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E-learner success assesment model (E_LSAM) in higher education: Does it work?

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Abstract: In today's digital age, the amount of available research literature is growing exponentially, the new normal era, after the COVID-19 pandemic, requires the world of education to carry out offline and online learning. Therefore, e-learner success remains an interesting topic to discuss. This research was conducted to map the factors, dimension, and mediating variable that determine the e-learner success in E-LSAM (E-Learner Success Assesment Model) model. The data is based on a survey method distributed to 1139 students from 12 State Islamic Higher Education Institutions (SIHEIs) in Indonesia. The collected data was then tested using Structural Equation Model (SEM) AMOS version 26. The results of this study indicate that the E-LSAM model is an effective assessment in measuring e-learner success. Variables that support the e-learner success are: self-efficacy, perceived enjoyment, subjective norm, image, perceived ease to use, service quality, social interaction, system quality, and diversity in assessment. The instructor dimension is the dimension that has the highest impact in achieving e-learner success, apart from that the system and course dimensions also provide support. Self-regulation, perceived usefulness, intention to continue using LMS (Learning Management System), attitude toward LMS, and learner satisfaction are important factors that directly and indirectly affect the learner success. LMS operation training needs to be held for instructors to improve e-learner success in SIHEIs.

Keywords: *Assesment, E-LSAM, Higher education, Online learning.*

1. Introduction

The government of Indonesia decide to publish the policy that provide education with a distance learning strategy during the pandemic of COVID-19 which valid since May 2020 [1]. This research found that the integrative e-learning model was able to increase the effectiveness of learning. Other researchers estimate the growth of digital education, which demands an increase in quality, openness, multidimensional nature and the development of alternative credentials [2]. However, there are concerns over the quality of online learning in higher education. Universities have better capacity to design and prepare their own e-learning [3]. Andrade et al. revealed the need for a common measure as a standard to ensure the quality of online learning [4]. Therefore, it is necessary to have a certain assessment model to be able to measure the e-learner success, especially in higher education.

LMS is a web-based application that is used as an e-learning delivery technology. LMS is able to help instructors with their technology to be able to make decisions based on the data provided [5], [6]. Recently, the growth of LMS has increased significantly especially in higher education and has become a trend in the field of education [3], [7]. This is driven by several reasons such as: perceived ease of use (PEU), wider coverage, course flexibility (CFX), convenience, cost efficiency, students are required to be more responsible and provide quality content [8], [9], [10], [6].

Several researchers have used different assessment models. For instance, the Expectation Confirmatory Model (ECM) presents factors that can influence learners' intention to continue using

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LMS (ICU) and feel satisfied in their learning (LST) [11], [12], [13], [14]. A person's beliefs and individual feelings about using the system will be able to shape his perception in assessing the PEU [15]. Factors that can influence are self-efficacy computer (CSE), computer anxiety (CAX), and perceived enjoyment (PEJ). CAX, CSE and PEJ can affect the PEU [10], [16], [17]. Students' CAX has a negative effect on their PEU [3]. Learner intention continuing to use LMS (ICU) is significantly influenced by the benefits and student satisfaction (LST) [3]. Otherwise, the ICU is influenced by the perceived usefulness (PUS) and attitudes towards (ATT) [18], [11]. ECM, TAM, flow theory and behavioral theory predict learners' ICU [13]. ICU is most influenced by LST, as well as by PUS, ATT and subjective norms (SBN) of each learner [16].

Technology Acceptance Model (TAM) measuring e-learner success by paying attention to PUS, PEU, ATT and ICU [19], [20]. The individual's belief that using a particular system can increase productivity and performance is the definition of the PUS [15], [13]. Image (IMG) and SBN are two determinants of perceived usefulness in TAM2 [18], [21]. SBN describe the extent to which a person perceives that he should or should not use the system [22]. However, the IMG is a social degree, the perspective of individuals who feel their social status increases when using a system. In e-learning, PUS is defined as the learner's perception of the importance of carrying out activities to achieve certain goals [11]. In addition, social factors also influence users' ICU [20]. Previous research found that students' understanding of e-learning was influenced by their attitude towards the system. [10], [13]. TAM describes attitude toward a system as the perceived level of positive or negative feelings associated with using a system [23]. Students' ICU explains their ATT. In online learning through LMS, the instructor uploads learning materials, then students participate in online learning via the internet [6]. Student's PUS and PEU will be able to produce more effective and efficient for e-learner success [16].

Self-Regulated Learning (SRL) is a dynamic process that is focused on planning, monitoring and evaluation in order to achieve the objectives [24], [25]. LMS is able to provide high flexibility for learners both in terms of time and place which gives them more freedom [26], [27]. Furthermore, without the limitations of time and space in e-learning, learners must develop self-regulation (SRG) which is explained by their ability to manage individual work as well as their ability to organize learning to complete the entire online learning program [16], [24]. In the context of online learning, assessment plays an important role for both instructors and learners [17]. SRG and learner progress can be ensured by a learning assessment [28]. In addition, the diversity of e-learning assessments (DIA) can also evaluate student's learning outcomes both in terms of progress, participation, success and even failure and obstacles during e-learning [27]. Therefore, different and varied questions are needed to assess the different experiences and understandings of online learners, so as to be able to fulfil their needs and expectations [24]. In addition, it must also be supported by the quality of audio, video and visual in the multimedia provided by the LMS to increase LST [9]. Convenience is the most important thing in online learning. In other words, it relates to when and where to learn, lower prices and ease of interaction [16], [7]. The involvement of learners, the ICU and LST are factors that determine the e-learner success [16], [9].

Otherwise, the DeLone and McLean information system (D&M ISS) focuses more on LST [29], [30], [31]. The above previous researchers have not used complete models. Hence, integrating these models into a complete model can measure the e-learner success in a more comprehensive manner, namely E-LSAM. In the D&M ISS model, the main producers of satisfaction are service quality (SVQ), course and quality of information (CIQ) and the quality of systems (STQ) [29]. The CIQ and STQ are important topics in e-learning. SVQ consists of the quality of instructor and technical services. Completeness of content, clarity, conciseness and attractive NGO design are factors that represent the CIQ [16]. LMS that is designed with an attractive, interactive, dynamic display, and supported by good technical services can increase learner satisfaction which in turn becomes the key to success for them in e-learning [30], [25]. LST is increasingly important for the University in supporting the e-learner success [16], [20]. The PUS and the social interaction (SIT)

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can influence LST [26], [25]. Furthermore, Hertel and Karlen [24] found that the high level of collaboration of learners can be a driving factor in their LST.

E-LSAM is a combination of several pre-existing models. First, ECM theory which found that the PEU can increase LST which then leads to their ICU [12], [11], [13], [32]. Second, TAM which was initially based on PEU and PUS. Furthermore, this model was developed into four variables: LST, ATT, ICU and PUS [15]. Then proceed with TAM 3 which combines TAM 2 with the factors that exist in the PEU model [18], [19]. Third, SRL theory which have six most popular self-study models consist of three stages, namely preparation, performance, and evaluation [28], [26], [24], [22]. Fourth, D&M ISS which consist of six elements: the impact of organization, STQ, SVQ, CIQ, PUS and LST [29], [33]. Safsouf et al. [16] found that SVQ, STQ and CIQ are important variables that support LST and ICU. While, other studies have found that the CIQ, SIT and LST were the main determinants in LST [33], [25].

This research was carried out after the pandemic, when learning was carried out online according to established regulations. So empirical studies are needed on how effective online learning is after the pandemic. In fact, after the pandemic, e-learning is still being used. The purpose of this study is to map the factors, mediating variables and dimensions that influence the e-learner success in E-LSAM model. This research is inspired by Safsouf et al. [16] research using the E-LSAM model in online courses in Morocco. The difference is, this research was conducted at Islamic higher education in Indonesia with the modifications of the research instrument. Cultural differences and the characteristics of the object of research yield different results. Previous research focused more on general higher education as an object, while not much research has focused on PTKIN. PTKIN is increasingly developing and being sought after by the public as it is permitted to establish general studies programs besides religious studies there. There are 58 PTKINs, half of which have the status of public service bodies that can open non-religious general study programs [34]. Fortunately, this model has predicted to be effective in measuring the online learner success at PTKIN in Indonesia. Apart from that, this research also simplifies the objectives of previous research into the following three research questions:

RQ1. What are the factors that influence e-learner success in E-LSAM model?

RQ2. What mediating variables support e-learner success in E-LSAM model?

RQ3. What dimensions play a role in achieving e-learner success in E-LSAM model?

2. Methods

This research using the model initiated by Safsouf et al. [16] which can be described as follows:

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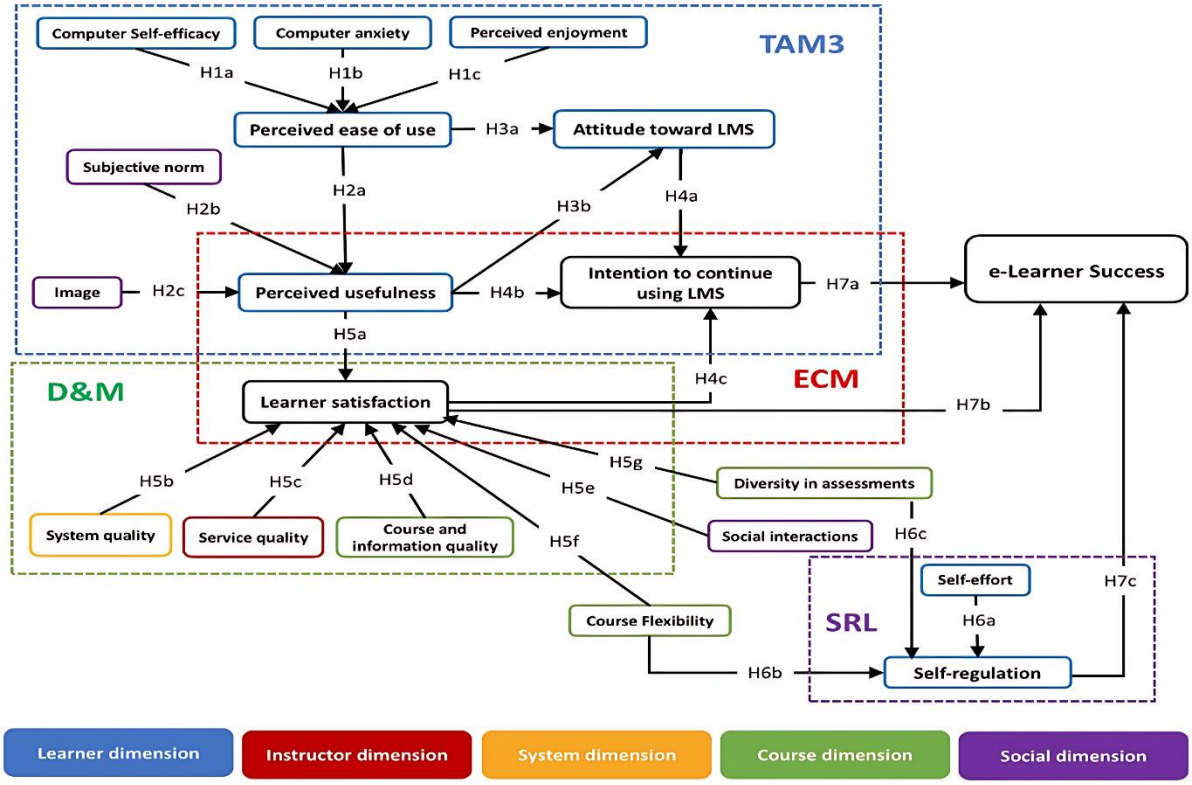

Figure 1.
Research model [16].

The research model illustrates that there are five important dimensions in achieving e-learner success in E-LSAM model, namely: learner, instructor, system, course and social dimension. Each dimension is based on several learning theories [16]. Learner dimension is based on TAM and D&M theory, instructor and system dimension uses TAM, D&M and ECM theory, course dimension is supported by TAM, ECM and SRL theory, while social dimension is based on ECM and SRL theory [16].

This research uses survey method which was conducted in 2022 with a population of 2,315 students of the Social Sciences Education Department in Education Faculty for all State Islamic Higher Education (PTKIN) institutions. Twelve PTKIN participated in this study with a total of 1,139 respondents who willing to fill out a questionnaire via google form. Based on gender, the majority of respondents or 73% (831 respondents) were women. This data confirms that in Indonesia, student interested in working of education, especially in social studies education, is still dominated by women. In terms of age, the lowest is 17 and the highest is 25, with the average age of the respondents being 19. Based on this age, respondents were mapped from semester 1 to semester 13 who were willing to fill out this research questionnaire.

The instrument used in this study is a questionnaire that has been used in previous studies [16] and has been modified. Instrument modification is done on statements that contain a negative tone that is different from other statements. The researcher conducted a validity test related to the translation of the previous questionnaire which was in English into Indonesian, then it was translated again from Indonesian to English. Testing the validity of the language showed the same results, so the questionnaire could be distributed to 48 University students to test the validity and reliability of the instrument. All statements in the questionnaire were measured using a Linkert scale ranging from 1 (strongly disagree) to 4 (strongly agree). There are 19 variables, where each

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variable consists of three questions. The results of the instrument validity test using the product moment correlation method and the reliability test using Cronbach's alpha show the results as shown in Table 1.

Table 1.
Instruments validity and reliability.

Variable	Pearson correlation	Cronbach's alpha	Note
LSC	0.687**	0.789	Valid & reliable
CSE	0.575**	0.774	Valid & reliable
CAX	0.714**	0.713	Valid & reliable
PEJ	0.796**	0.849	Valid & very reliable
PEU	0.488**	0.628	Valid & reliable
PUS	0.732**	0.768	Valid & reliable
ATT	0.823**	0.857	Valid & very reliable
SEF	0.529**	0.551	Valid & reliable enough
SRG	0.651**	0.695	Valid & reliable
SVQ	0.658**	0.580	Valid & reliable enough
STQ	0.561**	0.516	Valid & reliable enough
CIQ	0.742**	0.467	Valid & reliable enough
CFX	0.650**	0.714	Valid & reliable
DIA	0.740**	0.670	Valid & reliable
SBN	0.654**	0.856	Valid & very reliable
IMG	0.715**	0.691	Valid & reliable
SIT	0.660**	0.846	Valid & very reliable
ICU	0.889**	0.659	Valid & reliable
LST	0.832**	0.816	Valid & very reliable

Note: *** $p < 0.01$, ** $p < 0{,}05$, * $p < 0{,}1$.

Based on the Table 1, the total Pearson correlation value > the r table value with a significance of 1%. The Cronbach alpha (α) method was measured based on the Cronbach alpha scale (α) from 0.00 to 1.00. If the scale is grouped into five classes with the same range, then if Cronbach's alpha value is 0.00 to 0.20 it means less reliable, 0.21 to 0.40 means somewhat reliable, 0.41 to 0.60 means quite reliable, 0.61 to 0.80 means reliable and 0.81 to 1.00 means very reliable [35]. Based on Table 1, it shows that there are 5 variables whose instrument items are considered very reliable, there are 10 reliable variables and 4 variables that are quite reliable, so all questions can be used in this study.

2.1. Leveraging AI for Intelligent Reference Management

The power of AI lies in its ability to process vast amounts of data quickly and efficiently. In the context of academic research, this capability can be harnessed to perform tasks that would otherwise require hours of manual labor. Natural language processing (NLP) and machine learning are two key technologies that can be used to develop an intelligent reference management system.

NLP allows machines to understand and generate human language. When applied to academic research, NLP can be used to analyze the content of research papers, extract relevant information, and organize it in a way that is useful to researchers. For example, an AI-powered assistant could use NLP to read through thousands of journal articles, identify the most relevant sources for a particular research question, and present them to the researcher in an organized manner.

Machine learning, on the other hand, allows the assistant to learn from its interactions with the researcher. For instance, if a researcher frequently cites certain authors or journals, the assistant could learn to prioritize these sources in future searches. Over time, the assistant would become more attuned to the researcher's preferences, providing increasingly accurate and personalized recommendations.

The voice-controlled aspect of the proposed assistant would further enhance its usability.

By allowing researchers to interact with the system using simple voice commands, the assistant would eliminate the need for manual data entry and complex software navigation. This is particularly valuable in linguistic research, where researchers often need to consult multiple sources at once. With the AI assistant, they could simply ask for the information they need, and the system would provide it in real- time.

3. Descriptive Statistic

The results of the descriptive statistical test describe the minimum, maximum and mean data for each of the variables studied, which are shown in Table 2.

Table 2.
Instrument descriptive statistics.

Item	Minimum	Maximum	Mean
LSC	1	4	2.88
CSE	1	4	2.6
CAX	1	4	2.58
PEJ	1	4	2.58
PEU	1	4	2.7
PUS	1	4	2.68
ATT	1	4	2.6
SEF	1	4	3
SRG	1	4	3
SVQ	1	4	2.98
STQ	1	4	2.92
CIQ	1	4	2.89
CFX	1	4	3
DIA	1	4	3
SBN	1	4	2.84
IMG	1	4	2.74
SIT	1	4	2.8
ICU	1	4	2.77
LST	1	4	2.77

Table 2 shows that there is no variable that has a value of 4. This means that there are no students who strongly agree with the statements presented. The average of each variable is still close to 3 which means less agree, there are only 4 variables that are worth 3 which means students agree with the existing statement. These results can be concluded that the five dimensions studied both from the learner, instructor, course, system and social still need to be improved. The model feasibility test was carried out using the AMOS version 26 software. The goodness of fit value can be described as follows:

Table 3.
Goodness of fit.

Goodness of fit	Chi-square	P	CMIN/df	GFI	AGFI	TLI	CFI	RMSEA
Value	4247.393	0.000	2.972	0.875	0.855	0.933	0.940	0.042

Table 3 shows that some of the prerequisite values are not met. However, for large samples (> 200 samples), the degree of freedom applies, so the chi square must be accompanied by other tests [35]. The above model is said to be fit because the RMSEA value is 0.042 or 0.08, which is the most important thing in a model with large data [35]. In addition, the TLI and CFI values show good results because they are above 0.9, and the GFI and AGFI values are close to 0.9 so they can still be used to support a fit model [35].

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4. Factors that Influence E-Learner Success in E-LSAM Model

Subsequently, the research hypotheses were tested which can be shown in Table 4.

Table 4.
Regression weights.

Description				C.R., p-value	Support
H1a	CSE	–>	PEU	-0.284***	Yes
H1b	CAX	–>	PEU	0.145	No
H1c	PEJ	–>	PEU	1.204***	Yes
H2a	PEU	–>	PUS	0.538***	Yes
H2b	SBN	–>	PUS	-0.188***	Yes
H2c	IMG	–>	PUS	0.690***	Yes
H3a	PEU	–>	ATT	0.029	No
H3b	PUS	–>	ATT	1.069***	Yes
H4a	ATT	–>	ICU	-5.596***	Yes
H4b	PUS	–>	ICU	7.103***	Yes
H4c	LST	–>	ICU	0.937***	Yes
H5a	PUS	–>	LST	3.766***	Yes
H5b	STQ	–>	LST	-0.146	No
H5c	SVQ	–>	LST	-0.052	No
H5d	CIQ	–>	LST	-2.721***	Yes
H5e	SIT	–>	LST	0.091**	Yes
H5f	CFX	–>	LST	0.184**	Yes
H5g	DIA	–>	LST	0.075	No
H6a	SEF	–>	SRG	1.984***	Yes
H6b	CFX	–>	SRG	0.371**	Yes
H6c	DIA	–>	SRG	-0.970***	Yes
H7a	ICU	–>	LSC	-0.520***	Yes
H7b	LST	–>	LSC	1.189***	Yes
H7c	SRG	–>	LSC	0.421***	Yes

Table 4 is used to answer the first research question which is based on Figure 1. Research model. It can be found that almost all of the direct effects proposed in this research model show a significance level of 1% and 5%. The most influential variable can be seen from the C.R. value. The highest variables are PUS and ATT which have C.R. highest in influencing ICU and LST, so that it can influence LSC. However, apart from these variables, there are several variables that also influence LSC. CSE has a negative effect, while PEJ has a positive effect on PEU. The SBN negatively affect PUS. However, the PEU and IMG have a positive effect on PUS. ATT are positively affected by PUS, but are not affected by the PEU. The ICU will be affected by the ATT negatively, while PUS and LST effect that positively. The benefits felt by the learner are one of the things that determine the sustainability of the learner. The DIA, STQ and SVQ has no effect on LST. CIQ have a negative impact on LST. Meanwhile, LST is positively influenced by SIT and CFX. Furthermore, SEF and CFX have a positive effect on SRG, but the DIA has no effect on SRG. The LSC will be negatively affected by the ICU. LSC will be positively influenced by LST and SRG.

Otherwise, there are some correlations did not accept in this research. First, the effect of CAX on PEU. Learners still find it easy to use e-learning even though they have anxiety about using computers. This shows that learners are able to overcome this anxiety by trying their best in using e-learning. Second, PEU on ATT. ATT are not influenced by PEU, because learners inevitably have to use LMS in their learning. Furthermore, this study provides evidence of SVQ, STQ and DIA that have no effect on LST. These three variables are not enough to satisfy learners in their learning, however CFX and SIT can further increase learner satisfaction. Indirectly, the results of this research support previous

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research which revealed the weaknesses of online learning. Low student motivation in online learning can cause a decrease in productivity and learning outcomes [36]. Lecturers who are not familiar with new computer programs will have difficulty teaching online. Likewise, students who do not understand computer software will be increasingly left behind and feel isolated [36], [37]. Furthermore, another weakness revealed by Sadikin & Hamidah [38] that students are not supervised during online learning. This raises the issue of academic dishonesty, as someone other than the student could be the one submitting and completing assignments [39]. Another type of fraud is in the form of student work that is simply copy-pasted from various sources so that plagiarism increases [40].

The results of this study have similarities and differences compared to previous E-LSAM research [16]. Just like Safsouf et al. [16] this study also failed to support the hypothesis that had been proposed previously. However, there are differences in the rejected hypotheses. The results of this study support the results of previous studies which both showed a positive influence between LST and PEU. SBN affect positively on PEU. The PEU has positive effect on the IMG. PEU has no effect on ATT. ATT are influenced by PUS. The PUS has positive effects on LST, then support on ICU. SIT can improve the LST. Meanwhile, CIQ negatively affect LST as well as CFX. Furthermore, CFX can improve SRG and the DIA too. ICU and SRG can support the e-Learner success (LSC) [13], [16].

The results of this study are different from previous studies in the sense that SEF and DIA positively affect SRG [16], [13]. Whereas, the results of this study indicate that there is no effect on this relationship. While Safsouf et al. [16] shows that there is no influence between ATT on ICU, this study found a negative effect. In addition, Safsouf et al. [16] and Syedet al. [6] revealed that there is no effect on PUS, ICU, SVQ on LST, and LST on LSC. While, this study actually shows a positive influence among them. The results of previous studies found that CAX negatively affect PEU [16], [17], whereas in this study did not succeed in finding the correlation both of them. This study is different from previous studies, which found that CSE has positive effect on PEU, then affect positively PUS, and STQ has positive effect on LST [16], [7]. While, this study found a negative effect of the relationship.

5. Mediating Variables that Support E-Learner Success in E-LSAM Model

Furthermore, data regarding the total effect and indirect effect can be presented as in Table 5. This table is used to answer the third research question, namely the mediating variables in the e-LSAM model.

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Table 5.
Direct effect & indirect effect.

Variable	Direct effect							Indirect effect						
	PUS	**PEU**	**LST**	**SRG**	**ATT**	**LSC**	**ICU**	**PUS**	**PEU**	**LST**	**SRG**	**ATT**	**LSC**	**ICU**
SEF	0.000	0.000	0.000	1.631	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.613	0.000
CFX	0.000	0.000	-5.863	0.597	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-3.763	-5.492
DIA	0.000	0.000	4.403	-1.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.598	4.124
SVQ	0.000	0.000	-3.460	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-1.263	-1.739
CIQ	0.000	0.000	-3.460	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-2.353	-3.241
SIT	0.000	0.000	-.575	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.391	-0.539
IMG	0.555	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.025	0.000	0.615	-0.040	0.024
SBN	-0.194	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	-0.215	0.014	-0.008
STQ	0.000	0.000	7.284	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.954	6.824
PEJ	0.000	0.688	0.000	0.000	0.000	0.000	0.000	0.615	0.000	-0.028	0.000	0.773	-0.044	0.027
CAX	0.000	-6.214	0.000	0.000	0.000	0.000	0.000	2.905	0.000	0.130	0.000	3.649	0.210	-0.127
CSE	0.000	4.090	0.000	0.000	0.000	0.000	0.000	1.912	0.000	-.0086	0.000	2.402	-0.138	0.084
PUS	0.000	0.000	-0.045	0.000	1.109	0.000	0.085	0.000	0.000	0.000	0.000	0.000	-0.072	-0.876
PEU	0.467	0.000	0.000	0.000	0.069	0.000	0.000	0.000	0.000	-0.021	0.000	0.518	-0.034	0.021
LST	0.000	0.000	0.000	0.000	0.000	1.136	0.937	0.000	0.000	0.000	0.000	0.000	-0.456	-0.041
SRG	0.000	0.000	0.000	0.000	0.000	0.376	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ATT	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
LSC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ICU	0.000	0.000	0.000	0.000	0.000	-0.487	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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Table 5 shows that the PUS, LST, ATT and ICU are a good mediation in E-LSAM model. This can be seen from the value of the indirect effect which is greater than the value of the direct effect on the variable. This study can predict that LST, ATT and ICU can mediate other variables, like: PUS, PEU, SVQ, STQ, CIQ, CFX, SIT, and DIA, to achieve LSC. Based on the research data above, empirical evidence shows that the ATT, PUS, ICU and LST variables are suitable to be mediating variables in this E-LSAM model. Meanwhile, SRG has not succeeded in becoming a mediating variable in this model. This is partly due to the variables in SRL theory, namely CSE and SEF, which did not succeed in influencing SRG, but only the CFX variable succeeded in influencing it. The ICU variable is the strongest mediating variable to influence e-learner success. This variable is often a mediator for other variables to achieve LSC.

6. Dimensions that Support E-learner Success in E-LSAM Model

The effectiveness of the model can be assessed by testing the goodness of the model using multiple correlations which are the same as the R2 value in the Ordinary Least Square (OLS) described in Table 6. Table 6 is also used to answer the second research question regarding what dimensions influence the E-LSAM model.

Table 6.
Correlations precede structural equation modeling (R2).

R2	PUS	PEU	LST	SRG	ATT	ICU	LSC
Value	0.819	0.982	0.762	0.961	0.934	0.947	0.918

Table 6 shows that the R2 value of PUS is 81.9%, PEU is 98.2%, LST is 76.2%, SRG is 96.1%, ATT is 93.4%, ICU is 94.7% and LSC is 91.8%. Based on the R2 value, it shows that this model is very effective in assessing the success of online learning, especially in PTKIN. The R2 value of the PEU model shows the highest results. The PEU, PUS and LST models are part of the instructor dimension. These results indicate that the instructor is the dimension that most influences e-learner success. In higher education institutions, teachers/instructors are central to teaching, so the success or failure of learning also depends greatly on their innovation. Apart from that, the dimensional system also supports e-learner success as seen from the high R2 values of the ATT and ICU variables. Meanwhile, the course dimensions are also supported by the high R2 SRG value.

7. Discussion

The results of this study support previous research which examined the weaknesses of online learning. Tran [41] said that the lack of the presence of educators in the classroom reduces motivation to learn. Moreover, when internet service is weak and learning instructions are poorly understood, it can cause communication errors so that learning outcomes are low [40], [42]. Another weakness in online learning is that it requires quite high costs. Lecturers and students must provide adequate computer equipment, provide sufficient internet access, and pay for training in the use of computer software [41], [43], [44], [45]. The results of this research also support online learning theories that have been put forward by experts. Developed by Davis, Bagozzi, and Warshaw in 1989, TAM is the most common and most influential theory used in information systems. This model is basically based on two factors: PEU and PUS [19], [20]. In 1996, Venkatesh and Davis modified the TAM model and suggested that PEU and PUS have a direct effect on ICU [18], [21]. This model has four variables: PEU, PUS, LST, ICU. Previous research proposed a research framework based on the ECM model to study the relationship between perceived adaptability and system factors that can motivate learners to continue using e-learning systems in blended learning [32]. Perceived usefulness in using an e-learning system positively influences satisfaction, which in turn influences the intention to continue using a system. Chow and Shi empirically researched the antecedents of students' satisfaction and intention to continue

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learning in e-learning based on the ECM model, and they also extended the latter model by adding four other factors (course design, learning process, tutor and peer interaction) [13]. However, of these four variables, only the learning process and course design play a role in predicting satisfaction and intention to use e-learning.

SRL theory defines learning as a dynamic process in which students plan, monitor and evaluate their learning, applying appropriate strategies to achieve goals. It is a set of activities that an individual performs for himself proactively [28]. According to a recent article reviewing the six most popular independent learning models, most assessments consist of three stages, namely preparation, performance and evaluation [26]. Self-effort has a direct and indirect positive influence on e-learner success through self-regulation [34].

D&M Model [29], consists of six elements: system quality, information quality, system use, user satisfaction, individual impact and organizational impact. Furthermore, the service quality factor is added as a new construct in the model to measure the quality of services provided by information technology entities, because many organizations tend to outsource these services to other parties. Similarly, two factors, individual impact and organizational impact, are combined to form one factor referred to as net benefit [29]. Ozkan & Koseler [46] expanded the D&M ISS model by dividing its constructs into two categories: technical and social factors to form the hexagonal e-learning assessment model (HELAM). In fact, only two factors are retained in the ISS D&M model, system quality and service quality. While adding four new constructs, content quality, learner perspective, instructor attitude and supporting issues. Four variables: system quality, information quality, technology experience, and Internet experience are direct determinants of technology use and user satisfaction, which in turn influence the net benefits of Facebook and Moodle [33].

All models in the study produced quite high R2 values, where the PEU model produced the highest R2 values. This research provides empirical evidence of the effectiveness of TAM theory in supporting e-learner success with the highest scores. However, all the theories used in this research were successfully supported. The R2 value in this research is not much different from the results of previous studies which found a high score on the R2 value [16]. Based on the findings above, it can be concluded that E-LSAM is the most effective model in measuring the online learner success, especially in higher education. All models produce high R2 values, meaning that each dimension is needed to support e-learner success. However, the instructor dimension is the dimension that holds the most control in e-learner success. The instructor is central to learning, the success or failure of learning is largely determined by how innovative the instructor is in making learning a success, including online learning.

Previous research identified curricular elements for learner success, such as the flipped classroom, course redesign, and high impact practices, and links these to self-regulated learning to increase learner responsibility for the achievement of desired higher education outcomes—21st century skills for a global world [4]. With respect to learning activities, students who actively communicate with teachers/ coordinators via messenger services or questions and answer sessions, or students who log in to the online class at the early stage of the semester are more likely to pass a course. Individual course characteristics are also found to be important for pass in courses requiring a summative exam, while courses for either subjects that have a good track record of students passing or courses for subjects that are taught by teachers with a good track record of students passing are correlated with a high pass rate. The pass probability is greatly increased when students have passing experience, actively interact with teachers/ coordinators, or when the subject has a good student passing record [47]. The results of this research confirm the results of this research that e-learner success is supported by several interrelated dimensions, however, the instructor dimension is the dimension that most determines learner success. The results of this research show that in Islamic universities the instructor is still the center of learning.

This study contributes theoretically by providing an empirical evidence that combining ECM,

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TAM, SRL and D&M ISS can be a better assessment instrument. The result of this study also contributes in higher education management including all dimension in LMS design to support the success of learning of students. Universities should consider providing attractive learning media in order to guarantee students satisfaction and to continue using them which finally can give an impact on their learning success. This is also supported by the results of Prasetyo et al. [1] who found that Universities in Indonesia needed to improve the quality of the internet network and supporting infrastructure in improving the quality of education. Apart from that, LMS operation training is also needed for instructors, so that they can be more innovative by exploring all the menus in the LMS.

8. Conclusions

This study aimed to identify factors, mediating variable and dimension to support the e-learner success. Self-regulation, learner satisfaction, and intention continuing to use LMS are the determining factors that directly and indirectly affect the e-learner success. Those three variables can mediate other two variables: attitude toward LMS and the perceived usefulness. Other variables that also support the success of online learning are: self-efficacy, perceived enjoyment, subjective norm, image, perceived ease to use, service quality, social interaction, system quality, and diversity in assessment. The instructor dimension is the most important dimension apart from the course and system dimensions in supporting e-learner success. This research provides empirical evidence that TAM is the most effective model compared to other models as evidenced by the highest R2 value in this model. This study results can support the whole theory used in this research model.

This research has implications for providing interesting learning media in higher education so that students feel satisfied and then intend to continue using them which then has an impact on their learning success. An attractive LMS must also be supported by the instructor's ability to manage e-learning. Because the instructor dimension is important, it is necessary to provide LMS training for instructors so that they can be more innovative in implementing e-learning. This research was conducted on Islamic higher education in Indonesia, the results would be different if it was carried out in higher education in other countries. Different cultures and characteristics can be the cause of these differences. This study also lacks of control variable of respondent characteristics that can provide additional testing. Finally, it is better to use control variables in the form of respondent characteristics such as age, semester, higher education status, and study program in the next research agenda.

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Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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