INFLUENTIAL DETERMINANTS OF EDUCATIONAL TECHNOLOGY ACCEPTANCE FOR LEARNING OF THAI STUDENTS IN UPPER SECONDARY SCHOOLS

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Abstract

This research is focusing on examining the determinants of upper secondary students in order to accept the educational technology for their learning in schools in Bangkok. A sample of 284 students who used technology for education has been assessed to find out the determinants that impact on educational technology intention for their learning. The Structural Equation Model (SEM) has been implemented. The result shows 3 interesting determinants which are positive significantly related with behavioral intention to use technology for their learning in schools: 1) pedagogy integrated with technology, 2) knowledge of technology, and 3) goal orientation.

Keywords: Educational Technology Acceptance, Pedagogy Integrated with Technology, Goal Orientation, Knowledge of Technology, Thai students in upper secondary school level

Introduction

"… All around us we see the information technology revolution in progress – in communications, business and commerce, how we educate and train our people, and how we manage our personal lives" (Bond, 2002)

In the 21st Century, the Information Communications Technology (ICT) in education is necessary and inevitable that it has been one part of students' life that students have to know and use them to support their learning. Technologies can assist teachers and students to deliver learning process efficiently because they sustain the motivation of students' learning to be more interesting. As the result, they have been supported by all educational stakeholders including with parents, administrators, government, and etc. to adopt technologies in classroom (Jared, 2007).

In the 21st Century, technology acceptance cannot be focused on only teachers because students can also adopt and use technology to support their learning. Students are able to select the suitable educational technology and integrate technology for their learning support.

The activities of students to use technology are making report, searching information, writing the program, doing presentation, making graphic decoration, creating web design and etc. Moreover, technologies are medium communication among students and teachers. It can reduce the barrier between teachers and students when students have any doubts.

Educational Technology in Thailand

In national level, ICT has been focused into the Master plan of Ministry of Education (2011– 2013) for human resource development which it is congruent with the 2nd Thailand Information and Communications Technology (ICT) Master Plan (2009 – 2012).

Furthermore, the Ministry of Education attempts to drive Science Technology Engineering and Mathematics (STEM) Education into every schools. The government servant in Ministry of Education found that the country is driven depending on the fundamental knowledge of these studies. According to STEM education, technology is supportive instrument for education and for future development.

In Thailand, there are many projects adopting ICT as learning resources to enhance the ICT usage in schools (Tian, 2003) as follows:

1. SchoolNet has been established since 1995. It connected over 5,000 schools to the internet. This project provides the service without internet access charge to promote the use of internet in teaching and learning. However, the schools pays only the telephone charged at the local call rate about US$ 0.08 per connection. The tools are developed to support teachers to create their own content or teaching materials to be appended into the digital library (http://school.net.th).

2. The distance education foundation has been established to celebrate the 50th year of the King's Throne. The purpose of this project is supporting learning in remote area via Thaicom Satellite. This foundation cooperates with the Department of Non-Formal Education and General Education's tele-education project. The programs have been broadcasted from Wang Klai Kang Won School at Prachuapkhirikhan Province.

3. The Uninet project is established under the Ministry of Education to connect with the public universities through the high-speed fiber optic network. This project fosters the network facilities among universities throughout the country. The Information Technology Project has been initiated by HRH Princess Mahachakri Sirindhorn for grassroots level.

In addition, there are also many projects in Thailand from the private companies to enhance the education opportunity in technology such as True Corporation which provides the 3G broadband instruments in remote schools. Moreover the technology has also been distributed to a particular group of users such as people with disabilities. Furthermore, True Corporation implements online knowledge warehouse: TruePlookpanya, to support the students and teachers searching information and updating their knowledge through online website.

According to provided academic journals, the determinants of students' technology acceptance in high schools have not been studied much in Thailand. Most of studies emphasized on undergraduate students (Siritongthaworn & Krairit, 2004; Noiwan, et al., 2005; Jairak, et al., 2009; Teo, et al., 2014). Hence, this paper aims to focus on the upper secondary students.

To adopt technology in learning, the educational planners should know what factors of students will stimulate them to use technology for their learning support. As well as, teachers should understand how to motivate students in adopting technology in order to design the pedagogy to be congruent with their learnings and skills. Otherwise, the learners might not be interested in using technology for learning support because they are not convinced to use technology to support their learning.

Statement of Purpose

This paper aims to investigate the significant reasons of students' technology acceptance for their learning in order to find out the determinants to motivate students to use technology for their benefit in their learning. Moreover, the study focuses on the sequence of importance for management to motivate students for technology usage in their learning.

Research Questions

This paper is implemented to response the following questions:

1. Are the attitude towards technology, desire to learn, pedagogy integrated with technology, perceived usefulness of technology, technology anxiety, technology liking, teachers' motivation, negative reactions to technology, goal orientation, and knowledge of technology, significantly directly related with the technology intention for learning?

2. How do determinants affect to predict the behavioral intention in technology of students for their learning?

3. What is the significance's degree in each determinant of behavioral intention to use technology of students for learning?

Literature Review

There are many models: Innovation Diffusion Theory (IDT) (Rogers, 2010), Social Cognitive Theory (SCT) (Bandura, 1986), Theory of Reasoned Action (TRA) (Ajzen, 1985), Theory of Planned Behavior (TPB) (Ajzen, 1985), Technology Acceptance Model (TAM) Davis (1989), and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003), to find out the factors that influence technology acceptance which have been developed continuously as shown in figure 1. However, the conceptual model must be revised and reviewed when it is implemented in different context because each context has different factors.

Hence, this research has reviewed the determinants of technology intention to use in upper secondary students. The determinants in this study consist of attitude towards technology, desire to learn, pedagogy integrated with technology, perceived usefulness of technology, technology anxiety, technology liking, teachers' motivation, negative reactions to technology, goal orientation, and knowledge of technology.

1. Knowledge of Technology

Students' knowledge of technology increases the technology intention for their learning because they are familiar with the using technology (Raymond P., 1998). They are able to integrate technology with their learnings. Their intention to adopt technology for their learning will also increase.

Hypothesis 1: Knowledge of technology is significantly positively related with behavioral intention to use technology for learning.

2. Desire to Learn in Technology

However, "the more students are exposed to computer technologies, the more they want to learn and the greater their interest level" (Raymond, 1998). The desire to learn in technology of students fosters the increment of students' intention to use technology level. As a consequence, when they have more desire to learn about technology, they will more intend to adopt technology for their learnings.

Hypothesis 2: Desire to learn is significantly positively related with behavioral intention to use technology for learning.

Figure 1: Development of technology acceptance model
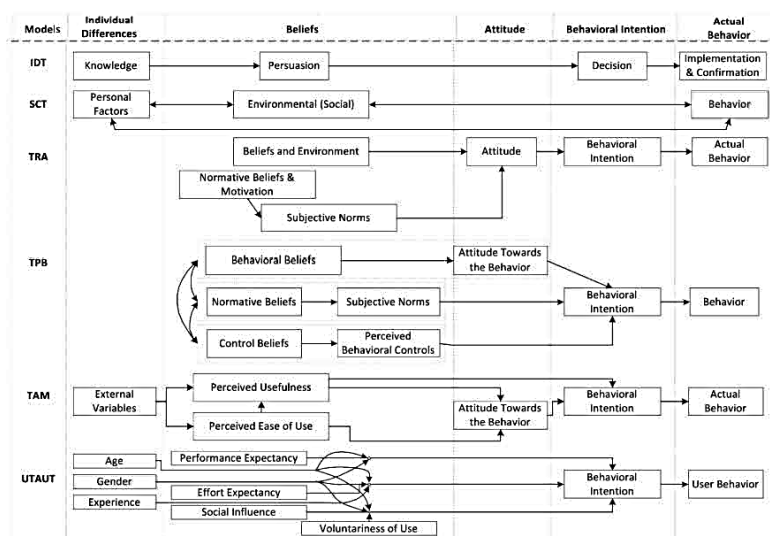
Source: Punnoose (2012)

3. Teachers' Motivation

In education field, teachers have crucial role for introducing technologies to support students' learning. Teachers are good motivators for students' learning (Autio, et al., 2007). Without teachers, students will not know how to integrate technology for their learnings. Hence, the motivation of teachers is one of interesting factor that might impact on the intention to use technology of students. For instance, teachers motivate students by assigning assignments to students for searching information by using technology. In addition, teachers stimulate students to use the Computer-Aided Instruction (CAI) or teaching assisted software for their self-learning.

Hypothesis 3: Teachers' motivation is significantly positively related with behavioral intention to use technology for learning.

4. Attitude towards Computer Use

Attitude towards computer use consists of four dimensions: computer anxiety, computer confidence, computer liking and negative reactions (Jantawan, et al., 2005). Computer anxiety has the negative relationship with computer usefulness, computer liking, and computer confidence (Jantawan, et al., 2005). It is implied that students, who think that computers are useful, will have less computer anxiety. Consequently, they are more confidence and enjoy to use technologies for their learning support. On the other hand, if the students are anxiety in using computers, they will be less confidence and dislike to use technologies for their learning.

In addition, the attitude towards computer usage instrument has been continuously studied (Samantha, et al., 2009). Samantha, et al. (2009) found that their attitude towards computer usage instrument is better than the original one (Popovich, et al., 1987) because many changes in technological landscape have occurred. The determinants for measuring attitude towards computer usage consists of negative reactions to computers and positive reactions to computers. However, the attitude towards computer usage in this research question focuses on three dimensions: technology liking, technology anxiety and negative reaction to technology. Then, the hypotheses of attitude towards computer usage related with behavioral intention have been hypothesized as follow:

Hypothesis 4: Technology liking is significantly positively related with Behavioral Intention to use technology for learning.

Hypothesis 5: Technology anxiety is significantly negatively related with Behavioral Intention to use technology for learning.

Hypothesis 6: Negative reaction to Technology is significantly negatively related with behavioral intention to use technology for learning.

5. Pedagogy integrated with Technology

Pedagogical integration is extended to which choice of particular technologies and the ways in which they are used in classes, are consistent with and between the pedagogical

philosophies, orientations and intentions of the teachers. Also, the learning styles, abilities and motivations of the students have been realized (Ham, et al., 2002).

Pedagogy integrated with Technology is necessary in both of teachers and students for teaching and learning supports. If technologies are not integrated in pedagogy, students will not know how to integrate technology for support their learning. They will not know how to use technology for their education. Hence, pedagogy integrated with technology can be a determinant to predict students' intention to use technology for their learning. This research focuses on capability of teachers and students for integrating technology in teaching and learning.

Hypothesis 7: Pedagogy integrated with technology is significantly positively related with behavioral intention to use technology for learning.

6. Goal Orientation

Patrick, et al. (2008) tested their conceptual model of relations among achievement goal orientation, self-efficacy, cognitive processing and achievement of students working within a particular collaborative computer based modeling task (Patrick, et al., 2008). It implies that the students who attempt to reach their own learning goals, they will learn to develop new skills and knowledges by using technology. According to the study, goal orientation are significantly positively related with cognitive processing which leads to achievement of students working within a computer-based modeling task.

Goal orientation in this study is the belief of students to use technology for their goal achievements such as technology skill improvement, enhancement in understanding in lecture, obtaining better grade and etc.

Hypothesis 8: Goal orientation is significantly positively related with behavioral intention to use technology for learning.

7. Perceived Usefulness

This determinant is studied in Technology Acceptance Model (TAM) which is the model that evaluates the determinants affecting behavioral intention to use technology developed by Davis (1989). There is significantly positively related with behavioral intention to use technology (Chuttur, 2009; Su-Houn, et al., 2005; James, et al., 2002).

In this study, this determinant is measuring the perceive usefulness of technology for students' learning. It is hypothesized that students who perceive the usefulness of technology for their learning, they will intend to use technology for their learning.

Hypothesis 9: Perceived usefulness of technology is significantly positively related with behavioral intention to use technology for learning.

8. Perceived Ease of Use (EOU)

Perceived ease of use in Technology Acceptance Model (TAM) is significantly related with attitude towards using technology (Davis, 1989). There is the study to test the relationship between perceived ease of use and behavioral intention to use e-Library (James, et al., 2002).

Perceived ease of use in this study is measured by the level of ease of use in using technology for students' learning. When the students perceive ease of use in using technology for learning, they might intentionally use it for their learning.

Hypothesis 10: Perceived ease of use is significantly positively related with behavioral intention to use technology for learning.

## Research Methodology

1. Data Collection Method

In this study, the population is the students in upper secondary level schools under the Ministry of Education in Thailand which its size is undefined. In the study, researcher focuses the schools where have the upper secondary level in Bangkok. The infrastructure of schools in Bangkok is ready for applying technology in learning support. The sampling technique in this research is non-probability sampling which observations are collected randomly because the sampling frame of all students in school is not acquired. The questionnaires have been distributed to 10 students in a school during January – March in year 2015 around Bangkok area.

The criteria to select the respondent is the student has an opportunity to use technology for their learning support. The research instrument consists of 4 parts: Part 1 - Attitude and perception of using technology for learning support, Part 2 – Technology Usage Information, Part 3 – Personal Information, and Part 4 – School Information. In measuring attitude and perception, each indicator is measured by 7 Likert scale.

2. Research Model and Hypotheses

According to literature review, the research model can be described into 10 hypotheses as shown into figure 2 below.

Figure 2: Research model
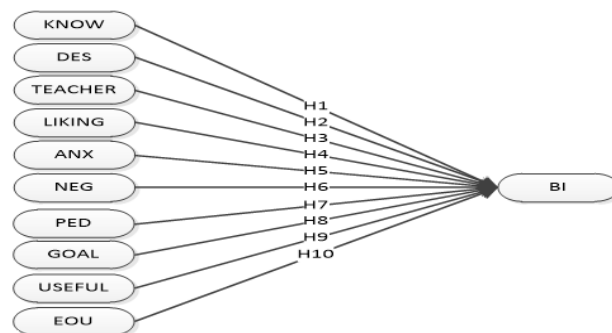
From figure 2, the researcher can formulate 10 hypotheses. However, there are 2 independent variables: technology anxiety (ANX) and negative reaction to technology (NEG),

denoted as significantly negatively related with behavioral intention to use technology for learning. The rest of independent variables are hypothesized significantly positively related with behavioral intention to use technology for learning.

Data Analysis and Results

Part 1: Descriptive Statistics

The respondents are classified and described by gender, education level and program of study. The descriptive analysis of respondents has been shown into Table 1. The requirement of the sample size for using Structural Equation Modeling (SEM) is between 150 and 400 (Hair, et al., 2006). In this study, the sample size is 284 respondents. Then, the SEM can be applied.

Table 1: Descriptive data of respondents

Categories		Frequency	Percent
Gender	Male	164	57.7
	Female	120	42.3
	Total	**284**	**100.0**
Education Level	Grade 10	87	30.6
	Grade 11	84	29.6
	Grade 12	113	39.8
	Total	**284**	**100.0**
Program of Study	Science –Math	128	44.4
	Arts – Math	77	27.1
	Arts – Languages	68	23.9
	Arts – Social	13	4.6
	Total	**284**	**100.0**

Part 2: Instrument of Measurement

The determinant of technology confident from computer attitude in this study is not well constructed because the communality value and factor loading are lower than the heuristic value 0.4. Then, the indicators in this construct should be deleted.

The instrument of study has been tested the internal consistency reliability estimate is 0.922. The following table shows the items in each determinants of behavioral intention to use technology for learning of students. The reliabilities of each construct are between 0.715 and 0.903 as shown into Table 2.

As regard, all Cronbach's Alpha values are above 0.70 which implies all internal consistency of the survey instruments is acceptable and reliable (Nunnally & Bernstein, 1997).

Table 2: Reliability of constructs

Abbreviation	Constructs	Reliability
Internal consistency reliability		0.889
LIKING	Technology Liking	0.804
USE	Perceived Usefulness of technology	0.876
ANX	Technology Anxiety	0.753
NEG	Negative Reactions to Technology	0.903
KNOW	Knowledge of Technology	0.852
TEACHER	Teachers' Motivation	0.810
DES	Desire to Learn	0.897
PED	Pedagogy integrated with Technology	0.726
GOAL	Goal Orientation	0.863
EOU	Perceived Ease of Use	0.715
BI	Behavioral Intention	0.835

Part 3: Research Results

After the model analysis, there are 7 determinants not significantly related with behavioral intention to use technology for learning: technology liking, perceived usefulness, technology anxiety, negative reactions to technology, teachers' motivation, desire to learn, and perceived ease of use. Then, they are excluded for further analysis.

The goodness-of-fit indices criteria are shown in table 3. There are seven criteria to confirm the fit model. They meet all specified heuristic criteria of model fit acceptance. The result in Table 3 can be concluded that the goodness-of-fit indices indicate a strong fit between the structural model and the data.

Table 3: Model fit index and its value

| Model Fit Index	Criteria	Model Overall
χ^2/df	≤ 3.00	1.638
GFI	≥ 0.90	0.948
AGFI	≥ 0.80	0.921
NFI	≥ 0.90	0.944
CFI	≥ 0.90	0.977
RMR	≤ 0.09	0.063
RMSEA	≤ 0.10	0.047

According to the Figure 3, there are three determinants significantly positively related with intention to use technology for learning of students. The determinants of significance are shown according to the level of strength towards technology intention: Pedagogy integrated with Technology, Goal Orientation, and Knowledge of Technology respectively.

Table 4: Parameter estimation

Predictors	Estimate	Standard Error	Critical Ratio	Probability
Pedagogy integrated with Technology	0.426	0.090	4.731[**]	0.000
Goal Orientation	0.373	0.067	5.569[**]	0.000
Knowledge of Technology	0.327	0.060	5.469[**]	0.000

** 0.01 significance level

Figure 3: The significant determinants to predict behavioral intention in technology of Thai upper secondary students
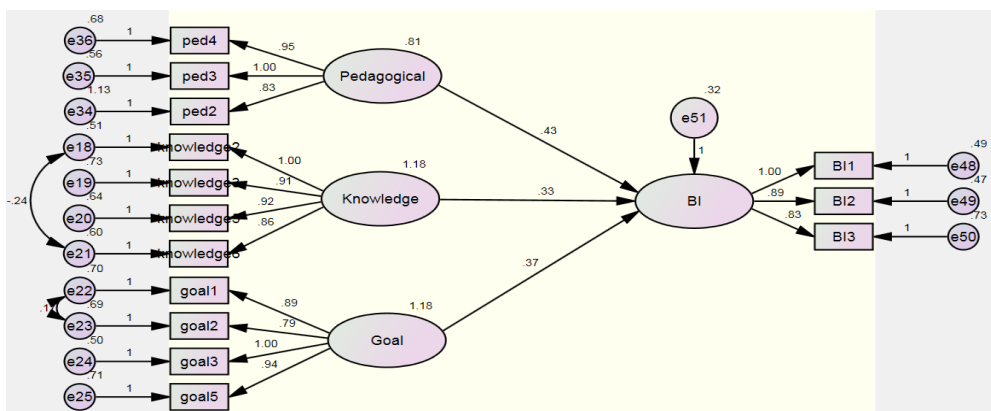
Conclusion

Totally, there are 3 significant determinants: Pedagogy integrated with Technology, Knowledge of Technology, and Goal Orientation, influence the technology intention of students for their learning.

According to table 4, the first significant determinant that school management team should aware of, to support using technology in learning of students, is pedagogical integrated with technology. The relationship between the pedagogical integrated with technology and behavioral intention to use technology of students is positive relationship.

The second significant determinant from study is goal orientation. The relationship between goal orientation and behavioral intention to use technology of students is positive relationship.

The third significant determinant from the study is knowledge of technology. The relationship between knowledge of technology and behavioral intention to use technology of students is positive relationship.

As a consequence, the model to predict technology adoption in students should not focus on only the infrastructure, perceived usefulness, teachers' motivation because students in the 21st century are able to make decision to select and use technology by themselves to support their learning. Moreover, the technology anxiety does not impact on the students in Bangkok area because the students in Bangkok are used to and grown up with technology. Then, they are not scared of using technology.

Recommendation

In the 21st century, the policy of Ministry of Education in many countries has focused on adopting technology in teaching and learning. The students in this generation are able to learn by adopting technology for themselves. In pedagogical integrated with technology determinant, teachers should integrate their teaching with technology to foster ability of students' learning. Students are able to use and adapt their learning by using technology to support. In addition, they are able to select which technology to be integrated to support their learning when they want to achieve their learning goals.

Goal orientation is necessary for using technology because they believe that technology can assist them to achieve their goals in study and future. Without goals, they do not have the direction and reason to use technology to support their learning.

Lastly, every students does not have the same knowledge in technology usage. However, the knowledge of technology is necessary to motivate their learning by using technology. The technology will be adopted for learning support successfully if the students have fundamental knowledge in technology. Hence, the Ministry of Education must well design the curriculum with appropriateness between the knowledge of students and technology.

Teaching and learning in the 21st century, teachers have crucial role to look after students' technology usage and support students' learning by selecting the suitable technology in teaching. As a consequence, teachers have to know and understand how to use and integrate technology for teaching and learning.

Nowadays, teachers are still confusing to use technology and not able to effectively integrate the technology with their teaching. Hence, Ministry of Education which has the important role to improve the quality of teachers, should conduct training for technological professional development sustainably and continuously. The procedures to integrate pedagogy with technology should be planned to support teachers. The teaching demonstration is also important to stimulate the teachers' teaching with technology. In addition, the use of technology for teaching

support should be evaluated in order to improve the quality of teaching integrated with technology.

Limitation

This research focuses on the upper secondary students in Bangkok. Then, the results are not covered students in other education level, and/or students in other regions in Thailand. For further study, researchers can compare the difference of technology intention between students in private schools and public schools. In addition, the comparison of technology intention of students in different regions is also interesting for further study in order to compare the intention of using technology of students to reduce the gap of inequality in education in Thailand. In addition, the technology for learning support is focused on only computer and internet. However, there are many technological devices to support their learning such as tablet and mobile phone. Hence, studying the influential determinants affecting behavioral intention to use in other devices is also interesting.

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