

Factors affecting teachers' behavioral intention of using information technology in lecturing-economic universities

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ABSTRACT

The research aims to find out the factors influencing teachers' behavioral intention and usage behavior of information technology (IT) in lectures based on the Unified Theory of Acceptance and Use of Technology (UTAUT) with structural equation modeling (SEM) supported by AMOS 20 software. The study examines the impact of performance expectancy, effort expectancy, social influence, and subject characteristics on the teachers' behavioral intention, which is later examined along with facilitating conditions and habit on the teachers' usage behavior of IT. Data is collected from lecturers working at economic university in the northern area of Vietnam. The result shows direct positive effect of performance expectancy, effort expectancy and subject characteristics on teacher's behavioral intention. Moreover, behavioral intention, facilitating condition and habit later on have influenced on teacher's actual use behavior. Finally, the research indicates that younger teachers have stronger behavioral intention of apply IT in lecturing.

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1. Introduction

Nowadays, as information technology develops rapidly, the application of information technology (IT) in all fields is indispensable, including the field of education and training. In education and training, information technology has been applied in recent years. The application of information technology in teaching helps teachers improve their creativity and flexibility in the teaching process. In particular, teachers are not only constrained by the amount of specialized knowledge available but also learn more about computer science and the use of visual and audio skills in the design of lectures. In addition, the application also makes it easier to share lectures between teachers, and provides opportunities for teachers to discuss and improve the quality of their teaching. For students, applying IT will make lectures more interesting and also enhance significantly interaction between teachers and students. However, in practice, the application of information technology in lecturing at economic universities in the northern area of Vietnam is still limited, most of the teachers still keep using traditional teaching methods and only nearly 40% teachers using e-lecturing for teaching. Therefore, the research for identifying factors influencing teachers' behavioral intention and teachers' usage behavior of IT in lectures at economic universities in the northern area of Vietnam is necessary to improve training quality. The research uses the most well-known models and theories to model and explain the dynamics of technology adoption and use such as Technology Acceptance Model (TAM) (Davis 1989); Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003); Theory of Reasoned Action (TRA) and theory of planned behavior (TPB) (Fishbein & Ajzen, 1975). Through literature review, extending UTAUT framework by added a new factor, subject characteristics, the research carries out a survey of 186 teachers of economic universities in the northern area of Vietnam to determine factors impacting on teachers' behavioral intention and teachers' usage behavior of IT in lectures and suggest some solutions for these economic universities.

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2. Literature review

The issues of consumer’s behavioral intention of adopting technology have been discussed in a variety of aspects. Many theories have been widely used to precisely analyze consumer behaviors of adopting new technology, for example, the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT). These have been accepted and applied in many of the different fields, such as behavior science, management, computer science, and education. In basics, these theories and models have some similarities and differences between factors influencing behavioral intention and usage behavior of consumers. The UTAUT theory has some outstanding points in comparison to others because it integrates and develops others theories. Thus, in this study, the author uses the UTAUT theory (Venkatesh et al., 2003) and adds a new factor which is the subject characteristics. After extending UTAUT model the final model includes all following factors: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Subject Characteristics (SC) as determinants of Behavioural Intention (BI), which is along with Facilitating conditions (FC) and Habit (HB) will influence the actual Usage behaviour (UB).

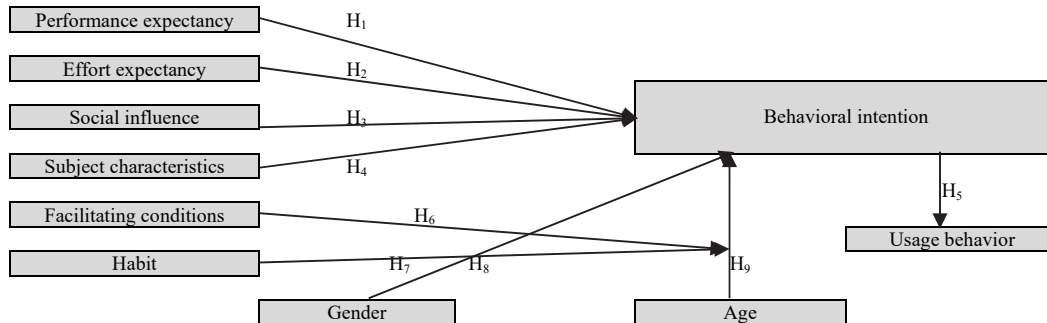


Fig. 1. Suggested research model

Performance expectancy is defined as the degree to which an individual believes that using system will help him/her attain gains in job performance (Venkatesh et al., 2003). In the research, performance expectancy shows the degree a teacher believes that applying information technology will improve his/her lecture and increases students’ understanding. A lot of previous studies confirmed that performance expectancy has a strong and positive effect on behavioral intention (Adedoja, et al., 2013; Tarhini et al., 2013b,c). Therefore, the hypothesis suggested in the research will be:

H₁: Performance expectancy will have a direct positive influence on teacher’s behavioural intention to use information technology in teaching.

Variable and source	Items
Performance expectancy (David, 1989; Moore and Benbasat, 1991)	1. Using IT in my lectures would improve my lecture performance 2. Using IT would make it easier to do my lectures 3. Using IT would enable me to accomplish lectures on time. 4. Using IT would make my students quickly understand lectures. 5. I feel that using IT is very useful

Effort Expectancy (EE): Effort expectancy is defined as the degree of ease to use a particular system (Venkatesh et al., 2003). In the previous model, effort expectancy is similar to perceived ease of use (TAM model), complexity (MPCU), and ease of use (IDT).

H₂: Effort expectancy will have a direct positive influence on teacher’s behavioural intention to use information technology in teaching.

Variable and source	Items
Effort expectancy (David, 1989; Moore and Benbasat, 1991)	1. Learning to apply IT in my lectures would be easy for me 2. I would find it easy to get IT to do what I want it to do 3. I would find be easy for me to become skillful at using IT 4. Overall, I believe that using IT in my lectures is easy.

Social influence is defined as the degree to which a person perceives how important it is that “other people” believe he or she should use a technology (Venkatesh et al., 2003). The importance of social influence in shaping behavioral intention are discussed in many studies (Tarhini et al., 2015; Alzeban, 2016).

H₃: Social Influence will have a positive influence on teacher’s behavioural intention to use information technology in teaching.

Variable and source	Items
Social Influence (Ajzen, 1991; David, 1989; Moore and Benbasat, 1991)	<ol style="list-style-type: none"> 1. I use IT because of the proportion of colleagues who use IT 2. People in my university who use IT have more prestige than those who do not 3. In general, the university has supported the use of IT

Subject characteristics: In this research, the author suggests a new element which may affect behavioral intention to use IT in the lectures of teachers at the university.

H₄: Subject characteristics will have a positive influence on teacher's behavioural intention to use information technology in teaching.

Variable and source	Items
Subject characteristics	<ol style="list-style-type: none"> 1. The content of subject is fit to apply IT 2. The method of teaching subject is fit to use IT 3. In general, subject characteristics is suitable to apply IT

Behavioural Intention (BI): Davis (1989) defined behavioural intention represents the degree to which a person is prompt to accomplish certain behaviour. In this study, we argue that behavioural intention can be determined throughout different factors including performance expectancy, effort expectancy, social influence, and subject characteristics. According to Tarhini et al (2015), behavioral "intention to reuse" can be an appropriate indicator for understanding the successful use of a technology, so following hypothesis will be tested:

H₅: Teacher's behavioural intention to use IT in teaching will have a direct positive influence on usage behavior.

Variable and source	Items
Behavioural Intention (Ajzen, 1991; David, 1989; Moore and Benbasat, 1991)	<ol style="list-style-type: none"> 1. I intend to use IT in my lectures in the future 2. I plan to use IT in my lectures the future 3. I will use IT on regular basis in the future 4. I will recommend my colleagues using IT

Facilitating conditions are defined as degree to which an individual believes that an organizational and technical infrastructure exists to support use the system. Alalwan et al.'s (2013) facilitating conditions could directly impact on the actual usage of computers and systems. Thus, the research suggests the following hypothesis:

H₆: Facilitating conditions to use IT will have a direct positive influence on usage behavior.

Variable and source	Items
Facilitating conditions (Ajzen, 1991; David, 1989; Davie et al, 1989; Moore and Benbasat, 1991)	<ol style="list-style-type: none"> 1. I have resources necessary to use IT 2. I have knowledge necessary to use IT 3. My university has technical infrastructure necessary to use IT

Habit: User's behavior is significantly influenced by individual habits. Raman and Don (2013) support positive effect for habit on usage behavior. Therefore, this study will test the following hypothesis:

H₇: Habit to use IT will have a direct positive influence on usage behavior.

Variable and source	Items
Habit (Venkatesh et al. 2003)	<ol style="list-style-type: none"> 1. Using IT is something I do frequently 2. Using IT is something I do automatically 3. Using IT in lecturing is my daily routine 4. Using IT is something that I have been doing for a long time

Use behavior

Variable and source	Items
Use behavior of IT (Ajzen, 1991; David, 1989; Moore and Benbasat, 1991)	<ol style="list-style-type: none"> 1. I use IT in my lectures on regular basis 2. I use IT for more than one subject 3. I may use IT for every lecture

In addition, age and gender have impacts on behavioral intention of applying IT in lecturing (Buabeng-Andoh, 2012; Scrimshaw, 2004), thus the study suggests following hypotheses:

H₈: There is a difference of gender on teacher's behavioral intention of using IT in lectures.

H₉: There is a difference of age on teacher's behavioral intention of using IT in lectures.

3. Research Methods

Qualitative research methods are used to identify groups of factors that affect the behavioral intention of applying IT in lectures and use behavior. Quantitative research methods were used in the study, such as Cronbach's alpha reliability, exploratory factorial analysis, confirmatory factor analysis, and structural equation modeling.

* Cronbach's alpha reliability test: used to eliminate the rubbish before conducting factor analysis. If Cronbach alpha ≥ 0.6 is an acceptable scale; Corrected item total correlation less than 0.3 will be rejected (Nunnally & Bernstein, 1994).

* Exploratory factor analysis (EFA) is used to explore variables which measure the factors of the behavioral intention of applying IT in lectures and use behavior

* Confirmatory Factor Analysis (CFA) is used to examine the relationships among the constructs within the proposed model (Arbuckle, 2009).

* Structural equation modeling (SEM) is used to test the proposed model. The structural model specifies the relationship between latent variables (a concept measured on many observable variables).

4. Research result

4.1. Sample statistics

Samples were selected by non-random sampling method. Based on Hair et al. (1998), for the EFA exploratory factor analysis, the minimum size is 5 times the total number of observed variables in the scales. The paper uses questionnaires with 28 observation variables used in factor analysis; therefore, the minimum sample size needed is: $28 \times 5 = 140$ observations. For this reason, the author uses a sample size of 240 questionnaires for lecturers at economic universities in the northern area of Vietnam. Out of 240 distributed questionnaires 186 were returned indicating 80.8 % response rate. 8 invalid questionnaires were eliminated due to incomplete data, thus the total number of 186 responses for final analysis.

Table 1
Sample statistics

Criteria	Amount	Percentage
1. Gender	186	100%
- Male	73	39.25
- Female	113	60.75
2. Age	186	100%
- Under 30	38	20.43
- 30 to 40 years old	65	34.95
- 40 to 50 years old	55	29.57
- Above 50 years old	28	15.05

(Source: Processing data of the author)

4.2. Cronbach Alpha reliability test

The results of Cronbach's alpha show that the Cronbach's Alpha of PE, EE, SI, SC, BI, AU, FC, HB are all greater than 0.6 (Table 4) and the corrected item-total correlation of all observed variables are greater than 0.3 (Hair et al., 2006). For the AU factors, the Cronbach's Alpha if the item AU3 deleted would be greater, thus eliminating AU3 variable.

Table 2
Cronbach's Alpha test results

Factor's notation	Cronbach's Alpha	Variables
PE	0.916	PE1, PE2, PE3, PE4, PE5
EE	0.933	EE1, EE2, EE3, EE4
SI	0.818	SI1, SI2, SI3
HB	0.949	HB1, HB2, HB3, HB4
SC	0.919	SC1, SC2, SC3
FC	0.834	FC1, FC2, FC3
UB	0.897	UB1, UB2
BI	0.92	BI1, BI2, BI3, BI4

4.3. Exploratory factor analysis

The exploratory factor analysis uses Principal Axis Factoring extraction method by Varimax rotation. According to Gerbing & Anderson (1988), the Principal Axis Factoring extraction method with Promax rotation will reflect the data structure more precisely than the Principal Components extraction method with Varimax rotation. To evaluate whether an exploratory factor analysis is suitable for analysis in this case, the authors use the KMO and Bartlett's test. In the exploratory factor analysis, the KMO index (Kaiser-Meyer- Olkin) is used to examine the suitability of factor analysis. The KMO value must be between 0.5 and 1, and if the value is less than 0.5, factor analysis may not be appropriate for the data.

The KMO test results of the study are as follows

Table 3
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
	Approx. Chi-Square	4274.676
Bartlett's Test of Sphericity	Df	378
	Sig.	.000

(Source: Processing data of the author)

The KMO and Bartlett's test showed KMO = 0,858 ($0.5 < KMO \leq 1$); Bartlett's Test statistic = 4274.676 with a Sig=0.00 < 0.05 (Table 1), which means that the application of exploratory factor analysis in the study is appropriate. Moreover, factors have the eigenvalue >1 which explains is greater than 50% (80.004%), the observed variables are grouped exactly as the initial scale (Table 4).

Table 4.
Pattern Matrix^a

	Factor							
	1	2	3	4	5	6	7	8
PE1	0.894							
PE2	0.889							
PE3	0.862							
PE4	0.725							
PE5	0.670							
HB3		0.979						
HB4		0.906						
HB1		0.888						
HB2		0.844						
EE4			0.934					
EE2			0.928					
EE1			0.821					
EE3			0.816					
BI1				0.909				
BI3				0.883				
BI4				0.824				
BI2				0.712				
SC2					0.917			
SC1					0.869			
SC3					0.859			
FC3						0.851		
FC2						0.843		
FC1						0.675		
SI3							0.797	
SI2							0.795	
SI1							0.750	
UB2								0.909
UB1								0.896

4.4. Confirmatory factor analysis

To measure the fit between the theoretical model and the actual data, CFA confirmatory factor analysis was used. The study conducted independent and dependent variables, Chi-square (CMIN), CMin / df, CFI, GFI, TLI, and RMSEA. The above values are considered appropriate if $GFI \geq 0.8$; $TLI, CFI \geq 0.9$ (Bentler & Bonelt, 1980), $CMIN / df \leq 3$ (Carmines & McIver, 1981); $RMSEA \leq 0,08$ (Steiger, 1990). The results of confirmatory factor analysis indicates that Chi-square =541.56; $df=322$ ($p = 0.000 < 0.05$); Chi-square / $df = 1.682$ (< 3); $TLI = 0.938$; $CFI = 0.947$ (> 0.9); $GFI = 0,835 > 0.8$ and $RMSEA = 0,061 < 0,08$. Therefore, it is possible to conclude that the model is compatible with market data.

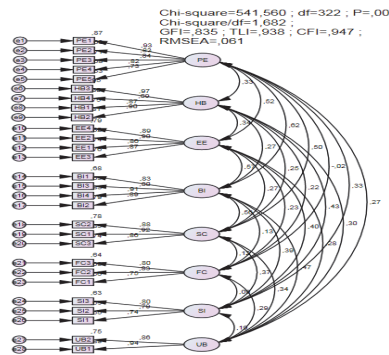


Fig. 2. Results of Confirmatory factor analysis (standardized)

The correlation coefficient between the component concepts and the standard deviation is less than 1 and the P-value is <0.05, statistically significant (correlation coefficient for each pair of concepts different from 1 at 95% confidence).

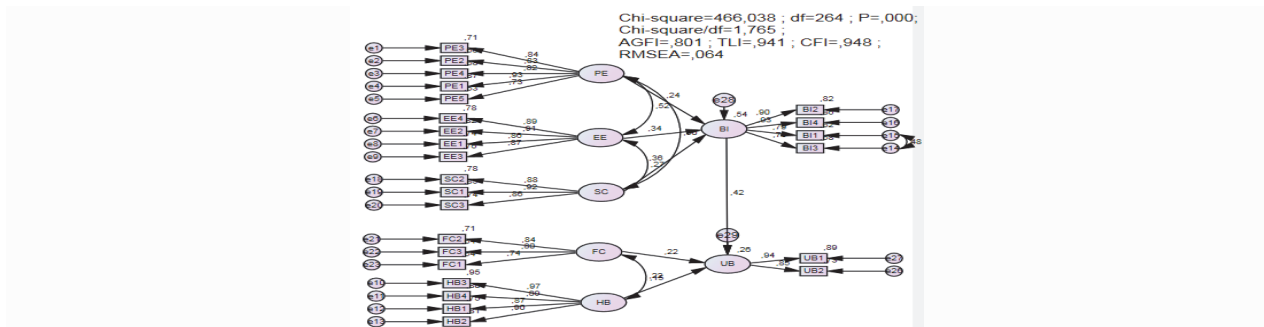
Table 5
Composite reliability (CR) and average variance extracted (AVE)

Factor's notation	Cronbach's Alpha	CR	AVE
PE	0.916	0.918	0.693
EE	0.933	0.934	0.779
SI	0.818	0.817	0.599
HB	0.949	0.950	0.825
SC	0.919	0.917	0.787
FC	0.834	0.865	0.631
UB	0.897	0.890	0.830
BI	0.920	0.920	0.727

Composite reliability (CR) and average variance extracted (AVE) were used to estimate the reliability and convergent validity of the factors. The CR value should be greater than 0,70 and that the AVE should be greater than 0.50 (Hair et al., 2010). As can be shown in Table 5, the average extracted variances within our sample were all above 0.599 and above 0.817 for CR. Therefore, all factors have adequate reliability and convergent validity.

4.5. Structural equation modeling

The research uses structural equation model to assess relevance of the model and reevaluate relationships in the model. Firstly, the estimated results show that the relationships were statistically significant (P<0.05) except that the relationship between social influence and behavioral intention was not statistically significant (P > 0.05). The social influence variable is eliminated and the second SEM analysis indicates df = 264, Chi-square = 466.038 with p-value = 0.000 <0.05, Chi-square / df = 1.765 <3, CFI = 0.948, TLI = 0.941 (<0.9), AGFI = 0.801 < 0.8, RMSEA = 0.064 <0.08. Therefore, it is possible to conclude that the model achieves compatibility with market data (Fig. 3).



*Results of hypothesis test

Fig. 3. The final results of analyzing by SEM model (standardized)

Hypotheses H₁, H₂, H₃, H₅, H₆, H₇ are accepted (p-value <0.05) and hypothesis H₄ is rejected due to p-value > 0.05 (Table 6). The standard estimate in the structural equation modeling indicates that subject characteristics has greatest impact teacher's behavioral intention of using information technology in lectures; effort expectancy is ranked in second place; performance expectancy also has quite great influence and social influence does not affect behavioral intention. For use behavior, the behavioral intention influence strongly on use behavior of teachers, habit and facilitating condition also impact use behavior.

Table 6
Results of hypothesis test

Correlation	Standard Estimate	S.E.	C.R.	P-value	Hypothesis	Result
BI ← PE	0.245	0.074	30.089	0.002	H1	Accepted
BI ← EE	0.338	0.064	40.674	***	H2	Accepted
BI ← SC	0.361	0.063	40.996	***	H3	Accepted
UB ← FC	0.217	0.081	20.751	0.006	H5	Accepted
UB ← HB	0.154	0.074	20.138	0.033	H6	Accepted
UB ← BI	0.423	0.092	50.153	***	H7	Accepted

4.6. Testing of differences of gender and age on teacher's behavioral intention of using information technology in lectures

One way ANOVA test is used for testing of differences of gender and age on teacher's behavioral intention of using information technology in lectures

* **Gender:** The result shows that the significant value of Levene Statistic is greater than 0.05 (0.76), thus ANOVA is useable. The one way ANOVA tests result points out that the significant value is greater than 0.05 so observation data are not yet qualified to confirm the difference of gender on teacher's behavioral intention of using information technology in lectures. Therefore, there is no difference of age on teacher's behavioral intention of using information technology in lectures.

Table 7

Result of testing of differences of gender on teacher's behavioral intention of using information technology in lectures
Test of Homogeneity of Variances

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.207	1	1.207	2.571	.111
Within Groups	86.405	184	.470		
Total	87.612	185			

Levene Statistics = 0.094 df1 = 1 df2 = 184 Sig. (0.760)

* **Age:** The result shows that the significant value of Levene Statistic is greater than 0.05 (0.76), thus ANOVA is useable. The one way ANOVA tests result points out that the significant value is smaller than 0,05 so observation data are qualified to confirm the difference of age on teacher's behavioral intention of using information technology in lectures. Post Hoc's result indicate that: There are differences in the values of teacher's behavioral intention of apply IT in lectures between different range of age due to the significant value is less than 0.05. In addition, behavioral intention average value under age of 30 is greater than others, behavioral intention average value from 30 to 40 years old is greater from 40 to 50 years old and above 50 years old and behavioral intention average value from 40 to 50 years old is greater than above 50 year old. This means younger teachers have greater intention to apply IT in lectures than older one.

Table 8

Result of testing of differences age on teacher's behavioral intention of using information technology in lectures
Test of Homogeneity of Variances

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25.214	3	8.405	24.514	.000
Within Groups	62.398	182	.343		
Total	87.612	185			

Levene Statistics = 3.000 df1 = 3 df2 = 182 Sig. (0.720)

Table 9

The results of Multiple Comparisons

(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Under 30	30-40	.47279*	.11517	.000	.1741	.7715
	40-50	.83448*	.11879	.000	.5264	1.1425
	Above 50	1.31471*	.16734	.000	.8807	1.7487
30-40	Under 30	-.47279*	.11517	.000	-.7715	-.1741
	40-50	.36169*	.10331	.003	.0938	.6296
	Above 50	.84191*	.15673	.000	.4355	1.2484
40-50	Under 30	-.83448*	.11879	.000	-1.1425	-.5264
	30-40	-.36169*	.10331	.003	-.6296	-.0938
	Above 50	.48022*	.15941	.016	.0668	.8936
Above 50	Under 30	-1.31471*	.16734	.000	-1.7487	-.8807
	30-40	-.84191*	.15673	.000	-1.2484	-.4355
	40-50	-.48022*	.15941	.016	-.8936	-.0668

*. The mean difference is significant at the 0.05 level.

In nutshell, H8 is rejected while H9 is accepted.

Dependent Variable: MeanBI

Tukey HSD

5. Conclusion

The results from the SEM model have shown that subject characteristic, effort expectancy and performance expectancy influenced on teacher's behavioral intention of applying IT in lectures at economic universities in the northern area of Vietnam. Moreover, the research has also indicated that behavioral intention, facilitating condition and habit of teachers had strong impact on teacher's use behavior of applying IT in lectures. Finally, after test differences of gender and age, the results have determined younger lectures had greater behavioral intention of apply IT in lectures than older ones. The research results have suggested that, in order to increase behavioral intention, economic universities in the northern area of Vietnam need to improve technical infrastructures in order to make it easier to apply IT in lectures. As other research, this study has some limitations. Data were collected from students using a convenience sampling technique and thus should not necessarily be considered representative of the population. Therefore, generalization of these findings should be treated with caution.

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