Acceptance Model (TAM) [8], Theory of Planned Behavior (TPB) [9], Innovation Diffusion Theory (IDT) [10], and the Unified Theory of Acceptance and Use of Technology (UTAUT) [11], developed from TAM. UTAUT provides a tool for leaders to test the likelihood of introducing new technology and understanding the drivers of acceptance to proactively design interventions, such as trainings, and outreaches. Users that are less likely to adopt and utilize the modern system are the target of these interventions. UTAUT, which has been used in academic settings by many scholars, presents a slight difference when implemented in these environments [12]. Regardless, it contributes to a better understanding of the acceptance and usage of ICT in the academic setting even though the issues in such settings differ slightly from the original model executed in non-academic environments. Implementing UTAUT will definitely help with understanding the mobile-learning management system's acceptance and use. These beliefs refer to the results of previous studies that apply this theory in technology adoption, including LMS [13-15] and mobile-LMS [16,17].

2.2. Research model and hypotheses. This study is based on the confirmation of UTAUT's success in understanding students using the LMS and mobile-LMS in academic environments. It explicitly applies the UTAUT model in the mobile learning management system's actual use, earlier discussed by prior research (see Figure 1). This study defines Performance Expectancy (PE) as students' belief that using this system will improve their academic behavior and Effort Expectancy (EE) as a student assessment using a mobile-LMS associated with the efforts required in the utilization. Social Influence (SI) is described as students' belief in the surrounding people, which gives them the confidence to use a mobile-LMS. Meanwhile, Facilitating Conditions (FC) is the extent to which learners believe in the system and the support offered by institutions, while the Behavioral Intention of use (BI) shows students' strong tendency to use a mobile-LMS. Actual usage is the students' perception of the mobile-LMS utilization frequency within a certain period.

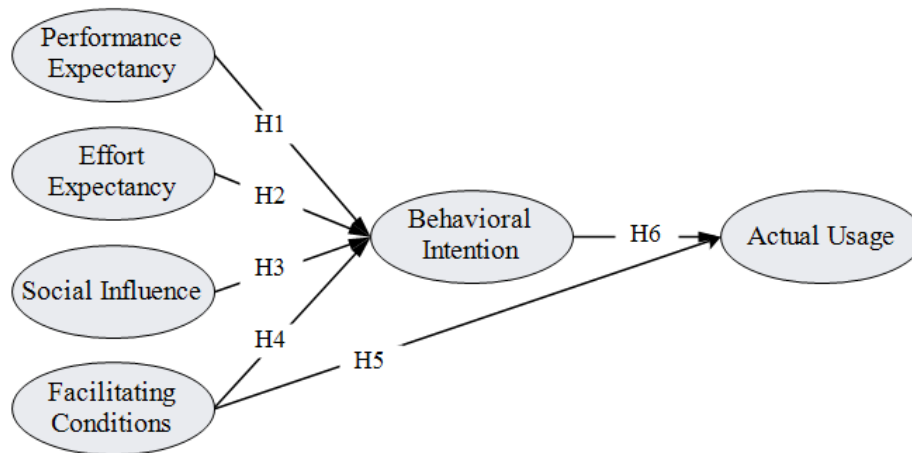


FIGURE 1. Hypothesis model

Six hypotheses were tested based on the research model, and each statement, as in Figure 1, is briefly explained below.

UTAUT proposes to follow how its constructs, PE, EE, SI, and FC positively affect BI, while BI and FC were hypothesized to determine actual use. Some of these bonds have been proven in prior studies, such as Mobile Cloud Learning (MCL) [16], LMS [13], mobile-LMS [14], and LMS Moodle [15]. Therefore, the following hypotheses were proposed.

H1-H4: PE, EE, SI, and FC have a positive effect on the behavioral intention to adopt mobile-LMS.

H5: FC has a positive effect on the actual usage of mobile-LMS.

H6: Behavioral intention has a positive effect on the actual usage of mobile-LMS.

3. Method. This quantitative study employed twenty-two question items developed by Venkatesh et al. [18] (see Appendix). Each item was measured on a Likert scale of 1-5, from strongly disagree (1) to strongly agree (5). Then, the original questionnaires were translated, adjusted, validated, and distributed to the students involved in the study. The sample comprised 500 persons and utilized the Slovin formula with an error margin of 5%. The selected respondents were current students in a fully online program at BINUS Online that used the mobile-LMS, known as 'BINUS Mobile for Students', in their teaching and learning process. Meanwhile, the main study aim was to assess the level of acceptance and use of this system via the UTAUT model. Every student was given an online questionnaire through their mobile-LMS, and the data were analyzed using SEM-PLS with SmartPLS 3.2.8 software.

4. Result and Discussion. The research model was tested using SmartPLS 3.2.8 with SEM-PLS, which comprised two measurements, namely the outer and inner models [19]. Tables 1 and 2 present the outer model results, consisting of the loading factor value, Average Variance Extracted (AVE), discriminant validity, composite reliability, and Cronbach's alpha of each variable. All the outer test models were satisfied, and each item had $AVE > 0.5$, alongside loading factor value, CR, and Cronbach's alpha > 0.7 . Meanwhile, the value of discriminant validity, which referred to the Heterotrait-Monotrait Ratio (HTMT) criteria was below 0.9 [19]. Table 3 and Figure 2 displayed the inner model results, consisting of the value of standardized regression coefficients, T -statistics, and P -values. All the hypotheses tested, i.e., H1 to H6 were confirmed to be positive and significant.

R-Squared (R^2), shown in Figure 2, is the coefficient of determination and implements a measure of how well the model predicts the substantive effect of exogenous variables

TABLE 1. Loading factor, AVE, composite reliability and Cronbach’s alpha test

Variable	Item	Loading factor	AVE	CR	Cronbach’s alpha
PE	PE.1	0.900	0.790	0.938	0.911
	PE.2	0.924			
	PE.3	0.852			
	PE.4	0.877			
EE	EE.1	0.843	0.706	0.907	0.864
	EE.2	0.848			
	EE.3	0.849			
	EE.4	0.829			
SI	SI.1	0.896	0.858	0.948	0.917
	SI.2	0.937			
	SI.3	0.944			
FC	FC.1	0.855	0.670	0.890	0.835
	FC.2	0.869			
	FC.3	0.803			
	FC.4	0.742			
Behavioral intention	BI.1	0.904	0.809	0.927	0.882
	BI.2	0.915			
	BI.3	0.879			
Actual usage	AU.1	0.910	0.724	0.913	0.870
	AU.2	0.902			
	AU.3	0.847			
	AU.4	0.734			

TABLE 2. Discriminant validity – Heterotrait-Monotrait Ratio (HTMT)

	AU	BI	EE	FC	PE	SI
AU						
BI	0.856					
EE	0.885	0.851				
FC	0.887	0.799	0.824			
PE	0.841	0.766	0.887	0.692		
SI	0.747	0.710	0.709	0.619	0.672	

TABLE 3. Hypothesis testing

Model	Path	β	T-stats	P-value	Decision	Effect size	R-Square
1	PE→BI	0.159	3.106	0.002	Accepted	0.026*	0.654 (moderate)
	EE→BI	0.303	4.961	0.000	Accepted	0.074*	
	SI→BI	0.205	3.674	0.001	Accepted	0.067*	
	FC→BI	0.269	5.500	0.000	Accepted	0.100*	
2	FC→AU	0.466	9.648	0.000	Accepted	0.350***	0.677
	BI→AU	0.428	8.865	0.000	Accepted	0.295**	(Strong)

Note: * = slight effect; ** = medium effect; *** = powerful effect [20].

on endogenous variables. The result of the magnitude of the variance in the students’ behavioral intention towards using mobile-LMS, according to Table 3, gave a value of 65.4% for PE, EE, SI, and FC. Meanwhile, the actual mobile-LMS usage produced 67.7% for FC and BI. The students’ behavioral intention to adopt a mobile-LMS was formed when they felt the system could support their academic activities, improve performance,

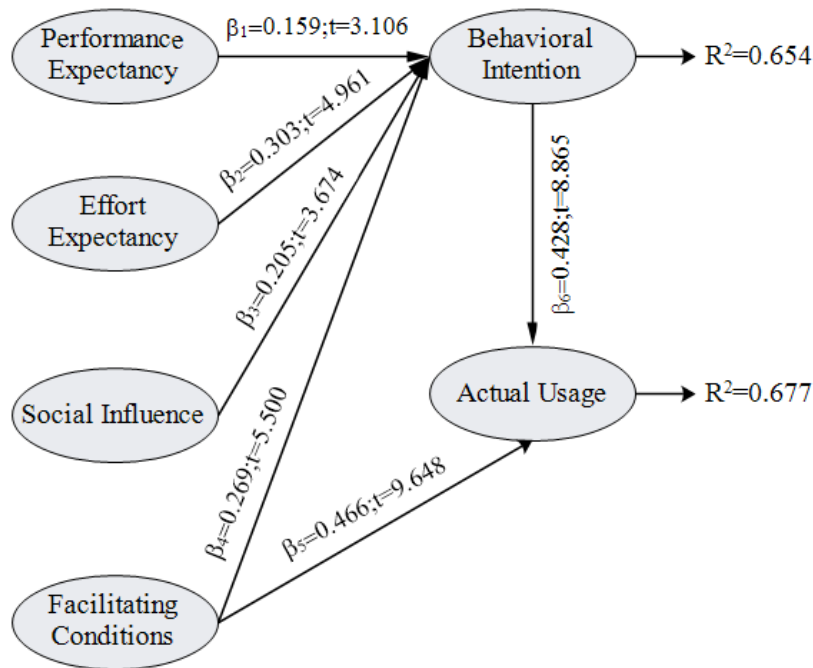


FIGURE 2. Structural model (β and T -value)

and was easy to use. Also, receiving support from someone influential and the ease of access contributed to their adoption of the system. Regarding actual use, students who had the knowledge, resources, and an intense desire to access the system were believed to regularly increase the frequency of mobile-LMS utilization.

The PLS model was also tested with Q^2 predictive relevance by the model and its parameter estimates. Since the value of $Q^2 = 0.888$ was greater than null, the model was assumed to have good predictive relevance. This result indicates that each coefficient of the relationship between the constructs has an excellent predictive value in explaining the actual use of mobile-LMS. Also, the FC f^2 value displayed a strong relationship with AU. The power of the research model's predictive value proves that the facility condition is a better construct than behavioral intention regarding the actual use of mobile-LMS. Consequently, FC had a moderate effect on AU, while PE, EE, SI, and FC had weak impacts on BI.

5. Discussion and Conclusion. This study proves that performance and effort expectancy, alongside social influence and facilitating conditions positively and significantly affect students' behavioral intention to use mobile-LMS. Also, facilitating conditions and behavioral intention displayed similar effects on actual mobile-LMS use.

These results were consistent with previous research concerning the use of technology in learning, involving LMS Moodle, mobile-LMS, and Mobile Cloud Learning and LMS, and succeeded in filling the rejected hypothesis gap. For example, it accepted the social influence hypothesis on behavioral intention in line with earlier studies [13,15], where previous research rejected it [14,16]. The effect of performance expectations on behavioral intention was also supported in several earlier research [13,15,16], while others rejected the hypothesis [14]. Furthermore, the influence of effort expectation on behavioral intention favored the previous study by Sultana [16], though other research rejected the hypothesis [13-15]. The effect of facilitating conditions on behavioral intention strengthened previous research [14,15] and contrasted with other studies [13,16], which rejected it. Facilitating conditions affect the actual usage of mobile-LMS, supporting the research of Ahmed et al. [13], and correcting the hypothesis by Sultana [16], which rejected the

premise. Lastly, the study showed that behavioral intention influences actual mobile-LMS use, in correspondence with previous research [13,16] and succeeded in refining the previous hypothesis, which rejected this [14].

Overall, effort expectancy had the most substantial effect on behavioral intention to use compared with performance expectancy, social influences, and facilitating conditions. This finding explains that students feel better and more comfortable using a mobile-LMS compared to a website-based LMS due to the possibility of access via smartphones.

From a theoretical perspective, this study can help research education, as it broadens and enhances understanding of mobile-LMS adoption for online learning and adds to the widespread discussion of this topic. It extends the findings of technology acceptance models in online learning to mobile-LMS use, as few employed the UTAUT model to investigate the actual use in higher education.

This research implication involves helping educational institutions learn how undergraduate scholars want to cooperate and use the mobile-LMS, as well as provides insights in designing and implementing portable technology for educational objectives. The university's operations can ensure that the development team is competent in designing a user-friendly and beneficial mobile-LMS for student learning success as difficulty and disruption of the system's accessibility can reduce the intention to use. Finally, this study's results are useful for application developers and universities that provide mobile-LMS to understand students' critical factors in adopting the technology.

There are several limitations of this study, as first, it did not test moderating variables, such as age, gender, and experience, as suggested by Venkatesh et al. [11]. Second, only the mobile-LMS usage from students' perceptions and not from the actual frequency of use was evaluated. In the future, considering the usage variables based on the login time of the mobile-LMS is recommended. Third, a longitudinal study, instead of the cross-section that was employed, should be used to evaluate the actual usage behavior of the mobile-LMS.

Finally, this study was conducted to explore the intentions and actual behavior of higher education students to use mobile-LMS. The UTAUT research model and the six research hypotheses proved to be accepted after empirically testing 500 students at BINUS Online Learning. Consequently, the analysis revealed that all the relationships between the hypothesized variables are positive and significant.

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Appendix.

Performance Expectancy

- 1) Using mobile-LMS is beneficial to support all my academic activities.
- 2) Using mobile-LMS can fulfill my expectations of achieving essential goals during the lecture process.
- 3) Mobile-LMS helps me complete all academic activities.
- 4) Using mobile-LMS can improve academic performance.

Effort Expectancy

- 1) For me, knowing how to use mobile-LMS is easy.
- 2) My interplay with the mobile-LMS is clear and comprehensible.
- 3) I find the mobile-LMS easy to use.
- 4) It is simple for me to become an expert in using mobile-LMS.

Social Influence

- 1) Somebody vital to me suggested studying online because of the mobile-LMS.

2) People who influence my behavior suggested studying online because mobile-LMS is employed.

3) People whose opinions I respect suggested learning online because it uses mobile-LMS.

Facilitating Condition

1) I have the resources needed to use mobile-LMS in my education.

2) I have the essential knowledge required to use mobile-LMS.

3) My mobile-LMS fits with the separate technologies I use.

4) I can get help from other people when I have difficulty using mobile-LMS.

Behavioral Intention

1) I plan to continue using mobile-LMS in the future in my education.

2) I will try using mobile-LMS in my education at some point.

3) I plan to keep using mobile-LMS regularly in my education.

Actual Usage

1) I routinely use mobile-LMS in my education.

2) Using mobile-LMS is an enjoyable experience.

3) I am currently using mobile-LMS as a supporting tool in my education.

4) I spend a lot of time using mobile-LMS in my education.