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A Study on Technology Acceptance Model for Using Learning Management System (LMS) Among University Students: Empirical Study from a Private University in Bogor

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Abstract

Internet-based online learning models are an option for more effective and efficient learning. The use of the Learning Management System (LMS) application in university education has become mandatory following the Covid-19 pandemic. This research aims to investigate the Technology Acceptance Model (TAM) in analyzing students' perceptions, attitudes, and behavior regarding the acceptance and use of LMS. The goal is to provide recommendations for enhancing the effectiveness of learning outcomes in higher education. This research was conducted at a private university (PTS) in Bogor by taking a random sample of 720 respondents from a population of 2,212 new students with a sampling error of 5%. The research results show that technology acceptance factors follow the process as described in attitude theory and the theory of planned behavior. The willingness to use the LMS well is greatly influenced by the cognitive processes that students receive in building their perception of ease and usefulness in accepting technology in learning.

1. Introduction

with internet-web-based applications, offers advantages such as widespread implementation and the ability to overcome physical boundaries, which is not feasible in face-to-face learning.

This platform has been widely adopted as a learning medium in universities, training institutions, and companies. During the COVID-19 pandemic, the use of LMS became increasingly popular, especially in universities where it was mandated for both lecturers and students. Even after the pandemic, when learning transitioned back to offline classes, the LMS application continued to be used as a medium for information and communication between higher education institutions, lecturers, and students.

The LMS menus are designed to be user-friendly, facilitating various tasks such as organizing lecture sessions, posting materials, sharing learning videos, recording attendance, assigning tasks, and uploading completed assignments and assessments. The TAM model, well-known in the literature for various technology adoption studies, successfully predicts and explains actual technology use (Huang and Teo, 2021).

However, despite the widespread use of LMS in universities, there are still challenges, including technical issues and inconsistent use. Research by Zharova et al. (2020) highlights several problems faced by students: 1) Perception that using the system complicates the learning process (29%); 2) Reluctance to invest time in mastering the system (24.6%); 3) Lack of understanding of the purpose and benefits of the system (39%); and 4) Lack of motivation to engage with the system (31.9%). Another study by Abdulrahman (2019) investigated

the underutilization of LMS, revealing that perceived ease of use (PEU) and perceived usefulness (PU) are influenced by factors related to technology, organization, and environment.
Usability is an important indicator because only when students believe that using an LMS can improve teaching efficiency, performance, and productivity will they be willing to use it regularly. Furthermore, the ease of use of an LMS is an effective motivator because students can use most of the tools without studying them in detail or having in-depth knowledge to operate them (Brady and Reilly, 2020). The process of forming attitudes and willingness to use an LMS is explained in attitude theory, where behavioral intention or behavioral intention to use (BIU) is strongly influenced by cognitive processes in building perceptions about ease of use and perceptions of usefulness.
Therefore, the aim of this research is to determine the important factors that influence the use of LMS technology by students by examining the direct relationship between perceived ease of use (PEU) and perceived usefulness (PU) on behavioral intention to use (BIU) and actual use (AU). It is hoped that the results of this research will be useful for researchers, university leaders, policymakers, and LMS designers to increase the effectiveness of using LMS in more efficient learning and teaching processes.

2. Literature Review

All Davis (1989) proposed a theory conceptualized based on the Theory of Reasoned Action (TRA), which has been described as a credible model to assist in the evaluation of various types of information technology systems. It is considered an important model for determining predictors of human behavior towards technology adoption (Granic and Marangunic, 2019). In the technology adoption literature, TAM is the foundational theory for optimal standards (Abdullah and Ward, 2016). TAM has become one of the most practical theoretical models in the field of using information systems for organizational development, as observed by Lee et al. (2015).

Conceptually, the Technology Acceptance Model developed by Davis et al. (1989) is based on the Theory of Reasoned Action (TRA) from Ajzen and Fishben (1985) and its subsequent development, namely the Theory of Planned Behavior (TPB). This model successfully explains the adoption of different information technology instruments. According to Davis et al. (1989), this model predicts the likelihood of new technology being adopted within a group of individuals or organizations. In their meta-analysis research, Ma and Liu (2004) reported that the TAM model continues to be developed and revised for application in various fields. They explained that the adoption of various technologies, ranging from software packages to various online service systems, was analyzed through TAM research, focusing on ensuring the level of technology application use and analyzing characteristics of technology application users to increase effectiveness.

The TAM model was initially introduced by Davis et al. (1989) to explain the acceptance and use of information technology. It is based on the "Theory of Reasoned Action" developed in Social Psychology by Fishbein and Ajzen (1975). The Theory of Reasoned Action (TRA) is a general system designed to explain almost every type of human behavior, emphasizing individual beliefs to predict human behavior (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TAM model exclusively focuses on the analysis of information technology (Chau, 1996; Featherman & Pavlov, 2003; Mathieson, 1991; Taylor & Todd, 1995; Venkatesh, 2000). In contrast to the TRA model, it establishes in advance the factors conditioning the user's attitude towards innovation, behavioral intention, and the intensity of system use.

Two key factors in determining intention, which predict innovation development and are present in all TAM model development studies, are perceived usefulness (PU) and perceived ease of use (PEU) (Davis & Wiedenbeck, 2001; Davis et al., 1989). Perceived usefulness is considered an extrinsic motivation for users and is defined as the extent to which a person believes that the use of a particular system can improve performance. Davis (1989), Lederer, Maupin, Sena, and Zhuang (2000), as well as Davis et al. (1989), emphasize the influence of beliefs such as usefulness on user intentions. An extensive body of theory on this subject, along with empirical studies, allows us to confirm the relationship between the two variables (Igbaria, 1993; Liaw & Huang, 2003; Triandis, 1977).

The perceived usefulness of using information technology also influences attitudes towards behavior. In other words, as long as an individual feels that information technology can be useful in completing their tasks, the individual intends to use it, regardless of whether information technology is easy or not. People believe that using this technology will make their work easier to complete. Consequently, individuals who use technology will develop a positive attitude towards the technology, influencing attitudes towards the behavior itself.

Further investigation into the effectiveness of LMS in this research will use the TAM Model to examine how this learning platform is used by investigating how the antecedent factors of the TAM Model influence it. Will perceived ease of use (PEU) and perceived usefulness (PU) directly influence actual system usage? Or does it require a mediating variable, behavioral intention to use? Does behavioral intention to use influence the actual use of the system? Do these two antecedent factors have a significant influence on behavioral intention to use? The results of research by Tukiran et al. (2022) and Sumantri et al. (2023) show that perceived ease of use and

perceived usefulness have a significant effect on actual system use but do not have a significant effect through the intention to use behavior.

3. Research Model and Hypothesis

The TAM model explains the attitudes of individual LMS users towards using information technology, and the intention to use information technology determines individual behavior in its use. The TAM model utilizes the basic theory of TPB, which is a development of the TRA theory, serving as a model for understanding technology acceptance through the process of forming attitudes and behavior. In this research, we investigated the technology acceptance process in using LMS among students at a private university in Bogor through the TAM Model.

Adapted from Davis (1989), Venkatesh (2000), and Tukiran (2022), this research model employs four research variables: 1) Perceived Ease of Use (PEU); 2) Perceived Usefulness (PU); 3) Behavioral Intention to Use (BIU); and 4) Actual Use or Actual Usage (AU)*.*

The model concept in TAM is rooted in the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1978), later developed by Ajzen (1985, 1987) into the Theory of Planned Behavior (TPB). TPB posits that behavior or actions are based on an individual's will to do something, preceded by the emergence of attitudes toward use, which begins with beliefs in ease and usefulness. The TAM model was then refined to better explain a person's attitudes and behavior in accepting technology. For example, Lui and Jamieson (2003) developed the TRITAM model (Trust and Risk in Technology Acceptance Model), which incorporates trust and risk factors into the TAM Model.

Similarly, research by Bagozzi (2007), Nasir (2013), and Tukiran (2023) simplified the TAM model by excluding the Attitude toward Usage (ATU) variable, reducing it to only four variables from the TAM model. According to Bagozzi (2007), intention or will is a direct determinant of behavior, and obtaining the right measure of intention provides the most accurate prediction of behavior. This model further explains the process of technology acceptance, analyzing it based on the attitude theory of Rosenberg and Hovland (1960) and Uhl Bein et al. (2014), known as the "Three-Component Model of Attitudes." In this model, behavior is structured as a cognitive (cognitive), affective (affective), and behavioral (behavioral) process. The knowledge, information, and experiences a person receives in the cognitive process will stimulate the affective process, fostering emotional feelings—both positive and negative—ultimately shaping an attitude towards behavior. Based on this model of attitude and behavior, this technology acceptance research model employs four variables from TAM, as presented in the figure below.

Based on the theoretical review of the research model construction above, the hypotheses in this research is:

H1: Perceived Ease of Use (Perceived Ease of Use) has a significant effect on Perceived Usefulness in the use of Learning Management Systems (LMS) in Private Universities in Bogor.

H2: Perceived Ease of Use (Perceived Ease of Use) has a significant effect on Behavioral Intentions to Use (Behavioral Intention to Use) in the use of Learning Management Systems (LMS) in Private Universities in Bogor.

H3: Perceived Usefulness has a significant effect on Behavioral Intentions to Use (Behavioral Intention to Use) in the use of the Learning Management System (LMS) of Private Universities in Bogor.

H4: Perceived Ease of Use (Perceived Ease of Use) has a significant effect on Actual Usage using the Learning Management System (LMS) in Private Universities in Bogor.

H5: Perceived Usefulness has a significant effect on the Actual Usage of the Learning Management System (LMS) in Private Universities in Bogor.

H6: Behavioral Intention to Use (Behavioral Intention) has a significant effect on Actual Usage of Learning Management Systems (LMS) in Private Universities in Bogor.

H7: Attitude Towards Using has a significant effect on Behavioral Intention in using the Learning Management System (LMS) in Private Universities in Bogor.

The research hypothesis model is presented as follows:

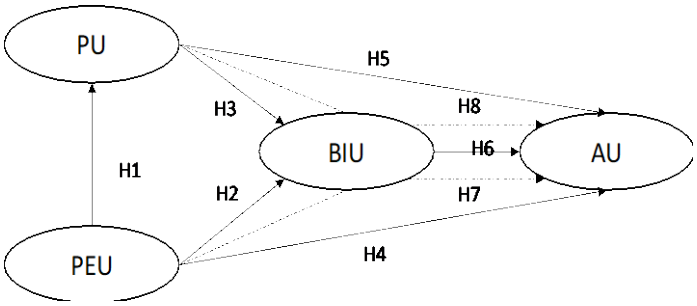

Fig. 1 *Research hypothesis model*

4. Research Method

The conceptual model framework for this research was built on the basis of theoretical foundations and supported by previous research. Based on the theoretical basis used, this research employs a multidimensional construct for the variables: Perceived Ease of Use, Perceived Usefulness, Behavioral Intention to Use, and Actual Usage. The indicators used are reflective at the first-order and second-order stages for all variables. The type of scale for variables (constructs) uses an ordinal scale, namely a 5-point Likert scale.

This research utilizes the Mode A algorithm analysis method for the outer model, meaning a reflective mode where the latent variable indicators are operationalized in a reflexive form, and a linear algorithm analysis for the inner model. In this research, the resampling method used is Stable1, and the number of resamples has been determined by the WarpPLS program (default 100). Because the number of resamples cannot be controlled, this method is very useful for analyzing large amounts of data. After conceptualizing the model, determining the algorithm analysis method and resampling method, the next step is to draw a path diagram of the model to be estimated. When drawing a path diagram in the WarpPLS program, it is sufficient to describe the relationship between the hypothesized variables, while the indicators that form the construct do not need to be described because the program has saved the results of the first-order and second-order analyses, which are then used to analyze the inner model based on the direction of the causality relationship that has been determined.

5. Findings and Discussion

After processing data with SEM using WarpPLS 7.0, the results in Table 1 below describe discriminant validity. All correlation values between variables (latent constructs) are below the square root value of AVE (see the diagonal line, in brackets). Following the method for determining discriminant validity, which involves comparing the square root of each AVE on the diagonal with the correlation coefficient (off-diagonal) for each construct in the relevant row and column for each variable (Fornel & Larcker, 1981), discriminant validity is acceptable for this measurement model overall, supporting the discriminant validity between variable constructs.

Table 1 *Discriminant validity*

Variable	Perceived Ease of Use	Perceived Usefulness	Behavioral Intention To Use	Actual Usage
Perceived Ease of Use	**(0,813)**			
Perceived Usefulness	0,771	**(0,856)**		
Behavioral Intention To Use	0,614	0,751	**(0,886)**	
Actual Usage	0,448	0,470	0,477	**(0,771)**

Source: Processed Primary Data (2023)

In addition to testing hypotheses, this research aims to find a model that fits the original data, which is crucial for measuring the model's quality. To evaluate the model fit, it is essential to follow criteria recommended by experts. Table 2 below provides an explanation for each fit measure based on the general result output above. The cut-off P-value for APC, ARS, and AARS is recommended to be ≤ 0.05 as an indication that the model fit is significant. However, the output above shows that the APC, ARS, and AARS values are at the significance level of P < 0.001, indicating that the model is very good.

Table 2 *General results of structural model measurements*

No	Model *Fit dan Quality Indices*	Value	Description
1	*Average path coeficient* (APC)	0,356	P<0,001
2	*Average R-squared* (ARS)	0,482	P<0,001
3	*Average adjusted R-squared* (AARS)	0,480	P<0,001
4	*Average block VIF* (AVIF)	2.639	accepted if ≤ 5, ideal is ≤ 3,3
5	*Average full collinearity* VIF (AFVIF)	2.470	accepted if ≤ 5, ideal is ≤ 3,3
6	*Tenehause GoF* (GoF)	0,578	small ≥ 0,1, medium ≥ 0,25, large ≥ 0,36
7	*Symson's paradox ratio* (SPR)	1.000	accepted if ≥ 0,7, ideal is = 1
8	*R-squared contribution ratio* (RSCR)	1.000	accepted if ≥ 0,9, ideal is = 1
9	*Statistical suppression ratio* (SSR)	1.000	accepted if ≥ 0,7, ideal is = 1
10	*Nonlinier bivariate causality direction ratio* (NLBCDR)	1.000	accepted if ≥ 0,7, ideal is = 1

Source: Processed Primary Data (2023)

For the Symson's Paradox index (SPR), the resulting value is 1, the R-squared Contribution Ratio (RSCR) is 1, the Statistical Suppression Ratio (SSR) is 1, and the Nonlinear Bivariate Causality Direction Ratio (NLBCDR) produces a value equal to 1. These values indicate that the SPR, SSR model index, RSCR index, and NLBCDR are ideal, collectively suggesting there are no causality problems in the model.

AVIF and AFVIF are two model fit measures used to test collinearity problems in the PLS model. The recommended values for these two measures must be ≤ 3.3 (ideal) or ≤ 5 (acceptable). According to the output above, there are no multicollinearity problems in the model.

The resulting goodness of fit (GoF) is 0.578 (≥ 0.36), indicating that the model fit is good. This suggests that the predictive power of the model is very strong. For SPR, an index measuring causality problems, the ideal value is 1 or ≥ 0.7 (acceptable), indicating the absence of causality problems in the model. RSCR is an index measuring expansion, where a model is free from negative R-squared contributions. Ideally, the RSCR index should be equal to 1 or ≥ 0.9 (acceptable), indicating no negative R-squared contribution in the model. SSR is an index measuring the expansion of a model free from statistical suppression effect problems. The acceptable SSR value is ≥ 0.7, signifying that 70% or more of the paths in the model are free of statistical suppression..

Table 3 *Latent variable coefficients*

No.	Variable	R-square	Adj. R-square	Composite reliability	Average variance extracted	Full Collinearity VIF
1	Perceived Ease of Use (PEU)			0,921	0,661	2.534
2	Perceived Usefulness (PU)	0,598	0,598	0,943	0,732	3.568
3	Behavioral Intention To Use (BIU)	0,573	0,572	0,948	0,786	2.407
4	Actual Usage (AU)	0,275	0,272	0,815	0,594	1.370

Source: Processed Primary Data (2023)

NLBDCR is an index used to measure the extent to which the bivariate non-linear coefficient of the relationship supports the hypothesis of a causal relationship in the model. An acceptable NLBDCR value is ≥ 0.7, indicating that 70% or more of the related paths in the model support the hypothesis of a weak causal relationship. Based on the general output results above, the resulting SPR, SSR, RSCR, and NLBDCR values are all equal to 1 (acceptable), signifying that there is no causality problem in the model.

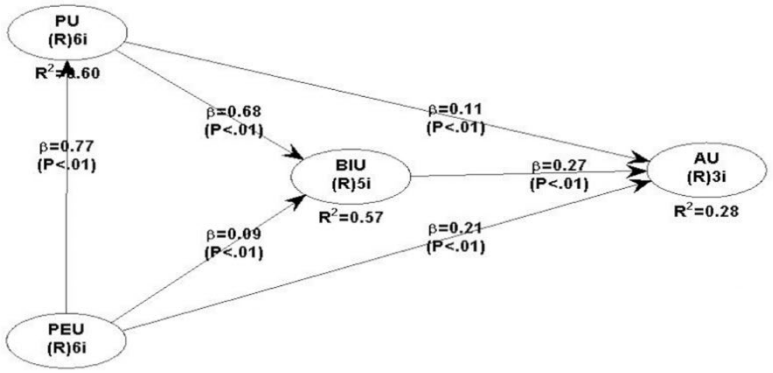

Fig. 2 *Structural model analysis results*
Source: Processed Primary Data (2023)

Figure 2 above presents the results of the PLS structural model analysis, illustrating path coefficients and their significance in detail. Schematically, the structural model measurement results are detailed in Figure 2. Meanwhile, Table 3 below explains the results of the structural model analysis, serving as the basis for drawing conclusions regarding the proposed hypothesis testing in this research.

Table 4 *Hypothesis testing results*

Hipotesis	*Path*	*Path coefficient*	*P-value*	Hasil Uji Hipotesis
H1	PEU → PU	0,773	<0.001	Diterima
H2	PEU→BIU	0,094	0,006	Diterima
H3	PU →BIU	0,682	<0.001	Diterima
H4	PEU →AU	0,211	<0.001	Diterima
H5	PU →AU	0,110	0.001	Diterima
H6	BIU → AU	0,268	<0.001	Diterima
H7	PEU→PU→BIU	0,527	<0.001	Diterima
H8	PEU→BIU→AU	0,110	0.001	Diterima
H9	PU→BIU→AU	0,183	<0.001	Diterima

Note: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Behavioral Intention to Use (BIU), Actual Usage (AU)
Source: Processed Primary Data (2023)

6. Discussion

Demographic analysis of respondents reveals that the majority fall into the Gen Z age group, specifically between 19 and 44 years, comprising 77%. Additionally, there is a prevalence of respondents with educational backgrounds ranging from Diploma to Postgraduate degrees. The frequency distribution of respondents' responses, totaling 77%, indicates a high level of perceived ease of use, behavioral intention to use, and actual use. Millennials and Generation Z, being more naturally familiar with technology applications, show a propensity towards positive technology-related behaviors. Research findings by Calvo-Porral & Pesqueira-Sanchez (2020) highlight differences in motivational factors underlying technology behavior within each generational group. Moreover, variations may exist in how each generational group utilizes and engages with technology.

Table 5 *Respondent demographics*

Category	Characteristic	Frequency	%
Gender	Male	261	36%
	Female	459	64%
	Total	720	100%
Age (years)	17 - 20	550	76%
	21 - 24	157	22%
	25 - 28	6	1%
	29 - 32	7	1%
	Total	720	100%
Study Program	D3 Accounting	33	5%
	D3 Tax	33	5%
	D3 Banking	22	3%
	S1 Accounting	80	11%
	Bachelor of Management	528	73%
	Masters in Management	24	3%
	Total	720	100%

Source: Processed Primary Data (2023)

Descriptively, respondents' perceptions are highest for the Perception of Ease of Use (PEU), with an average score of 3.95, equivalent to 79% on the 5-point Likert scale. The Perception of Usefulness (PU) follows with an average score of 3.75 or 75%, Actual Use (AU) with 3.58 or 71.6%, and Behavioral Intention to Use (BIU) with 3.45 or 69%. In terms of frequency distribution, Perceived Ease of Use (PEU) also garners the highest response, with 96% of respondents indicating very high, high, or medium perceptions, while only 4% consider it low or very low.

For the Perceived Usefulness (PU) variable, 92% of respondents rate it very high, high, or medium, with only 8% considering it low or very low. Concerning Actual Use (AU), 89% of respondents see it as very high, high, or medium, while 11% rate it low or very low. Regarding the Behavioral Intention to Use (BIU) variable, 82% of respondents indicate very high, high, or medium intentions, with only 18% stating low or very low intentions.

The relatively lower perceived usefulness, as indicated in the descriptive analysis, could be linked to demographic factors. The study by Calvo-Porral and Pesqueira-Sanchez (2020) notes that the millennial generation primarily uses technology for entertainment and hedonic purposes, while Generation X individuals are more utilitarian and seek information. Lai and Hong's (2015) research reports that because digital technology is an integral part of young people's daily lives, some commentators claim that the current generation of learners think and learn differently from their predecessors. In line with that, Stern (2002) also stated that the Millennial Generation is the first generation that can adapt to technology, such as they are better at operating a mouse than a pen and they carry out unlimited activities using the internet, and they are better at using the internet.

In terms of gender differences, this research aligns with Gefen and Straub's (1997) findings that women and men differ in their perceptions of technology use, but this difference doesn't significantly affect actual usage. Although women dominate the demographic profile at 64%, their average actual use score is high compared to the perception of use. Overall, the study suggests that different generations exhibit variations in perceived ease of use and perceived usefulness. However, these differences, influenced by gender and age (mostly Millennials and Generation Z), do not impact behavioral intentions to use. The hypothesis testing results also reveal no effect on actual use.

6.1 Direct Influence of Perceived Ease OF Use (PEU) on Perceive Usefulness (PU)

The results of hypothesis testing indicate a significant influence of Perceived Ease of Use (PEU) on Perceived Usefulness (PU), with a structural coefficient of 0.773 and a P-value < 0.001. Since the P-value is < 0.05, and the positive coefficient suggests a positive and significant influence between Perceived Ease of Use and Perceived Usefulness, it can be inferred that enhancing students' Perception of Ease of Use regarding the Learning Management System (LMS) will increase their perception of the LMS's usefulness. With a substantial coefficient value of 0.773 and an R-square value of 0.60, it can be concluded that the perception of ease of use of the LMS is crucial in shaping students' perception of the LMS's usefulness.

Hypothesis testing further reveals a positive and significant direct influence of Perceived Ease of Use on Perceived Usefulness. These empirical findings highlight Perceived Ease of Use as the degree to which a person believes that using a particular system will be free from difficulties. This emphasizes the importance of providing guidance or training to enhance students' perception of ease in using the LMS.

In this study, the Perceived Ease of Use indicator comprises five elements: ease of learning (PEU1), easy to understand (PEU2), easy to be proficient (PEU3), easy to use (PEU4), easy to control (PEU5), and easy to remember (PEU6), each with loading factor values of 0.832, 0.820, 0.823, 0.797, 0.769, and 0.836, respectively. Notably, the indicators "easy to remember" (PEU6) and "easy to understand" (PEU1) have higher factor loading values than the other indicators. This underscores the significance of the Perceived Ease of Use (PEU) variable towards Perceived Usefulness (PU). To enhance the perceived usefulness of the LMS, particularly through socialization and/or training, it is crucial to focus on aspects that are easy to remember and easy to understand. This holds particular importance for universities where the use of LMS plays a vital role in the learning and teaching process.

These findings align with research conducted by Bambang (2023) and Martinus et al. (2022) in their studies using the TAM model in Human Resources Information Systems (HRIS) in companies, where they observed a significant influence of Perceived Ease of Use on Perceived Usefulness. Similarly, research by Mira et al. (2022), which applied the Technology Acceptance Model (TAM) to study Instagram user behavior, reported similar findings, emphasizing the significant effect of Perceived Ease of Use on Perceived Usefulness.

6.2 Direct Influence of Perceived Ease of Use (PEU) on Behavioral Intention to Use (BIU)

The influence of perceived ease of use on behavioral intention to use resulted in a structural coefficient of 0.094 and a P-value of 0.006. As the P-value is < 0.05, and the positive coefficient suggests a positive and significant influence between Perceived Ease of Use and Behavioral Intention to Use. This indicates that a higher perceived ease of use correlates with a higher behavioral intention to use.

As highlighted earlier, the indicators "easy to remember" (PEU6) and "easy to learn" (PEU1), "easy to understand" (PE2), and "easy to proficient" (PEU3) have higher loading factor values compared to other indicators in the variable perceived ease of use (PEU). This underscores the importance of perceived ease of use as a crucial predictor for technology acceptance or the actual use of LMS applications among students in university learning and teaching processes.

In the implementation of LMS usage at universities, providing socialization on how to operate the LMS application effectively is crucial. This helps in building a perception of ease of use, which, in turn, leads to the emergence of a perception of usefulness, fostering a desire to use it, and ultimately encouraging actual and continuous use of the LMS.

These findings align with research by Tukiran, Martinus et al. (2022), concluding that Perceived Ease of Use significantly affects Behavioral Intention to Use, particularly in university settings. This is further supported by Heryanta Jufry's research at the university, focusing on the TAM model among Gojek users, which reported a significant effect of Perceived Ease of Use on Behavioral Intention to Use technology.

6.3 Direct Influence of Perceived Usefulness (PU) on Behavioral Intention to Use (BIU)

The influence of perceived usefulness on behavioral intention to use yielded a structural coefficient of 0.682 and a P-value < 0.001. As the P-value is < 0.05, and the positive coefficient indicates a positive and significant influence between Perception of Usefulness and Behavioral Intention to Use. In essence, this means that a higher Perception of Usefulness correlates with a higher Behavioral Intention to Use.

Hypothesis testing further reveals a positive and significant direct influence of perceived usefulness on actual use. These empirical findings demonstrate that a positive perception of the usefulness of LMS applications strongly and significantly impacts the actual use of the LMS application.

In this research, there are four indicators of Perceived Usefulness, namely completing work faster, making work easier, developing employee performance, and increasing productivity. Judging from the factor loading coefficient values for each indicator (PU1, PU2, PU3, and PU4), the largest indicator is PU4 (increasing productivity). By focusing on strengthening perceptions of the usability of the LMS application, organizations can influence students as users to view the LMS as useful in completing tasks and increasing work productivity. Perceived usability is essentially the belief that using the system can enhance performance, leading to an intention to use the LMS application to support one's work.

These findings align with research by Tukiran et al. (2023), which concluded that Perception of Usefulness significantly affects Behavioral Intention to Use, focusing on Postgraduate students at Pakuan University, Bogor. This is reinforced by research from Heryanta Jufry at Brawijaya University, Malang, who studied Gojek users and similarly concluded that Perception of Usefulness significantly affects Behavioral Intention to Use. Additionally, research by Nursiah (2017) related to the influence of Perceived Ease of Use and Perceived Usefulness on Behavioral Intention To Use is consistent with the findings. The t-test also confirms a significant relationship between perceived usefulness and behavioral intention to use, where the calculated t-value is greater than the t-

table value (2.930 > 2.048), indicating that changes in perceived usefulness directly influence behavioral intention to use.

6.4 Direct Influence of Perceived Ease of Use (PEU) on Actual Use (AU)

The results of hypothesis testing indicate that the influence of perceived ease of use (PEU) on actual use (AU) yielded a structural coefficient of 0.221 and a P-value < 0.001. As the P-value is < 0.05, and the positive coefficient suggests a positive and significant influence between Perceived Ease of Use and Actual Use, signifying that a higher Perceived Ease of Use will increase the Actual Use of the LMS.

Hypothesis testing further underscores a positive and significant direct influence of perceived ease of use on actual use. These findings empirically confirm that perceived ease of use represents the degree to which a person believes that using a particular system will be free from difficulties. This underscores the recommendation to the university to provide guidance or training to enhance students' perception of ease in using the LMS.

A system used more frequently indicates that the system is better known, easier to operate, and more user-friendly in the learning and teaching process. This ease comparison suggests that individuals using the new system find their work easier compared to those working with the old system.

The Perceived Ease of Use (PEU) variable comprises five indicators: ease of learning (PEU1), easy to understand (PEU2), easy to proficient (PEU3), easy to use (PEU4), easy to control (PEU5), and easy to remember (PEU6), with loading factor values of 0.832, 0.820, 0.823, 0.797, 0.769, and 0.836, respectively. Notably, the indicators "easy to remember" and "easy to learn" have higher values than other indicators, suggesting that the acceptance of LMS technology by students will be perceived as easy to use if the application is easy to learn and easy to remember.

In summary, referring to the research results and discussions above, the findings in this research state that there is a positive and significant influence of the Perception of Ease of Use on actual use. To increase the actual use of LMS applications, it is essential to establish a strong perception of ease of use of LMS applications at universities or colleges through effective socialization and training that facilitates easy learning and remembrance.

These findings are consistent with research by Bambang (2023) and Martinus et al. (2022), who used the TAM model in HRIS in companies, suggesting an insignificant influence of perceived ease of use on actual use. Similarly, another study by Mira et al. (2022) examining the application of the TAM model to the behavior of Instagram platform users found that perceived ease of use has a significant effect on actual use.

6.5 Direct Influence of Perceived Usefulness (PU) on Actual Use (AU)

The influence of perceived usefulness on actual use yielded a structural coefficient of 0.110 and a P-value of 0.001. Since the P-value is < 0.05, and the positive coefficient indicates a positive and significant influence between Perceived Usefulness and Actual Use. Essentially, this implies that a higher perceived usefulness corresponds to a higher actual use. These empirical findings confirm that a positive Perception of Usefulness of LMS Applications significantly increases LMS usage for students.

In this research, there are four indicators of Perceived Usefulness: completing work faster, making work easier, developing employee performance, and increasing productivity. The Perception of Usefulness variable comprises five indicators: faster (PU1), improving performance (PU2), increasing productivity (PU3), increasing efficiency (PU4), and easier (PU5), each with loading factor values of PU1 0.802, PU2 0.893, PEU3 0.896, PU4 0.862, PEU5 0.826, and PEU6 0.852. Based on the loading factor values, the perception of usefulness of the LMS application is more widely perceived through indicators that emphasize the LMS's potential to increase productivity and improve performance. Analyzing these factors indicates that productivity and performance improvement, crucial for completing assignments, are essential factors driving the use of LMS applications in the learning and teaching process. Therefore, these two factors or indicators should be emphasized during the introduction, training, and socialization of LMS in universities.

The findings in this research align with the study by Tukiran et al. (2023), concluding that Perception of Usefulness significantly influences Actual System Use among postgraduate students at Pakuan University, Bogor. This is further supported by research from Putu Ayu Mira et al., which applied the Technology Acceptance Model (TAM) to study Instagram user behavior, concluding that Perceived Usefulness has a significant effect on Actual System Use, with a probability value of 0.007 (< 0.05) and a coefficient value of 0.289.

6.6 Direct Influence of Behavioral Intention to Use (BIU) on Actual Use (AU)

The influence of behavioral intention to use on actual use yielded a structural coefficient of 0.268 with a P-value < 0.001. Given the P-value is < 0.05, this signifies a significant influence between Behavioral Intention to Use and

Actual Use. In other words, the presence of behavioral intentions significantly influences students' use of LMS, indicating that the higher the behavioral intention to use, the greater the actual use of the LMS among students.

Contrary to this, hypothesis testing shows that there is no significant influence of behavioral intention to use on the actual use of LMS applications for students. These findings, however, empirically demonstrate that Behavioral Intention to Use has a significant impact on students' actual use of LMS applications. The Behavioral Intention to Use (BIU) variable consists of five indicators: using at any time (BIU1), using in any condition (BIU2), continuing to use (BIU3), intention to continue using (BIU4), and hope to use (BIU5). The loading factor values for each indicator are consecutively BIU1 0.856, BIU2 0.896, BIU3 0.909, BIU4 0.911, and BIU5 0.856.

Based on these factor loadings, indicators BIU4 (intention to continue using) and BIU3 (will continue to use) are indicators with higher values than other indicators, indicating that students intend to use the LMS continuously. This suggests that high behavioral intentions to use the LMS predict high actual use of the LMS. For universities, building perceptions of ease of use and perceived usefulness of the LMS becomes crucial to encourage students' behavioral intentions to use the LMS, ultimately increasing its usage in the teaching and learning process.

These findings differ from the research of Tukiran et al. (2022), concluding that Behavioral Intention to Use does not significantly affect Actual Use, as well as research from Muliati (2019), who examined the TAM model in implementing the Enterprise Resource Planning (ERP) platform in private companies. In the latter case, Behavioral Intention to Use had a positive influence but did not significantly impact Actual Use.

The explanation from these two studies offers insights into the variances in technology application use in companies and universities. While both applications are mandatory for employees and students, differences in implications arise. For instance, HRIS and ERP applications in companies are directly related to personnel management, impacting various aspects such as salary calculations, overtime pay, allowances, leave, and more. Failure to use these applications for personnel transactions may result in the non-payment of these entitlements. Similarly, the use of ERP applications in companies directly affects production, purchasing, sales, and service transactions, making it crucial for maintaining smooth operations.

6.7 Indirect Influence of Perceived Ease of Use (PEU) on Actual Use (AU) through Behavioral Intention to Use (BIU)

The mediating effect of Behavioral Intention to Use on the relationship between Perceived Ease of Use and Actual Use resulted in a total structural coefficient of 0.110 with a P-value of 0.001. Since the P-value is < 0.05, and the coefficient with a positive sign indicates a positive and significant influence between Perceived Ease of Use and Actual Use through Behavioral Intention to Use. This suggests that Behavioral Intention to Use can partially mediate the relationship between Perceived Ease of Use and Actual Use.

In light of the research results and discussion above, the findings in this discovery state a direct positive influence and significant perceived ease of use towards actual use through behavioral intention to use. This implies that behavioral intention to use will lead to higher actual use of LMS applications among students. Therefore, efforts to increase the perception of ease of use using behavioral intention to use mediation can be implemented.

However, these findings differ from the research of Tukiran et al. (2023), as their study concluded that there is an insignificant positive influence between Perceived Ease of Use and Actual Use through Behavioral Intention to Use. This means that Behavioral Intention to Use cannot act as a mediator for the relationship between Perceived Ease of Use and Use, as demonstrated in their research on postgraduate students at Pakuan University, Bogor.

6.8 Indirect Influence of Perceived Usefulness (PU) on Actual Use (AU) through Behavioral Intention to Use (BIU)

The mediating effect of Behavioral Intention to Use on the relationship between Perceived Usefulness and Actual Use resulted in a total structural coefficient of 0.183 with a P-value of < 0.001. Since the P-value is < 0.05, and the coefficient with a positive sign indicates a significant positive influence between Perceived Usefulness and Actual Use through Behavioral Intention to Use. This implies that behavioral intention to use can act as a mediator for the relationship between perceived usefulness and actual use.

Based on the research results and discussion above, the findings in this discovery state a direct positive influence and significant perceived usefulness of actual use through behavioral intention to use. This suggests that behavioral intention to use will lead to higher actual use of the LMS application for students. Therefore, efforts to increase perceived usefulness using behavioral intention to use as mediation can be implemented.

However, these findings are not in line with the research results of Tukiran et al. (2022), where in their research on companies, they concluded that there was an insignificant positive influence between perceived usefulness and actual use through Behavioral Intention to Use. In this research, Behavioral Intention to Use is

identified as a mediator for the relationship between Perceptions of Usefulness and Use, conducted among university students.

6.9 Implications of Research Results

The LMS application used to support the teaching and learning process is crucial for successful learning in higher education. The intense use of LMS applications by both lecturers and students serves as a key indicator of successful technology acceptance in higher education. The TAM (Technology Acceptance Model) is effective in explaining the process of technology acceptance, rooted in the theory of attitude and behavior formation. Acceptance, in this context, is an action or course of action undertaken after an individual has the intention or desire to do so, stemming from an understanding of the convenience and usefulness of the technology.

The findings of this research reinforce previous studies on theoretical models of technology acceptance, indicating that perceived ease of use significantly influences perceptions of use, thereby contributing to an increase in the actual use of LMS applications. The better the perceived ease of use of the LMS application, the more positive the perception of its usefulness, leading to an escalation in actual usage. This has implications for LMS management in higher education, emphasizing the importance of ongoing monitoring and evaluation, particularly focusing on strengthening indicators related to the perception of ease of use—specifically, aspects like ease of learning, ease of remembering, and ease of use. From a practical standpoint, enhancing the user-friendliness of the LMS application in higher education is essential, achieved by designing menus and options that are easy to learn and operate, ensuring optimal and effective utilization of the LMS.

7. Conclusion

Based on the results of research and discussions regarding Efforts to Increase the Use of Learning Management Systems (LMS) using the Technology Acceptance Model (TAM Model) conducted at a private university in Bogor, conclusions can be drawn, namely: 1) There is a positive and significant influence of Perception of Ease of Use on Perception of LMS Use; 2) There is a positive and significant influence of Perceived Ease of Use on Behavioral Intention to Use the LMS; 3) There is a positive and significant influence between Perception of Usefulness on Behavioral Intention to Use the LMS; 4) There is a positive and significant influence between Perceived Ease of Use and Actual LMS Use; 5) There is a positive and significant influence between Perception of Expectancy on Behavioral Intentions for Actual Use of the LMS; 6) There is a positive and significant influence between Behavioral Intentions and Actual LMS Use; 7) There is a partial mediating role of Behavioral Intention to Use in the influence of Perceived Ease of Use on Actual LMS Use; and 8) There is a partial mediating role of Behavioral Intention to Use in the influence of Perceived Usefulness on Actual Use of the LMS.

The research results show that the TAM model is very effective in explaining how technology acceptance in using LMS at universities follows a process of forming attitudes and behavior, which is previously preceded by cognitive processes that build perceptions of the ease and usefulness of the technology to be adopted. Providing understanding, outreach, and training is the key for universities so that students can use the LMS properly and realize their needs. Increasing understanding about the ease of the LMS application will build a perception of the usefulness of the LMS itself, which will then, in turn, encourage students' intention or desire to want to use it, and ultimately they will actually use the LMS.

This explanation of the theory of attitude and behavior formation is supported by the results of research on the TAM model from Sumantri (2023) and Tukiran et al. (2023), which were carried out in companies to investigate the acceptance of HRIS technology. Both studies prove that Behavioral Intention to Use does not have a significant influence on the actual use of HRIS, so that Behavioral Intention also provides full mediation on the indirect influence of Perceived Ease of Use and Perceived Usefulness on Actual Use of HRIS for workers in companies. This can be analyzed where the use of HRIS for employees is mandatory and becomes a self-service for employees to carry out employment transactions, such as taking leave, claiming medical expenses, permission to be absent from work due to illness, and others. If they do not want to carry out transactions in HRIS, there will be consequences for employees, including medical claims not being paid, absence from work resulting in absenteeism which will result in warning letters being issued, and so on.

For students, using an LMS is a necessity in the learning process, where they must truly understand the ease of using this technology and how the LMS application can be perceived as highly useful. Thus, the TAM model in the study of LMS use at this university can explain the theory of attitude and behavior formation, which involves a cognitive process for students. The existence of behavioral norms in an organizational or university environment, as explained in the TPB theory, where all lecturers and students collectively use the LMS application in the learning and teaching process, will encourage students to be willing to actually use the LMS. Lecturers and students will engage intensively in teaching and learning activities, such as providing lecture materials, assignments, and assessments, as well as submitting assignments, recording attendance, and participating in discussions or asking questions. This will further strengthen the behavioral intention to use and the actual use of the LMS.

This research was limited to being conducted at only one private university. Of course, a broader and more diverse population from higher education is needed to draw general conclusions. However, these findings can offer recommendations for universities on how to effectively use LMS applications as learning media, especially for students. The university needs to conduct a proper cognitive process through socialization and providing students with an understanding of the LMS, its uses, and how to integrate it into the teaching and learning process. For the academic world, this research also contributes to the study of technology acceptance theory, particularly the TAM model, and human technology study related to the formation of human attitudes and behavior in accepting or adopting new technology or innovation.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

All authors confirm contribution to the paper. All authors reviewed the results and approved the final version of the manuscript.

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