การปรับปรุงและพัฒนาตัวแบบ Unified Theory of Acceptance and Use of Technology (UTAUT) ในการใช้เทคโนโลยีของครูระดับมัธยมศึกษาตอนปลาย

Revising and Extending the Determinants of the Unified Theory of Acceptance and Use of Technology (UTAUT) Model in In-Service Upper Secondary Level Teachers' Perspectives

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บทคัดย่อ

งานวิจัยฉบับนี้มีวัตถุประสงค์เพื่อปรับปรุงและพัฒนาปัจจัยเพิ่มเติมจากตัวแบบ Unified Theory of Acceptance and Use of Technology (UTAUT) ที่มีผลต่อการตัดสินใจในการใช้เทคโนโลยีของครูระดับมัธยมศึกษาตอนปลาย ปัจจัยที่ปรับปรุง ประกอบด้วย ทัศนคติและความสามารถทางคอมพิวเตอร์ในตนเอง สำหรับปัจจัยเพิ่มเติมประกอบด้วย ความรู้เนื้อหาการสอนโดยเทคโนโลยี การพัฒนาความสามารถทาง ICT ความช่วยเหลือทางเทคโนโลยี ความพร้อม และความสามารถทางภาษาอังกฤษ กลุ่มเป้าหมายในการศึกษานี้คือครูที่กำลังสอนในระดับมัธยมศึกษาตอนปลายในเขตกรุงเทพมหานครและปริมณฑล โมเดลที่ศึกษาสามารถอธิบายความผันแปรของการตัดสินใจใช้เทคโนโลยีได้ประมาณร้อยละ 70 จากการศึกษาพบว่าทัศนคติ ความรู้เนื้อหาการสอนโดยเทคโนโลยีและการพัฒนาความสามารถทาง ICT มีผลโดยตรงต่อการตัดสินใจในการใช้เทคโนโลยีของครูระดับมัธยมศึกษาตอนปลาย

คำสำคัญ: Unified Theory of Acceptance and Use of Technology (UTAUT) การสอนโดยเทคโนโลยี การพัฒนาความสามารถทาง ICT

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Abstract

The purpose of this study was to revise and extende the determinants from Unified Theory of Acceptance and Use of Technology Model (UTAUT) that affects behavioral intention in using technology of in-service upper secondary level teachers. The revised determinants are attitude and computer self-efficacy and extended determinants of UTAUT model are Technological Pedagogical Content Knowledge (TPACK), ICT professional development (ICTPD), technical assistance (TA), availability (A), and English language skill (EL). The respondents of this study were teachers in upper secondary level in Bangkok and the metropolitan area. This model could explain the variation of behavioral intention approximately 70%. The result showed attitude, TPACK and ICTPD have direct effect to behavioral intention in using technology of upper secondary level teachers.

Keywords : Unified Theory of Acceptance and Use of Technology (UTAUT), Technological Pedagogical Content Knowledge (TPACK), ICT professional development (ICTPD)

INTRODUCTION

Technology is necessary device to improve quality of teaching and also students' learning (Kadijevich & Haapasalo, 2003). Nowadays, the technology; especially computer for teaching support, is gradually accepted. Traditional devices cannot create the visualization to explain the difficult issues and also do not motivate students to learn in classroom. With emerging new technology, teaching professional is changed from teacher-centered, lecture-based instruction to be interactive learning environment (Resta & Unesco, 2002). Also, technology can shift the schools from being the places of teaching to be the places of learning. Hence, teachers should adapt their pedagogy by integrating technology and curriculum to mentor the classroom because teaching in textbook is not enough; they have to apply from various sources. However, management of school; education minister, school director and the board of director, must fully support teachers to be able to integrate technology into their pedagogy for corresponding to the rapid change of society (Resta & Unesco, 2002).

However, the technology integration in teaching still poses many questions; for example, what suitable technologies should be integrated in classroom, how technologies could be adapted in classroom, what factors motivate teachers to adopt technologies in teaching. This research focuses on teachers' perspective because teachers are the facilitators of students' learning success. Teachers are important to startup by adopting technology for guiding their students. Also, teachers should be able to select the suitable technologies to correspond to their pedagogy, assigning assignment. As a consequence, this research focuses on teachers' aspect which aims to increase to level of

technology acceptance of teachers in upper secondary level of Thailand.

Thus, the research question of this study as follows :

1. What are the determinants of technology acceptance of upper secondary teachers in Bangkok amd metropolitan area?

2. Among the significant determinants of technology accepted by secondary school teachers, which determinants are mostly used in teaching practice?

LITERATURE REVIEW

Unified Theory of Acceptance and Use of Technology Model (UTAUT) integrates elements across eight models of IT acceptance: Theory of Reasoned Action, Theory Acceptance Model, Motivation Model, Theory of Planned Behavior, Innovation Diffusion Theory, Combined TAM and TPB, Model of Personal Computer Utilization, and Social Cognitive Theory. UTAUT model has been widely used to explain the individual acceptance of technology (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT is also applied in education to determine the reason for technology adoption based on teachers' perspective (Birch & Irvine, 2009; Marques, Villate, & Carvalho, 2011).

Originally, UTAUT focuses 6 independent constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, computer self-efficacy and attitude toward using technology. Only four significant constructs: performance expectancy, effort expectancy, social influence and facilitating conditions explain the behavioral intention and actual use (Venkatesh, et al., 2003). However, there is no perfect model, it depends on the objectives of the study in a particular context (Venkatesh, et al., 2003). Hence, the model of UTAUT should be reviewed in order to explain the behavior of technology acceptance in Thai teachers.

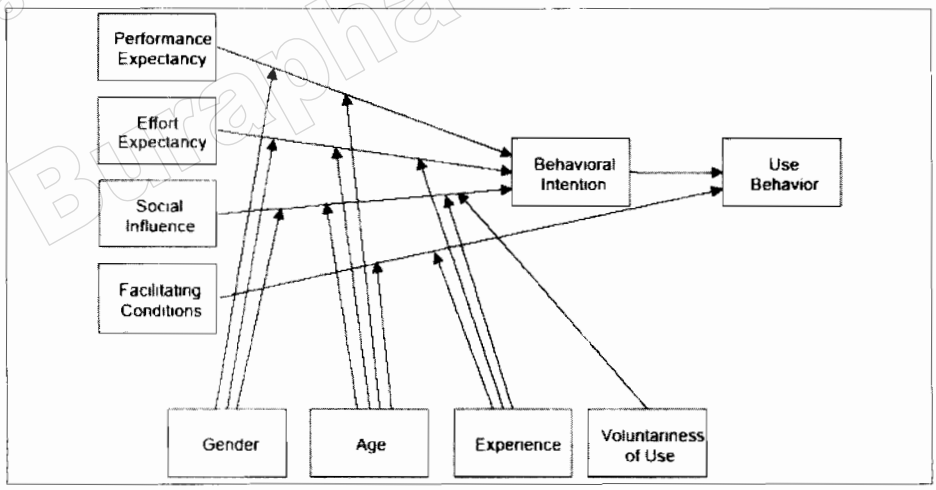

Figure 1: The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003)

HYPOTHESIS DEVELOPMENT

In this research, the researchers revised all 6 independent constructs of UTAUT model: performance expectancy (PE), effort expectancy (EE), social influence (SI), computer self efficacy (CSE), 2 aspects of attitude: liking (LIKE), anxiety (ANX), 3 aspects of facilitating conditions: organizational infrastructure (OI), technical infrastructure (TI) and technical assistance (TA) and also integrates the necessary supplementary variables in educational field: technological pedagogical content knowledge (TPACK), English language skill (EL), availability (A), and ICT professional development (ICTPD) to explain the behavior intention of upper secondary teachers on technology acceptance for teaching support in Thailand.

Performance Expectancy (PE)

Performance expectancy is defined as the degree to which a teacher expects that using technology will help him or her to accomplish teaching task. This determinant is modified and measured focusing on the following constructs: perceived usefulness, compatibility, relative advantage and outcome expectations. Previous researcher found performance expectancy is significantly related to attitude: liking and anxiety (Huang & Chuang, 2007) Huang, 2007, Extending the theory of planned behaviour as a model to explain post-merger employee behaviour of IS use}, behavioral intention to use technology (Im, Hong, & Kang, 2011), and actual use (Zhou, Lu, & Wang, 2010).

Hypothesis 1: Performance expectancy (PE) has positive and direct effect on Liking (LIKE) in teaching.

Hypothesis 2: Performance expectancy (PE) has negative and direct effect on Anxiety (ANX) in teaching.

Hypothesis 3: Performance Expectancy (PE) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Effort Expectancy (EE)

Effort expectancy is defined as the degree of ease associated with the use of technology for teaching task. This determinant is modified and measured by the following constructs: perceived ease of use, complexity and ease of use. From previous research, the effort expectancy is also significantly related to behavioral intention to use technology (Im, et al., 2011) and performance expectancy (Zhou, et al., 2010). Obviously, effort expectancy is indirectly related to actual use by performance expectancy (Zhou, et al., 2010).

Hypothesis 4: Effort Expectancy (EE) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Social Influence (SI)

Social influence is defined as the important persons or influential persons (supervisors, colleagues, students and etc.) to a teacher who think that he or she should use technology to support his or her teaching. Social influence has significantly relationship with behavioral intention to use technology (Im, et al., 2011; Jong & Wang, 2009). In addition, there

is effect of social influence to actual use (Jong & Wang, 2009), attitude (Kulviwat, Bruner II, & Al-Shuridah, 2009).

Hypothesis 5: Social Influence (SI) has positive and direct effect on Liking (LIKE) in teaching.

Hypothesis 6: Social Influence (SI) has negative and direct effect on Anxiety (ANX) in teaching.

Hypothesis 7: Social Influence (SI) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Facilitating Conditions

Facilitating conditions have been defined as the degree to which teacher believes that the external factors increase intention to use technology for teaching. The facilitating conditions have been classified into two critical constructs: organizational infrastructure and technical infrastructure (Benjamin & Morton, 1992). Teachers will use technology for teaching if it is easy to use and help teachers how to use (Gu, Lee, & Suh, 2009). Technical assistance is also an external factor supported by the school which increases behavioral intention to use technology but it is not mentioned in UTAUT model. As a consequence, the facilitating conditions in this study consist of three constructs: organizational infrastructure, technical infrastructure and technical assistance.

Organizational Infrastructure (OI)

Organizational infrastructure is defined as the perception of a teacher on school's policy to support teacher's technology usage. The school's policy must conform to the goal of Ministry of Education. Hence, school's policy should integrate technology investment which is an imperative construct to reinforce teachers to adapt technologies as teaching instrument (Peerapol, 2010). In addition, the policy that concerns providing personal computers in instructors' office positively affects the attitude and usage (Yushau, 2006).

Hypothesis 8: Organizational Infrastructure (OI) has positive and direct effect on Liking (LIKE) in teaching.

Hypothesis 9: Organizational Infrastructure (OI) has negative and direct effect on Anxiety (ANX) in teaching.

Hypothesis 10: Organizational Infrastructure (OI) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Technical Infrastructure (TI)

Technical infrastructure is defined as the perception of a teacher on hardware and software provided by school to support a teacher to adopt technology in teaching. Technology infrastructure influences the behavioral intention and satisfaction (Lin & Hsieh, 2007) which implies readiness of technologies in school have effect on teachers' attitude and behavioral intention. Goktas (2009) found that the lack of ICT infrastructure to support teaching was the main barrier to ICTs integration in teaching (Goktas, Yildirim, & Yildirim, 2009). Eventhough, there

are various softwares produced for educational support, they might not be appropriate for classroom use (Goktas, et al., 2009). The appropriateness of the software is essential. Schools have to provide the suitable software for a particular subject. Otherwise, teachers might not adopt technology for teaching because the software does not fit their teaching.

Hypothesis 11: Technical Infrastructure (TI) has positive and direct effect on Liking (LIKE) in teaching.

Hypothesis 12: Technical Infrastructure (TI) has negative and direct effect on Anxiety (ANX) in teaching.

Hypothesis 13: Technical Infrastructure (TI) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Technical Assistance (TA)

Technical assistance is defined as the ability of technical assistance to solve the technical problems and promply of technical support. Technical assistance can influence the users to adopt technology (Stewart, 2007). Technical assistance is necessary when technology has been incorporated in teaching to support teachers during technology adoption (Bingimlas, 2009) and it is a critical factor for success in implementing ICTs (Resta & Unesco, 2002). The attitude towards using computer has been influenced by technical support (Shiue, 2007) if technicians are able to solve the technical problem. Teachers will enjoy to adopt technology and the anxiety of technology usage during the class will reduce. As a consequence, they are hypothesized to have positive effect on enjoyment and have negative effect on anxiety of teachers. In contrary, the effects will reverse if technicians cannot solve the problem especially during the classroom.

Hypothesis 14: Technical Assistance (TA) has positive and direct effect on Liking (LIKE) in teaching.

Hypothesis 15: Technical Assistance (TA) has negative and direct effect on Anxiety (ANX) in teaching.

Hypothesis 16: Technical Assistance (TA) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Attitude toward using Technology

Attitude toward using technology in this study is separated into two aspects: positive attitude, computer liking (LIKE); negative attitude, computer anxiety (ANX) adapted from Computer Attitude Scale (CAS) (Loyd, Loyd, & Gressard, 1987). They have opposite effect of positive attitude and negative attitude on behavioral intention. Each aspect significantly affects behavioral intention. However, teacher's attitude towards computers is an important factor related to the teacher's role towards the effective use of computers in education (Buabeng-Andoh, 2012). Yushan (2005) found that that computer anxiety and lack of enjoyment influence negatively both the acceptance of computers and their use as a teaching and learning tool (Yushau, 2006). Positive attitude towards computer has positively

influenced behavioral intention (Deepti & Ajay, 2007), actual use (Jong & Wang, 2009) and is also has significant positive correlation with behavioral intention (Teo & Lee, 2010).

Hypothesis 17: Liking (LIKE) for teaching has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Hypothesis 18: Anxiety (ANX) in teaching has negative and direct effect on Behavioral Intention to use technology (BI) in teaching.

Computer Self-Efficacy (CSE)

The computer self-efficacy is the belief in the personal capability to effectively use a computer (Rogers, Medina, Rivera, & Wiley, 2005) and defined as the degree of teachers' judgments of their ability to infuse technology into teaching (Haight, 2011). Users who are strong in computer will have more desire to adopt computer (Gong, Xu, & Yu, 2004). On the other hand, users who have weak computer efficacy tend to be more frustrated than those who have strong computer efficacy. Lacking computer efficacy is a major barrier of teachers in adopting technology into classroom (Haight, 2011). Computer self-efficacy is found to be associated with positive attitudes toward computer technologies (Zhang & Espinoza, 1998). Moreover, specific self-efficacy for specific activities such as using advanced software package or computer for teaching is a very powerful construct for predicting behavior but it is not effective for beginners (Barbeite & Weiss, 2004)2004. In addition, there is a relationship between technological pedagogical content knowledge and self-efficacy on pre-service teachers (Abbitt, 2011). The capability to use technology is a powerful predictor to technological pedagogical content knowledge in order to contribute to teacher's use of technology in classroom (BİLİCİ, Yamak, Kavak, & Guzey, 2013). It implies that teachers who have high computer self-efficacy will be able to gain knowledge of integrating technology, pedagogy and content for their teaching support.

Hypothesis 19: Computer self-efficacy (CSE) has positive and direct effect on Liking (LIKE) in teaching.

Hypothesis 20: Computer self-efficacy (CSE) has positive and direct effect on Technological Pedagogical Content Knowledge (TPACK).

SUPPLEMENTARY VARIABLES OF UTAUT MODEL

Four supplementary variables consist of ICT Professional development (ICTPD), Technological Pedagogical Content Knowledge (TPACK), Time availability (A) and English skill (EL). ICT Professional development (ICTPD) is considered (Bingimlas, 2009; Resta & Unesco, 2002) because teachers need training courses to improve their computer efficacy (CSE); to gain pedagogy and content knowledge (TPACK) for their teaching. Availability (A) of teachers is also unavoidable (Bingimlas, 2009) because the workload of Thai teachers is high. As a consequence, Teachers cannot sacrifice their time to practice using technology and prepare

their classes. English skill (EL) is another barrier for Thai teachers to adopt technology. Teachers are not fluent on English because English is not normally communicated in classroom except English subject. Thus, English language could be their barrier to adopt technology.

Technological Pedagogical Content Knowledge (TPACK)

In 21st century, teachers must understand how to coordinate technology with pedagogy and content knowledge effectively (BİLİCİ, et al., 2013). Technological pedagogical content knowledge is the framework to understand and describe the kinds of knowledge needed by a teacher for effective pedagogical practice in a technology enhanced learning environment (Shulman, 1987). TPACK refers "a teacher's knowledge of how to coordinate the use of subject-specific activities or topic-specific activities with topic-specific representations using emerging technologies to facilitate student learning" (Cox & Graham, 2009) which has been developed by (Shulman, 1987).

With the fruitfulness of TPACK, the teachers can identify topics to be taught with ICT; infuse ICT activities in classroom teaching; transform content to integrate with ICT (Chai, Koh, & Tsai, 2013). Researcher hypothesizes that teachers who have more knowledge in technological pedagogical content, they will be more intensive to adopt technology to support their teaching.

Hypothesis 21: Technological Pedagogical Content Knowledge (TPACK) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

English Language Skill (EL)

English language is not always appropriate in some country (Resta & Unesco, 2002). Mostly, computer software language embedded in computer is English. Thus, this may be an obstacle to adopt technology in teaching especially in countries where English is a second language like Thailand (NECTEC, 2002). Main language of communication in classroom is conducted in Thai whereas instruction embedded in software is English. Hence, it is difficult to be understood by Thai teachers. They will not know how to solve when they face technical problems. Hence, language proficiency could impact the technology adoption of teachers.

With the above reasons, the researcher integrates English skill as a determinant of technology acceptance for teaching. With high English proficiency can improve computer self-efficacy. Teachers can follow the embedded instruction manual. It is hypothesized that English language proficiency positively affects the computer self-efficacy.

Hypothesis 22: English language skill (EL) has positive and direct effect on Computer self-efficacy (CSE) in teaching.

Availability (A)

Teachers in schools are overloaded; teaching responsibility; advising students;

administrative tasks, they reduce intention of technology adoption. Lack of time is a barrier for ICTs integration (Goktas, et al., 2009; Wachira & Keengwe, 2011). Hence, availability is necessary for preparing the instruction by adopting technology. As the consequence, time availability have positive and direct effect on intention to use behavior (Buabeng-Andoh, 2012). In addition, lack of time impacts teachers' ability to improve their computer self-efficacy (Grainger & Tolhurst, 2005). If teachers are available, they have more chance to create the instruction with technology. Hence, time availability is also positively related to computer self-efficacy (Brinkerhoff, 2006).

Hypothesis 23: Availability (A) has positive and direct effect on Computer self-efficacy (CSE) in teaching.

Hypothesis 24: Availability (A) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

ICT Professional Development (ICTPD)

Technology integration for education is ambiguous even if technologies have been already provided. Lack of training is one essential factor that many teachers rarely use them in their educational practice (Kadijevich & Haapasalo, 2003). Teachers will not be able to adopt technology for teaching if the training courses are not provided (Bingimlas, 2009; Goktas, et al., 2009). Moreover, ICT professional development increases teachers' computer self-efficacy (Franklin, 2005). In Thailand, ICT training courses are frequently revised and updated. Hence, the ICT professional development has positive and direct effect on computer self-efficacy (Franklin, 2005). Although skill training is obviously vital in order to advocate teachers to adopt technology, it is not sufficient because teachers are not able to integrate their technological skills with their teaching. The training courses should include how to integrate technological skills with subject (Davies & Pittard, 2009). As a consequence, rather than focusing on only technological training or only pedagogical training, school should support both of them in order to train teachers how to integrate technology in classroom effectively (Wepner, Tao, & Ziomek, 2006). Teachers' technological pedagogical content knowledge will increase after they attend ICT professional development programs (Buabeng-Andoh, 2012). Moreover, ICT professional development programs are positively related to Technological Pedagogical Content Knowledge (Cox & Graham, 2009; Harris, Mishra, & Koehler, 2009).

Hypothesis 25: ICT Professional Development (ICTPD) has positive and direct effect on Computer self-efficacy (CSE) in teaching.

Hypothesis 26: ICT Professional Development (ICTPD) has positive and direct effect on Technological Pedagogical Content Knowledge (TPACK).

Hypothesis 27: ICT Professional Development (ICTPD) has positive and direct effect on Behavioral Intention to use technology (BI) in teaching.

Behavioral Intention (BI)

The purpose of this research is to investigate the determinants that affect Behavioral Intention of teachers to use technology for teaching in upper secondary level. This construct measures the level of Behavioral Intention to use technology as shown in figure 2.

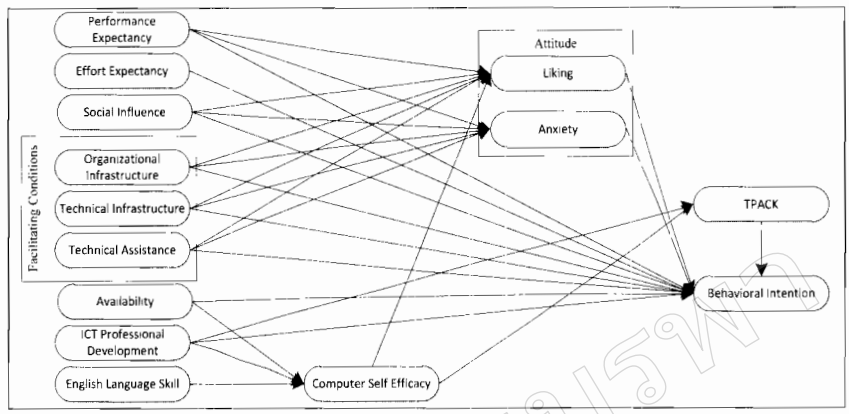

Figure 2: Theoretical Model

RESEARCH DESIGN AND METHODOLOGY

In this study, the population is teachers in upper secondary level of public extra large schools under the Ministry of Education in Thailand. The schools are focused in Bangkok Metropolitan region which consist of Bangkok, Nonthaburi, Samut Prakan, Pathum Thani, Samut Sakhon and Nakhon Pathom. The extra large schools are the schools where have more than 2,500 students. These schools are selected because technology infrastructure in these areas is already provided and developed as well as highly supported from the government. Thus, they can invest money on technological development.

There are 83 extra large schools in Bangkok metropolitan: 50 schools in Bangkok, 10 schools in Nonthaburi, 6 schools in Pathum Thani, 9 schools in Samut Prakarn, 6 schools in Nakhon Pathom, 2 schools in Samut Sakorn. Ten questionnaires are distributed in each school by mail survey. A questionnaire consists of 4 sections. The first section is general information about teacher: education level, subject that he/she teaches and experience in teaching. The second section is the current technology usage for teaching; how often they use technology; where they use technology; what technology they use; what software they use. The third section is measuring the indicators in each construct in the model. The questionnaires are tested twice for reliability investigation before the real questionnaires are distributed. Each indicator is measured by 5 Likert scale. The indicators in each latent variable are shown in the Appendix. The last section is asking their opinions and suggestions about current technology usage in teaching. The response rate of respondent in this study is 49%.

DATA PREPARATION AND PRELIMINARY DATA ANALYSIS

Table 1 shows the profile of respondents classified by education and subject they are teaching. Majority of respondents graduated bachelor's degree. Most of them are teaching in professional works and technology subject as shown 35%. Science and Mathematics teachers are the second and the third rank, respectively.

Table 1: Profile of teachers with education level and responded subject

Education Level		Teaching Subjects									Total
		Thai Language	Mathematics	Foreign Language	Science	Arts and Music	Social, Religious and Culture	Health and Physical Science	Professional works and Technology	Student counseling	
Bachelor Degree	Count	25	30	25	45	7	19	3	86	3	243
	% of Total	(6%)	(8%)	(6%)	(11%)	(2%)	(5%)	(1%)	(22%)	(1%)	(61%)
Master Degree and Above	Count	12	25	12	27	5	15	7	53	0	156
	% of Total	(3%)	(6%)	(3%)	(7%)	(1%)	(4%)	(2%)	(13%)	(0%)	(39%)
Total	Count	37	55	37	72	12	34	10	139	3	399
	% of Total	(9%)	(14%)	(9%)	(18%)	(3%)	(9%)	(3%)	(35%)	(1%)	(100%)

Firstly, the assumptions of Structural Equation Model (SEM) are addressed: missing value, normality test, and outlier detection. Skewness and kurtosis values for normality detection should be within ±2. Both values of each indicator are in the range. All data are normally distributed. Therefore, the use of maximum likelihood estimation in the subsequent SEM analysis is acceptable.

Secondly, the indicators which have small communalities values are eliminated from the analysis. The cutoff value in communalities values should be 0.4. Hence, the number of indicator remains 53 items; 5 items in TI, 5 items in ICTPD, 5 items in OI, 4 items in ANX, items, ICTPD 5 items, OI 5 itmes, ANX 4 items, CONF 4 items, LGO 4 items, EL 3 items, CSE3 items in EL, 3 items in CSE, 3 items in A, 3 items in TPACK, 2 items in SI, 3 items in TA, 2 items in LIKE, 4 items in EE, and 3 items in PE.

Thirdly, PE and EE constructs are originally isolated but the result from principle component analysis (PCA) shows that they are located in the same factor with high consistency measurement. However, PE and EE are the expectancy of teacher to accomplish their teaching by using technology. As a consequence, they are gathered and renamed as work expectancy (WE) which is defined as the expectancy of using technology to support teachers' teaching.

Fourthly, Cronbach's alpha values measure the reliability of each construct. The value indicates high consistency and should be above 0.7 (Knapp & Mueller, 2010). Cronbach's Alpha values, in table 2, are between 0.860 and 0.965 which are high consistency in every construct. Finally, the instrument is suitable for further analysis on Structural Equation Model (SEM) to investigate which constructs impact behavioral intention.

Table 2: Cronbach's Alpha measurement

Latent Variables	No. of Items	Cronbach's Alpha	Latent Variables	No. of Items	Cronbach's Alpha
WE (Venkatesh, et al., 2003)	7	0.867	TPACK (Shulman, 1987)	3	0.914
SI (Venkatesh, et al., 2003)	2	0.886	BI (Venkatesh, et al., 2003)	3	0.959
OI (Peerapol, 2010)	5	0.928	EL*	3	0.911
TI (Benjamin & Morton, 1992)	5	0.926	A*	3	0.893
CSE (Venkatesh, et al., 2003)	3	0.864	TA*	3	0.898
LIKE (Loyd, et al., 1987)	2	0.901	ICTPD*	5	0.945
ANX (Loyd, et al., 1987)	4	0.965			

*Developed for this study

MODEL ANALYSIS AND DEVELOPMENT

According to psychometric literature, the statistics adjusted by its degree of freedom (CMIN/DF) should not exceed 3.00 (Kline, 2004) (Methodology in the social sciences. Although GFI and AGFI are lower than the recommended threshold of 0.90, they are not relied upon as standing alone index because they have been affected by the sample size (Hooper, Coughlan, & Mullen, 2008). NFI is recommended to be good fit when its value is greater than 0.90 (Bentler & Bonett, 1980). NFI in final model is higher than the recommended value but it is also sensitive with the sample size (Bentler, 1990). However, the most popular index that has been the least affected by the size of sample is CFI (Fan, Thompson, & Wang, 1999). Its value of recognition as being as very good fit model should be higher than 0.95 (Hu & Bentler, 1999). The threshold of RMSEA to indicate suitable fit model should be below 0.06 (Hu & Bentler, 1999). SRMR has been characterized as more sensitive to model misspecification than to sample size or violations of distributional assumptions (Hu & Bentler, 1999). The well fitting value of SRMR should be less than 0.05 (Diamantopoulos & Siguaw, 2000). According to table 3, the final model is acceptable.

Table 3: Fit statistics of the final model

Model	N	NPar	CMIN/DF	RMR	GFI	AGFI	NFI	IFI	CFI	RMSEA	SRMR
Final Model	399	123	1.643	0.032	0.886	0.863	0.923	0.968	0.968	0.040	0.0466

R-Sqr: CSE = 0.652, ANX = 0.196, LIKE = 0.463, TPACK = 0.819, BI = 0.691

Figure 3 shows the results of effect, unstandardized and standardized values among variables. ICTPD is only one variable in this research which has positive and direct effect on behavioral intention with medium magnitude effect. There are three intervening variables that have direct effect on behavioral intention consist of LIKE, ANX and TPACK. LIKE has large positive direct effect on behavioral intention. TPACK has medium positive direct effect on behavioral intention whereas ANX has small negative direct effect on behavioral intention. In addition, two variables; organizational infrastructure and technical infrastructure are not significantly direct effect to any variables. Therefore, they have been excluded from the model.

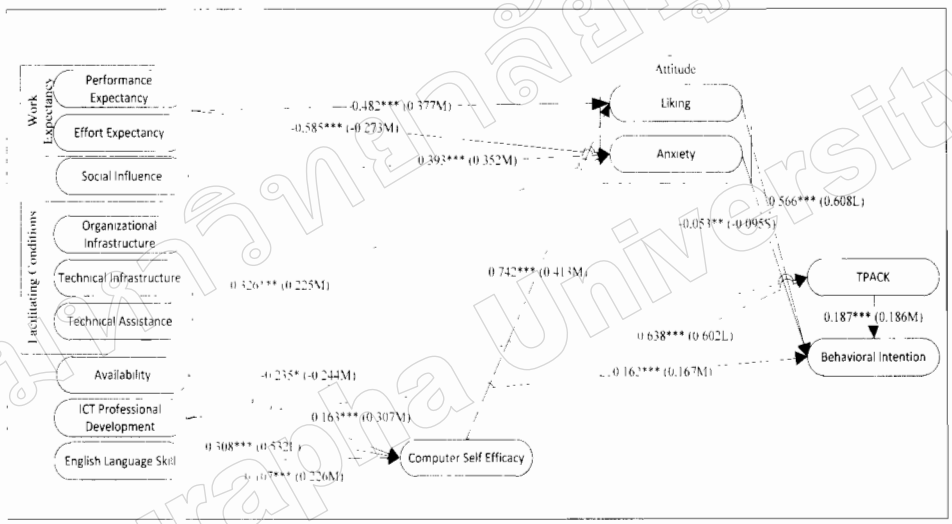

Figure 3: Final Model (S = Small, M = Medium, L = Large): *, ** and *** represent statistical significance at level of 0.05, 0.01 and 0.001 respectively.

INTERPRETATION AND IMPLICATION OF FINDINGS

Behavioral Intention

Four latent variables have the effect on behavioral intention: LIKE, TPACK, ICTPD and ANX. LIKE, TPACK and ICTPD have positive and direct effect but ANX has the negative and direct effect on behavioral intention. The positive attitude has more effect on computer integrating in the classroom than negative attitude (van Braak, Tondeur, & Valcke, 2004) because the magnitude of positive effects are higher than negative effect. TPACK and ICTPD are new extended variables

to study. Teachers who have well developed TPACK, they will be able to select and integrate the technology for teaching support (Nelson, Angela, & Clif, 2009). For ICTPD, teachers will intend to use technology if training programs concentrate on subject matter, values and the technology (Buabeng-Andoh, 2012). As a consequence, ICTPD is essential activity to foster teachers to know how to adapt their technology usage to support their teaching by adopting technology. Original UTAUT model, attitude is not included into the model because it is not significance but expectancy and social influence have direct effect on behavioral intention. In this study, attitude is imperative variable as an intervening variable to fulfill the effects between work expectancy and behavioral intention, social influence and behavioral intention, and technical assistance and behavioral intention (Davis, 1989). In addition, English language skill and availability do not have direct effect on behavioral intention but they have indirect effect via computer self-efficacy. English language skill and availability increase computer self-efficacy to foster teachers' intention to adopt technology for their teaching.

Anxiety

Anxiety has small negative effect on behavioral intention. It is implied that anxiety reduces the degree of intention of teachers to use technology. Teachers will not adopt technology when they have high anxiety. However, anxiety can be addressed when using technology matches their teaching expectations: increased students' interest, increased students' understanding, ease to use on teaching and etc. Surprisingly, social influence has positive and direct effect on anxiety. Social influence increases teachers' anxiety to use technology. However, teachers are forced by the important person or their society to adopt technology rather than being volunteers to use technology. They are anxious using technology for their teaching because of this enforcement. Level of anxiety can be reduced when teachers are supported rather than mandated by their society. As the result, social influence has positive and direct effect on anxiety.Moreover, in Thai culture, teachers do not dare to ask others' assistance because of "Kreng Jai" (Burnard, 2006; Niratpattanasai, 2002). Kreng Jai means to be considerate, to feel reluctant to impose upon another person, to take another person's feelings into account, or to take every measure not no cause discomfort or inconvenience to other people (Klausner, 1987). As an illustration, teachers hardly ask assistance even though teachers are anxious and afraid of using technology because in Thai culture, they are "Kreng Jai" to disturb their colleagues for any assistance and also to save their face. As a consequence, technical assistance also has positive and direct effect on anxiety.

Liking

Liking is imperative variable which has large direct effect on behavioral intention. School's director should motivate teachers'

enjoyment to use technology in classroom. However, the level of liking will be increased by two variables: computer self-efficacy and work expectancy because they have positive direct effect on liking. Teachers will enjoy using technology if they have high computer self-efficacy and technology matches their work expectancy.

Technological pedagogical content knowledge

There are two variables influence technological pedagogical content knowledge (TPACK) of teachers: computer self-efficacy and ICTPD. Computer self-efficacy has positive direct effect on TPACK. The result can imply that teachers who have high computer self-efficacy will be able to integrate their knowledge on technology, pedagogy and content for teaching.

Surprisingly, ICT professional development (ICTPD) has negative and direct effect on TPACK. Presently, ICTPD is training in how to use software for administrative task rather than how to adapt technology for teaching in classroom. It is implied that current training cannot improve teachers' technological pedagogical content knowledge because ICTPD does not demonstrate how technology integrated in content and pedagogy. Hence, the successful ICTPD should demonstrate how to integrate technology, pedagogy in their responsible subjects.

Computer self-efficacy

Computer self-efficacy has been influenced by ICTPD, availability and English language skill. They have positive direct effect to computer self-efficacy. All three variables support the improvement of computer self-efficacy of teachers. ICTPD should be conducted effectively and continuously. However, the participants should be classified by their level of computer literacy background to arrange the suitable training course. In addition, trainers should evaluate and follow up the outcomes how teachers adapt the training into teaching. Availability is essential factor to increase their computer self-efficacy. Nowadays, teachers have tons of work e.g. quality assurance, high teaching load, extra curriculum activities, administrative works, taking care of many students etc. They do not have enough time to learn how technology applied in their teaching. Teachers must plan themselves to learn how to use technology for teaching support. English language is the barrier for technology usage especially the country where English is the second language like Thailand. Thai teachers do not use English to communicate. In addition, English skill of Thai is not much fluent. Hence, teachers who are fluent in English will have higher computer self-efficacy than teachers who are not fluent in English.

Interpretation of discarded variables

Two variables are discarded: organizational infrastructure and technical infrastructure, because this study focuses on teachers who teach in Bangkok and metropolitan area. This area is the most developed area than other part of Thailand. The size of school in this study is extra large. Hence, these schools have higher

budget than other. As a consequence, these schools have high opportunity to invest and maintain the quality of computer and software. The investment in technology of these schools such as computer centers, computer laboratory and schools' website is fully supported. In conclusion, the both infrastructures are not found to be significant in this study.

As the conclusion, there are 11 hypotheses support the previous studies, 13 hypotheses do not support the previous studies and 3 hypotheses conflict with the previous study. Table 4 shows the conclusion of this study.

Table 4: Conclusion of Study

	Supported Hypotheses	Not Supported Hypotheses	Conflicted Results
Hypothesis Number	1,2,17,18,19,20,21,22,23,25,27	3,4,5,7,8,9,10,11,12,13,14,16,24	6,15,27

FUTURE RESEARCH

This research finds that two infrastructures: technical infrastructure and organizational infrastructure have no impact on behavioral intention to use technology in teaching. However, the survey focuses only in Bangkok metropolitan area in extra large size schools. The institutional characteristics that influence teachers' adoption and integrating ICT into classroom are imperative consideration (Buabeng-Andoh, 2012) because telecommunication service providers cannot support schools in remote area (Blackmore, Hardcastle, Bamblett, & Owens, 2003). These schools are low socio-economic schools which have limited budget for telecommunication investment. Hence, further research can be done in other parts of Thailand and/or focused on the different sizes of schools.There are also many differences in using technology for education among ASEAN countries. Further study can be done applying this model to compare the intention of technology acceptance of teachers among these nations. Moreover, researchers can compare how technology is applied in teaching support or compare the effectiveness of using technology in teaching in classroom. Researchers can understand how Thailand fares with other nations in terms of education.

CONCLUSION

This research confirms that the model of study in technology acceptance should be changed in a particular context and over time. This research found that four variables from UTAUT do not directly affect behavioral intention when the attitude construct is adopted. Attitude is still necessary to be studied in the field of technology adoption when respondents volunteer to use technology (Yousafzai, Foxall, & Pallister, 2007) as well as culture in each country is important for technology adoption. Researchers have to review the cultural

background to find out the hidden reasons of respondents. For further educational research, the new variables: TPACK and ICTPD should be considered and reviewed.

LIMITATION OF STUDY

With 49% of response rate by mail survey, the response rate is not appropriate in this study. However, the sample size in this study meets minimum requirement which is exceed 384 samples (Yamane, 1967). In addition, one of determining an acceptance response rate is type of statistical analysis which Structural Equation Model (SEM). The suitable sample size in SEM should be more than 200 samples (Lei & Wu, 2007) . Hence, 49% of this response rate is applicable.

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APPENDIX

Table A1: Indicators of latent variables

Latent Variables	Indicators
Work Expectancy	-Technology is useful for my job. -Using technology improves the students' interest in studying. -Using technology helps me explain to students for better understanding in the lesson. -Using technology is easy and clear. -It is easy to use technology in teaching. -You can adapt technology in your teaching. -It is easy to learn and use technology for teaching.
Social Influence	-You use technology in teaching/learning because people in your community think that you should use. -You use technology in teaching/learning because the important person to you thinks that you should use.
Organizational Infrastructure	-The objectives of using technology in teaching are stated clearly in school's policy. -School has defined specific goals of using technology for teaching into school's ICT policy. -The school has clearly defined guidelines for using technology in teaching. -The school's administrators realize the importance of policy of using technology in teaching. -The school's administrators have strategies to encourage commitment among teachers in using technology in teaching.

Table A1: Indicators of latent variables (Cont.)

Latent Variables	Indicators
Technical Infrastructure	-There is an adequate budget for the operation and maintenance of the IT equipment in your school. -The school provides sufficient number of computers for teaching learning -The school provides suitable software for teaching learning. -The school provides sufficient number of equipment connecting to the internet. -Teachers in school can access to the technology
English Language	-You have ability to read and understand English necessary for using technology. -You are able to follow instructions written in English when using technology. -You are able to use computer program described in English.
Technical Assistance	-You are able to request for technical help and support from technician when you need. -The technical assistants are able to solve the technical problems. -The technical assistants are able to solve problem quickly.
Availability	-You have time to learn how to use technology. -You have time to prepare the lesson using technology. -You have time to prepare teaching learning by using technology apart from your workload.
ICT Professional Development	-Technology-related development, i.e. training, is useful for using ICT in teaching. -Technology-related development, i.e. training, is important for using ICT in teaching. -Technology-related development, i.e. training, encourages you to use ICT in teaching. -Technology-related development, i.e. training, makes you comfortable to use ICT in teaching. -Technology-related development, i.e. training, makes you confident to use ICT in teaching.
Computer Self Efficacy	-You could use technology for teaching if there is someone helping when you have a problem. -You could use technology for teaching if someone shows you how to do it first. -You could use technology for teaching if you have used similar computer packages before.
Technological Pedagogical Content Knowledge	-You can teach lessons that appropriately combine curriculum subject, technologies and teaching methods. -You have strategies that combine content, technologies and teaching methods. -You can select appropriate technologies to use in your teaching.
Anxiety	-You are scared of using technology. -You worry if you press the wrong button, the information will be disappeared. -You hesitate to use technology because you are afraid of unable to resolve when there is mistake. -Technology makes you depressed.
Liking	-You do enjoy using technology. -You have fun when using technology in teaching.
Behavioral Intention	-You intend to use technology in teaching development in the future. -You think that you would use technology in teaching development in the future. -You plan to use technology in teaching development in the future.