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Factors affecting students' intention to use artificial intelligence in learning: An empirical study in Vietnam

Nguyen Thu Hoai[1*]
[1]Thuongmai University, Vietnam; nguyenhoai@tmu.edu.vn (N.T.H.).

Abstract: This study was conducted to evaluate the factors affecting students' intention to use artificial intelligence (AI) in their learning process in the context of Vietnam. A mixed-method approach, which combined both quantitative and qualitative analysis, was used in this study. The research model was built based on the technology acceptance model (TAM). The research results with 404 students at universities in Vietnam showed that the intention to use AI was influenced by the factors of perceived ease of use and perceived usefulness of AI. The study also provided some implications for universities, developers, and service providers related to AI to increase the value of AI in students' learning process.

Keywords: *Artificial intelligence, Factors affecting, Students' intention to use, Vietnam.*

1. Introduction

With the development of technology, AI has become a topic of interest in all fields and professions, and the education sector is no exception to that trend. Current digital technology advancements have brought about the development of alternative learning and teaching strategies and methodologies [1, 2]. In Vietnam, AI has been used for a long time, but only right after the COVID-19 pandemic broke out, AI technology was widely used and developed remarkably, especially in the fields of healthcare, education, finance, e-commerce… In the field of education, educational software designed on the basis of AI helped improve and enhance people's access to information, track learners' progress, support learners to complete their study program. According Li [3] the potential of AI systems in higher education is endless. Technology related to AI adopted in the educational institutions can assist in educational problem-solution and promote high quality of education [4].

AI technology has brought significant value to the education sector and formed the habit of using AI in the learning progress of learners. However, besides that, there is still a certain number of students who are reluctant or even afraid to approach and use AI technology in their learning process. For the facilitation of learning process within AI-assited environments, the attitudes of learners towards AI technology need to be explored [5]. Nevertheless, the reality is, students' willingness towards its adoption classroom applications of AI have largely been placed aside in the field of education Chai, et al. [6]. Wang, et al. [7] and Lee [8] also recommended the need to examine the factors that influence learners' willingness towards AI technology use from the perspective of student-oriented learning. Therefore, this study was conducted not only to evaluate the current status of AI use by students but also to find out the factors that influence the intention to use AI in the context of universities in Vietnam.

This study developed a research model based on TAM to elucidate the factors that influence students' intention to use AI in their learning process. The article mainly focusses on answering the questions: (1) What factors influence students' intention to use AI? (2) What is the specific direction and level of influence of these factors on students' intention to use AI in learning process?

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* Correspondence: nguyenhoai@tmu.edu.vn

2. Literature Review and Hypothesis Development

The number of studies related to intention to use AI in learning in the world is not much and mainly uses the TAM model. The TAM model was proposed by Davis [9] with two main factors affecting users' acceptance of technology including: (1) perceived ease of use, (2) perceived usefulness. In which, perceived ease of use is understood as the extent to which users believe that using technology is not complicated. Perceived usefulness is the extent to which users believe that technology will benefit their work or needs.

According to Davis [10] an individual's ability to accept technology will be higher if this person perceives that the technology is easy to use. The impact of this factor on technology acceptance has been demonstrated in the studies of Wu, et al. [11] and Smit, et al. [12]. Some studies in the field of education also showed similar results such as the study of Damerji [13] with a group of accounting students in the United States, Malek, et al. [14] with students at universities in Jordan, Sudaryanto, et al. [15] with Indonesian students... However, some other studies showed different results such as the study of Park [16] with students in Korea, Lee, et al. [17] in Taiwan... Based on these previous studies, the author proposes the following research hypothesis:

H1: Perceived ease of use of AI technology has a positive effect on students' intention to use this technology

Regarding the perceived usefulness factor, according to Davis [10] the higher perceived usefulness, the higher likelihood of technology adoption. Empirical studies have proven this hypothesis such as Bagozzi, et al. [18] and Larasati and Santosa [19]. In the field of education, studies by Damerji [13]; Malek, et al. [14] and Sudaryanto, et al. [15] also gave similar results. Based on these previous studies, the author proposes the following research hypothesis:

H2: Perceived usefulness of AI technology has a positive effect on students' intention to use this technology.

3. Research Design

3.1. The Research Model

Inheriting from previous studies and based on TAM model, the proposed research model is as follows:

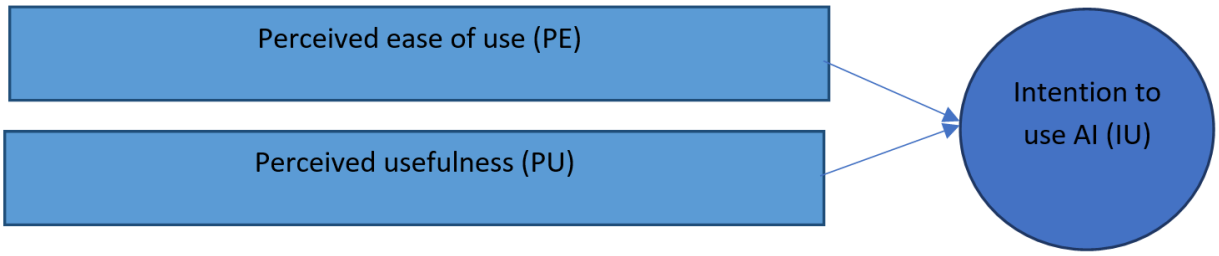

Figure 1.
Research model.

The research model is expressed by the following fomula:

$$IU = \beta_1 PE + \beta_2 PU$$

3.2. The Research Sample

The study tested the research hypotheses on factors affecting students' intention to use AI technology in their learning process. The survey subjects of the study were students at Vietnamese universities from different majors of different universities in different geographical areas. The sample size was determined according to Hair, et al. [20]: the sample size for quantitative research is at least

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200-250. The survey questionnaire was sent to the survey subjects in the form of google form via Zalo, Instagram, Email, etc.

3.3. The Research Methodology

This study used a combination of qualitative and quantitative research methods. In which, the qualitative research method is used to collect data from previous studies to build models, research hypotheses and design the survey questionnaire. The study tested the suitability of the research model as well as built new scales through semi-structured interviews and pilot surveys. Based on the qualitative research method, the study obtained a survey questionnaire consisting of 4 scales for the dependent variable and 9 scales for independent variables. The study used quantitative research methods such as Cronbach's Alpha scale reliability testing, EFA exploratory factor analysis, and regression analysis on SPSS 20 software.

The scale of factors in the study was inherited from previous studies and adjusted to suit the study, specifically as follows:

Table 1.
Scales of variables in research.

Variables	Code	Scales	Sources
Perceived ease of use	PE1	Learning to use AI would be easy	Thompson, et al. [21]; Davis [10] and Igbaria, et al. [22]
	PE2	I would find it easy to use AI to do what I want to do	
	PE3	It would be easy for me to become skillful at using AI	
	PE4	I would find AI easy to use	
Perceived usefulness	PU1	1. Using AI improves my learning performance	Thompson, et al. [21]; Davis [10] and Igbaria, et al. [22]
	PU2	2. Using AI increases my learning productivity	
	PU3	3. I find AI useful for my learning process	
	PU4	4. Using AI enhances my effectiveness in my learning process	
	PU5	5. Using AI provides me with information that would lead to better decisions	
Intention to use AI in learning process	IU1	I will continue to keep an eye on the progress of AI technologies	Chai, et al. [6] and Chengliang, et al. [23]
	IU2	I will regularly update the latest AI applications	
	IU3	I plan to use AI to help me learn now and in the future	
	IU4	I will continue to apply AI technology to solve problems I encounter in learning process	

4. Results and Discussion

4.1. Descriptive Statistics of Survey Sample

The author distributed 500 questionnaires, resulting in 404 valid responses used for analysis in the next steps. According to the descriptive statistics (Table 2), 52.48% respondents were male and 47.52% were female. In addition, the majority of the survey subjects were students from the following majors: engineering and technology (23.76%), medical science (18.32%), economics (29.21%), humanities and society (18.32%). With geographical characteristics, Vietnam consists of 3 main regions: North, Middle, South and most universities are allocated in the North and South regions, so the number of students participating in the survey in these regions is superior to the Midle region.

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Table 2.
Descriptive statistics of survey sample.

Demographic Variables	Category	Frequency	Percentage
Gender	Male	212	52.48%
	Female	192	47.52%
Subject	Engineering and technology	96	23.76%
	Medical science	74	18.32%
	Economics	118	29.21%
	Humanities and society	74	18.32%
	Others	42	10.4%
Origin of students	North	176	43.56%
	South	133	32.92%
	Middle	95	23.52%

4.2. The Reliability of the Scales

Study used Cronbach's Alpha coefficient to test the reliability of the dependent and independent variable scales. According to Table 3, the Cronbach's Alpha coefficients of all variables are in the range of 0.7-0.9. Therefore, the reliability of all scales is ensured for carrying out the empirical study.

Table 3.
The reliability of the scales.

Variables	Cronbach's Alpha	N
Perceived ease of use	0.718	4
Perceived usefulness	0.841	5
Intention to use AI in learning process	0.841	4

4.3. Exploratory Factor Analysis Results

After analyzing the reliability of the scale, the study uses exploratory factor analysis (EFA) to determine whether the observed variables are suitable for performing regression analysis in the next step.

For independent variables: The results of exploratory factor analysis of independent variables are shown in Tables 4 and 5 below. The KMO coefficient is 0.884, satisfying the condition: 0.5 <KMO < 1, Bartlett's test has sig < 0.05 (according to Table 4). With the angle rotation method (Varimax), all variables have loading factors greater than 0.5, there is no cross loading phenomenon (according to Table 5).

Table 4.
KMO and Bartlett's Test (Independent variables).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.884**
Bartlett's Test of Sphericity	Approx. Chi-Square	1292.595
	df	36
	Sig.	0.000

Table 5.
Rotating factors (Independent variables).

	Component	
	1	**2**
PU3	0.830	
PU1	0.797	
PU4	0.767	
PU2	0.763	
PU5	0.586	
PE2		0.823
PE4		0.755
PE1		0.597
PE3		0.541

For the dependent variable: KMO coefficient = 0.815 > 0.5, Bartlett test has sig < 0.05 (according to Table 6) showing that the data is suitable for exploratory factor analysis. With the angle rotation method (Varimax), the variables converge so there is no rotation matrix table.

Table 6.
KMO and Bartlett's Test (The dependent variable).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.815
Bartlett's Test of Sphericity	Approx. Chi-Square	625.073
	df	6
	Sig.	.000

4.4. Pearson Correlation Analysis Results

Prior to testing the hypothesis, a Pearson correlation analysis was performed to determine the degree, strength, and direction of correlation between the variables.

Table 7.
Pearson correlation analysis results.

		IU	**PE**	**PU**
IU	Pearson Correlation	1	0.732**	0.691**
	Sig. (2-tailed)		0.000	0.000
PE	Pearson Correlation		1	0.572**
	Sig. (2-tailed)			0.000
PU	Pearson Correlation			1
	Sig. (2-tailed)			

As can be seen from the Table 7, there are significant positive correlations between students' intention to use AI in learning process and the the perceived ease of use and perceived usefulness. The perceived ease of use has the most remarkable relationship with the students' intention to use AI (r=0.732) while perceived usefulness has the correlation with r = 0.572.

4.5. Multiple Regression Analysis Results

The VIF coefficients are all 1.486 < 2, so there is no multicollinearity between the independent variables. The Durbin – Waston test (according to Table 8) gives a value of 1.743 in the range from 1 to 3, so there is no correlation between the residuals. The ANOVA test according to Table 9 gives a significance level of < 0.05, so the regression model fits the data and can be used. The R2 coefficient is 0.647 (according to Table 8), which means that 64.7% of the variation in the intention to use AI is explained by the factors that are independent variables included in the model. The regression results

according to Table 10 show that all independent variables have a significant and positive influence on students' intention to use AI during the learning process. The standardized regression equation for factors affecting students' intention to use AI during the learning process is shown as follows:
IU = 0.5 PE + 0.405 PU

Table 8.
Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.804[a]	0.647	0.645	.36501	1.743

Table 9.
ANOVA a test.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	97.738	2	48.869	366.792	0.000[b]
	Residual	53.427	401	0.133		
	Total	151.165	403			

Table 10.
Regression analysis.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.148	0.140		1.053	0.293		
	PE	0.539	0.039	0.500	13.828	0.000	0.673	1.486
	PU	0.366	0.033	0.405	11.197	0.000	0.673	1.486

5. Conclusions and Policy Implications

The results of the study showed that the independent variables had a significant correlation with students' intention to use AI in their learning process. This result is also consistent with some previous studies such as: Damerji [13]; Malek, et al. [14] and Sudaryanto, et al. [15].

Table 11.
Summary of hypotheses testing results.

Hypotheses	Testing results	Beta coefficient	Correlation
H1: Perceived ease of use of AI technology has a positive effect on students' intention to use this technology	Accepted	0.500	Positive
H2: Perceived usefulness of AI technology has a positive effect on students' intention to use this technology	Accepted	0.405	Positive

The perception of ease of use has a significant impact on students' intention to use AI. The research results show that students easily access and use AI proficiently in the learning process. This may be related to the implementation of AI system integration by universities in training activities as well as the use of AI in the teaching process by teachers.

In addition, regarding the second research hypothesis, the results show that the surveyed students have a high level of appreciation for the usefulness of AI in completing learning tasks and improving learning outcomes, so they tend to continue using AI in the future.

The results of the study can add to the richness of the literature related to AI in the field of education. However, the study still has certain limitations:

(1) The study only applies the TAM model to develop the research model and hypothesis. Besides the TAM model, there are also other models such as Unified theory of acceptance and use of technology - TAUT, Task technology fit - TTF, etc.

(2) The study only focused on surveying students in general, and did not see the difference between the level and influencing factors of students in different majors.

Therefore, future studies can apply other research models and add more factors to the research model as well as consider the difference in AI usage and factors influencing the intention to use AI for students in different majors.

The study shows the significant influence of factors including: (1) perception of ease of use, (2) perception of usefulness of AI on the intention to use AI in the learning process of students at universities in Vietnam. This result can support researchers in developing AI technology related to the education field, focusing on factors to promote the sustainable and effective use of AI for learners such as increasing ease of use or supporting learners in managing and evaluating the learning process. The research results can also be used to orient the use of AI in students' learning in the right direction. Educational institutions such as universities and lecturers can consider adding AI tools to the training process, supporting students to access and use appropriate AI applications to achieve the best learning outcomes. Universities should also consider organizing AI training programs for teachers and learners in teaching and learning activities to improve the experience and effectiveness of use. Finally, policymakers should also develop policies to support both academic and financial aspects to continue to develop and exploit the value of AI tools in training.

Transparency:

The author confirms 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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