Online Learning and Student Achievement in Sensitivity Analysis Perspective

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Abstract. The pandemic covid 19 brought huge changes in the education system, especially the need and necessity for an online learning process system from offline or face-to-face. This study examined the factors that determine the use of continuous e-learning and its impact on student achievement. Five variables in this study are thought to affect the continuous use of e-learning, namely professional factors, personal factors, environmental factors, information technology factors, and satisfaction with e-learning use. This type of research is hypothesis testing with primary data through questionnaires collected from active students ranging from Diploma 3 to doctoral programs within the scope of the Faculty of Economics and Business, Universitas Trisakti. The number of samples used is 1,114. The analytical tool used is SEM-PLS. The findings show that personal factors, environmental factors, information technology factors, and satisfaction with using e-learning proved to have a significant positive effect on sustainable e-learning. In contrast, professional factors did not have a positive effect on using sustainable e-learning. Other findings show that the use of sustainable e-learning has a positive effect on student achievement.

Keywords: Student Learning Achievement, Continuous use of E-Learning, Determinants of Continuous E-Learning

1 Introduction

The COVID-19 pandemic has brought about rapid changes in the education system [1]. The presence of COVID-19 puts higher education institutions in a dilemma choice. On the one hand, if we continue to carry out the face-to-face learning process at the university, the risk of the spread of COVID-19 is unavoidable. On the other hand, if staying at home, learning will not occur, so the fate of all elements in higher education institutions is at stake. Finally, globally, it is felt that the urgent solution is that learning can only be done online [2]. Electronic-based learning (e-learning), which was previously only an alternative, is now the only option so that the learning process can continue from home, as well as a common way to break the chain of the spread of COVID-19.

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The application of e-learning presupposes and demands acceptance and continuous use by students of certain types of technology used in an applied e-learning system [3]. For a long time, technology in education has become a necessity and inevitable [4]. The emergence of the COVID-19 pandemic shows that the use of technology in higher education has brought about some radical changes in the dynamics of learning [5]

There are four groups of determinant factors categorized by [6] that affect the use of sustainable e-learning. First, professional factors where the findings of [6] prove that professional factors have a positive effect on the use of sustainable e-learning. These findings are supported by other research findings related to the influence of professional factors on sustainable e-learning, namely the research findings of [7] [8]. The second factor that influences the use of sustainable e-learning is the personal factor. Several empirical studies prove the influence of personal factors, which include the dimensions of performance expectations, relative advantages, suitability, and attitudes towards the use of sustainable e-learning, as shown by the findings of [6], [9] [10] Environmental factors consisting of aspects of college colleagues, family and friends, and other support are the third factors that influence the use of sustainable e-learning such as the research findings of [6][11][12][13] The fourth factor that influences the use of sustainable e-learning is the information technology factor. The results of empirical studies prove the positive influence of information technology factors on the use of sustainable e-learning, such as the findings of [6][13] [14],[15]. The satisfaction factor is one of the variables that significantly influence the intention to use e-learning [9] consistently. These findings are supported by research findings by [16],[17],[10]

Based on the explanation above, this study was conducted with the aim of testing and analyzing the influence of professional, personal, environmental, and information technology factors and student satisfaction on the use of sustainable e-learning, which then has an impact on student achievement.

2 Methods

The type of research used is hypotheses testing, which aims to empirically test the influence of determinants on sustainable e-learning to improve student achievement at the Faculty of Economics and Business, Universitas Trisakti, from the existing Diploma 3 to the doctoral program.

The variables used in this study consisted of 5 independent variables, 1 intervening variable, and one dependent variable. The five independent variables are the first professional factor with three dimensions, namely faculty support, management support, and learning support, by adopting the [6] measurement with a total of 9 measurement indicators. The second is a personal factor with four dimensions, namely performance expectations, relative advantage, suitability, and attitudes, with 15 measurement indicators adopted from [6]. The Third is environmental factors consisting of 3 dimensions, namely college colleagues, family and friends, and other support, with a total of 9 indicators where all measurements adopted from [6]. Fourth is the information technology factor, with four measurement indicators adopted from [6]. The fifth is the satisfaction factor using three measurement indicators adopted from [9]. The intervening variable used in

this study is continuous e-learning with four measurement indicators adopted from [6]. The dependent variable in this study is student achievement, whose measurement uses four indicators adopted from [6]. All measurement indicators use a Likert scale of 1 to 5 (strongly disagree to agree strongly).

In this study, the population used were active students of the Faculty of Economics and Business, Universitas Trisakti, who came from the 3-year diploma, undergraduate, Postgraduate, and Doctoral Program. The total sample used in this study was ten times the number of indicators used [18]). The total indicators used in this study are 49, so the minimum sample is 10 x 49 = 490. This survey conducted obtained a sample of 1,114 respondents with a composition of 3-year diploma programs of 34.2%, undergraduate programs as much as 44.6%, masters programs as many as 10.1%, and doctoral programs as much as 10.9%, The analytical method used in this study is the Structural Equation Model Partial Least Square (SEM-PLS) to accommodate the heterogeneity of the sample from diploma to doctoral study programs so that the assumption of normality required in the model is ignored. The processing stage begins with making the SEM-PLS model, built based on the literature review and previous empirical studies, as shown in Fig. 1. The next stage is testing the research instrument.

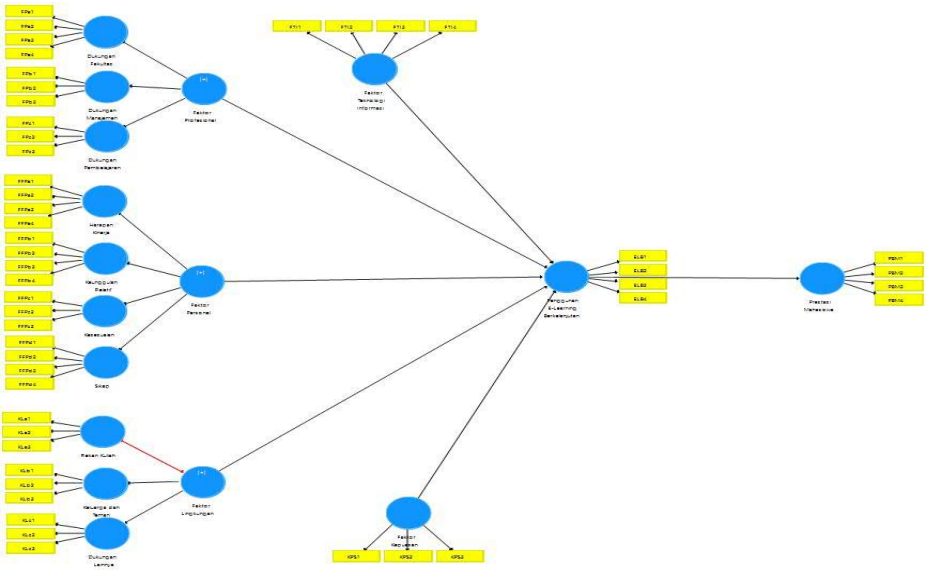

Fig 1. SEM-PLS research model.

Which consists of validity testing, which aims to test whether the indicators used to measure what they want to measure by using outer loading, where an indicator is said to be valid if it has an outer loading of more than 0.5 [19] as well as reliability testing to test

the consistency of respondents' answers, using Cronbach Alpha where the indicator is said to be consistent if it has a Cronbach Alpha value of more than 0.6 [18]. The next step is to perform a descriptive statistical analysis of the research variables to determine the respondents' responses related to each research variable. The analysis is continued for testing the fit model using multicollinearity testing where the independent variable is said to have no multicollinearity if it has a VIF value < 10 and testing the coefficient of determination (R2) to find out how much variation of the independent variable can explain the variation of the variable. The last dependent variable is partial testing (t-test), which aims to test the effect of one variable on other variables according to the number of research hypotheses used.

3 Results and Discussion

The results of instrument testing, namely validity and reliability, as well as descriptive statistics for research variables, can be seen in Table 1. The results of validity testing produce an outer loading value > 0.5 for all indicators that form dimensions or variables so that it can be concluded that all measurement indicators are proven valid (measuring what to measure). Reliability testing for each dimension or variable resulted in a Cronbach alpha value > 0.6, which all indicators measuring the dimensions or variables proved consistent.

Descriptive statistics for research variables consisting of professional, personal, environmental, and information technology factors, satisfaction with the use of e-learning, continuous use of e-learning, and overall student achievement resulted in a good response, as indicated by a mean score of more than 4. Likewise, the response for each dimension and the indicators forming the variable as a whole produce a good response because most produce a mean value of more than 4. However, some indicators produce an average value close to 4.

Table 1 Research instrument testing and descriptive statistics.

Item	Indicator	*Outer Loading*	Cronbach Alpha	*Mean*	Deviation Standard
Variable: Professional Factor				4,273	0,837
Dimension: Faculty Support				4.407	0.571
DF1		0,820	0.803	4.351	0.772
DF2		0,864		4.498	0.677
DF3		0,808		4.599	0.653
DF4		0,680		4.181	0.790
Dimension: Management Support				4.116	0.723
DM1		0,892	0.873	4.199	0.760
DM2		0,904		4.087	0.794
DM3		0,883		4.063	0.875

Item	Indicator	*Outer Loading*	Cronbach Alpha	*Mean*	Deviation Standard
Dimension: Learning Support				4.297	0.647
DP1		0,872	0.864	4.196	0.764
DP2		0,892		4.386	0.716
DP3		0,896		4.308	0.711
Variable: Personal Factor				**4,273**	**0,837**
Dimension: Performance Expectation				4.204	0.762
HK1		0,915	0.935	4.216	0.828
HK2		0,922		4.206	0.844
HK3		0,922		4.162	0.864
HK4		0,902		4.234`	0.792
Dimension: Relative Advantage				4.197	0.751
KR1		0,904	0.927	4.237	0.827
KR2		0,874		4.246	0.812
KR3		0,918		4.146	0.830
KR4		0,927		4.160	0.847
Dimensi: Suitability				4.007	0.818
KS1		0,912	0.915	4.005	0.870
KS2		0,936		4.030	0.869
KS3		0,927		3.987	0.915
Dimension: Attitude				4.015	0.815
SK1		0,885	0.910	4.150	0.838
SK2		0,891		4.040	0.906
SK3		0,855		3.850	1.020
SKJ4		0,916		4.018	0.912
Variable: Environmental Factor				**4,273**	**0,837**
Dimension: College Colleagues				4.003	0.781
RK1		0,909	0.915	4.047	0.834
RK2		0,927		3.965	0.870
RK4		0,935		3.996	0.833
Dimension: Family and Friends				4.092	0.742
KT1		0,922	0.890	4.131	0.808
KT2		0,920		4.064	0.841
KT3		0,875		4.082	0.811
Dimension: Other Support				3.998	0.790
OL1		0,930	0,918	3.997	0.852

Item	Indicator	*Outer Loading*	Cronbach Alpha	*Mean*	Deviation Standard
OL2		0,932		4.003	0.827
OL3		0,919		3.994	0.876
Variable: Information Technology				**4.112**	**0.747**
TI1		0,885	0,917	4.127	0.829
TI2		0.904		4.031	0.876
TI3		0,905		4.088	0.828
TI4		0,886		4.201	0.807
Satisfaction of Continuous Use of e-Learning				**4,063**	**0,778**
KPE1		0,913	0,916	4.011	0.856
KPE2		0,939		4.105	0.828
KPE3		0,922		4.074	0.840
Use of Sustainable e-Learning				4.034	**0,837**
PEB1		0.943	0,948	4.060	0.902
PEB2		0.950		4.058	0.887
PEB3		0.930		4.088	0.863
PEB4		0.895		3.930	0.953
Student Learning Achievement				4.004	0.840
PBM1		0.903	0,943	3.983	0.932
PBM2		0.939		3.981	0.915
PBM3		0.923		4.007	0.919
PBM4		0.929		4.046	0.872

Source: data processed

The results of theoretical hypothesis testing can be seen in Table 2. For hypothesis H1, it is concluded that professional factors have not been proven to have a positive effect on sustainable e-learning because it produces a negative estimate value of -0.100. These findings contradict the findings of [6], [7], and [8]. The results of testing the H2 hypothesis showed that personal factors had a significant positive effect on continuous e-learning, as indicated by the estimated coefficient value of 0.302 with a p-value of 0.000 <0.05. These findings support the research findings of [6] [14], [10]. Testing the H3 hypothesis resulted in the conclusion that environmental factors had a significant positive effect on the use of sustainable e-learning, as indicated by the estimated coefficient value of 0.164 with a p-value of 0.000 <0.05. These findings support the findings of research conducted by [6], [11], [12], [13]. The findings for hypothesis H4 show that information

technology factors have a significant positive effect on the use of sustainable e-learning, as indicated by the estimated coefficient of 0.193 with a p-value of t statistic of 0.000 <0.05. These findings support the findings of research conducted by [6], [13], [14], and [15]. Hypothesis H5 produces an estimated value of 0.303 with a p-value of 0.000 <0.05, which means it is proven that the satisfaction of using e-learning has a positive effect on the use of sustainable e-learning. These results support the research findings of [9], [16],[17], and [10]. Hypothesis H6 resulted in the finding that the use of continuous e-learning had a significant positive effect on student achievement as indicated by the estimated value of 0.772 with a p-value of 0.000 <0.05. These results support the research findings of [20], [21],[10].

Table 2. Research hypotheses testing result.

	Hypotheses	Estimate	C.R.	p-value	Conclusion
H_1	There is an influence of professional factors on the use of continuous e-learning.	-0.100	-3.244	0.000	Not supported
H_3	There is an influence of personal factors on the use of continuous e-learning	0.302	6.291	0.000	Supported
H_3	There is an influence of environmental factors on the use of continuous e-learning	0.164	3.462	0.000	Supported
H_4	There is an influence of information technology factor on the use of continuous e-learning	0.193	3.988	0.000	Supported
H_5	There is an influence of satisfaction on the use of continuous e-learning	0.303	4.936	0.000	Supported
H_6	There is an influence of continuous e-learning usage on student achievement	0.772	40.690	0.000	Supported

Source: data processed

4 Conclusion

The research findings show that personal factors, environmental factors, information technology factors, and satisfaction with the use of e-learning have a significant effect on the continuous use of e-learning. Other findings also prove that the continuous use of e-learning is proven to improve student achievement. There is one variable, namely professional factors that have not been proven to have a positive effect on the continuous use of e-learning and one of the causes is that the Faculty of Economics and Business, Universitas Trisakti, has the largest number of active students, which is above 5,000 students. On the one hand, while on the other hand, the capacity for e-learning availability is less than the existing needs due to the COVID-19 pandemic, where 100% of learning must use e-learning.

The managerial implication of these findings is that continuous e-learning stimulates student achievement improvement. The inhibiting factor for optimizing the positive influence of the continuous use of e-learning is the professional factor, and this is more due to the very high need for the use of e-learning because, during the COVID-19 pandemic, all of them used e-learning learning methods while the available capacity was limited. This is an input for institutions to always improve the quality of services from online learning systems by increasing the capacity of the e-learning system, especially in terms of speed, so that student users and lecturers will face minimal obstacles related to the existing e-learning system.

References

1 R. A. Moawad, "Online Learning during the COVID- 19 Pandemic and Academic Stress in University Students," *Rev. Rom. pentru Educ. Multidimens.*, vol. 12, no. 1Sup2, pp. 100–107, 2020, doi: 10.18662/rrem/12.1sup2/252.

2 S. S. A. Almekhlafy, "Online learning of English language courses via blackboard at Saudi universities in the era of COVID-19: perception and use," *PSU Res. Rev.*, vol. 5, no. 1, pp. 16–32, 2020, doi: 10.1108/PRR-08-2020-0026.

3 A. Bhattacherjee, "Understanding Information Systems Continuance: An Expectation-Confirmation Mode," *MIS Quarterly,* vol. 25, no. 3, pp. 351–370, 2001.

4 M. M. N. Hassan Ja'ashan, "Perceptions and Attitudes towards Blended Learning for English Courses: A Case Study of Students at University of Bisha," *English Lang. Teach.*, vol. 8, no. 9, pp. 40–50, 2015, doi: 10.5539/elt.v8n9p40.

5 A. A. Taiwo and A. G. Downe, "The theory of user acceptance and use of technology (UTAUT): A meta-analytic review of empirical findings," *J. Theor. Appl. Inf. Technol.*, vol. 49, no. 1, pp. 48–58, 2013.

6 A. Kapo, A. Mujkic, L. Turulja, and J. Kovačević, "Continuous e-learning at the workplace: the passport for the future of knowledge," *Inf. Technol. People*, vol. 34, no. 5, pp. 1462–1489, 2020, doi: 10.1108/ITP-04-2020-0223.

7 M. Moradi, H. Tarighi, R. Hosseinipour, and M. Saravani, "Factors influencing the learning of accounting information systems (AIS)," *J. Econ. Adm. Sci.*, vol. 36, no. 3, pp. 226–245, 2019, doi: 10.1108/jeas-02-2019-0014.

8 A. Alam and M. Ahmad, "The role of teachers' emotional intelligence in enhancing student achievement," *J. Asia Bus. Stud.*, vol. 12, no. 1, pp. 31–43, 2018, doi: 10.1108/JABS-08-2015-0134.

9 M. N. Hossain, M. S. Talukder, A. Khayer, and Y. Bao, "Investigating the factors driving adult learners' continuous intention to use M-learning application: a fuzzy-set analysis," *J. Res. Innov. Teach. Learn.*, vol. 14, no. 2, pp. 245–270, 2021, doi: 10.1108/jrit-09-2019-0071.

10 N. Elfaki, I. Abdulreheem, and R. Abdulrahim, “Impact of E-Learning vs Traditional Learning on Student’s Performance and Attitude,” *Int. J. Med. Res. Heal. Sci.*, vol. 8, no. 10, pp. 76–82, 2019.

11 A. Doucet, D. D. Netolicky, K. Timmers, and F. J. Tuscano, “Thinking about Pedagogy in an Unfolding Pandemic by Education International - issuu,” *Educ. Int.*, no. March, p. 58, 2020, [Online]. Available: https://issuu.com/educationinternational/docs/2020_research_covid-19_eng.

12 Z. Zainuddin, C. J. Perera, H. Haruna, and H. Habiburrahim, “Literacy in the new norm: stay-home game plan for parents,” *Inf. Learn. Sci.*, vol. 121, no. 7–8, pp. 645–653, 2020, doi: 10.1108/ILS-04-2020-0069.

13 M. J. S. Diño and A. B. De Guzman, “Using Partial Least Squares (PLS) in Predicting Behavioral Intention for Telehealth Use among Filipino Elderly,” *Educ. Gerontol.*, vol. 41, no. 1, pp. 53–68, 2015, doi: 10.1080/03601277.2014.917236.

14 H. Y. Hsu, F. H. Liu, H. T. Tsou, and L. J. Chen, “Openness of technology adoption, top management support and service innovation: a social innovation perspective,” *J. Bus. Ind. Mark.*, vol. 34, no. 3, pp. 575–590, 2019, doi: 10.1108/JBIM-03-2017-0068.

15 T. Abu Salim, M. El Barachi, O. P. Onyia, and S. S. Mathew, “Effects of smart city service channel- and user-characteristics on user satisfaction and continuance intention,” *Inf. Technol. People*, vol. 34, no. 1, pp. 147–177, 2021, doi: 10.1108/ITP-06-2019-0300.

16 S. Shehzadi, Q. A. Nisar, M. S. Hussain, M. F. Basheer, W. U. Hameed, and N. I. Chaudhry, “The role of digital learning toward students’ satisfaction and university brand image at educational institutes of Pakistan: a post-effect of COVID-19,” *Asian Educ. Dev. Stud.*, vol. 10, no. 2, pp. 276–294, 2021, doi: 10.1108/AEDS-04-2020-0063.

17 Fatoni *et al.*, “University students online learning system during Covid-19 pandemic: Advantages, constraints and solutions,” *Syst. Rev. Pharm.*, vol. 11, no. 7, pp. 570–576, 2020, doi: 10.31838/srp.2020.7.81.

18 Hair, J. F., et al., *Multivariate Data Analysis*, 7th ed. Edinburgh: Pearson, 2009.

19 Sugiyono, *Statistika untuk Penelitian. Bandung*. Bandung: Alfabeta, 2017.

20 E.-S. T. Abumandour, “Public libraries’ role in supporting e-learning and spreading lifelong education: a case study,” *J. Res. Innov. Teach. Learn.*, vol. 14, no. 2, pp. 178–217, 2021, doi: 10.1108/jrit-06-2019-0063.

21 S. Dhawan, “Online Learning: A Panacea in the Time of COVID-19 Crisis,” *J. Educ. Technol. Syst.*, vol. 49, no. 1, pp. 5–22, 2020, doi: 10.1177/0047239520934018.