Causal Relationship Model of the Information and Communication Technology Skill Affect the Technology Acceptance Process in the 21st Century for Undergraduate Students

Thanyatorn Amornkitpinyo[1], Pallop Piriyasurawong [2]
[1] Assumption University, Bangkok, Thailand,
[2] King Mongkut's University of Technology North Bangkok, Bangkok, Thailand

Abstract—The objective of this study is to design a framework for a causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process (TAP) for undergraduate students in the 21ST Century. This research uses correlational analysis. A consideration of the research methodology is divided into two sections. The first section involves a synthesis concept framework for process acceptance of the causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century. The second section proposes the design concept framework of the model. The research findings are as follows:

1) The exogenous latent variables included in the causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century are basic ICT skills and self-efficacy.

2) The mediating latent variables of the causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century are from the TAM Model, these includes three components: 1) perceived usefulness, 2) perceived ease of use and 3) attitudes.

3) The outcome latent variable of the causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century is behavioural intention.

Index Terms—Causal Relationship Model, Technology Acceptance Process, Basic ICT skills, Self- Efficacy.

I. INTRODUCTION

Thailand has implemented ICT Policy Framework (B.E. 2554-2563, ICT 2020) which aims to enhance the economy and quality of life of the Thai people and lead Thailand towards a knowledge-based economy and society. By this respect, information and communication technology can be used to promote learning in order to drive education and encourage "wise learning". This is related to the way in which we ought to manage education according to National Education Act of B.E. 2542 (1999) Chapter 9, which concerns the role of technology within education. It states that learners have the right to develop their technology-utilizing abilities for educational purposes. They need to have sufficient knowledge and skill in using these technologies in order to acquire knowledge for themselves on a continuous lifelong basis. Thus, the Thai government has to introduce a high-speed efficient ICT infrastructure across the whole country as part of a high–speed internet connection service to provide a broadband network that connects teachers and students. This can satisfy teaching requirements everywhere and at all times.

Accordingly, higher education institutions in Thailand have to plan the strategy for teaching patterns in the 21ST century. They need to prepare their institutions for educational resource management and technological strategic development by using technology and communication devices for the efficient improvement of lecturers and students.

Computing and ICT Literacy involves accessing, managing, integrating, evaluating, creating and communicating. Such literacy will become one of the most significant literary changes of the 21ST century. It also supports the use of technology and communication devices. Moreover, this literary development will also help students when it comes to self-study. [15]

Self-efficacy beliefs should not be completely separated from outcome expectations which are the people's judgments of the consequences that will be produced by their behaviour. Regularly, the expected outcome is supported by self-efficacy beliefs [17]. High self-efficacy learners take part in more effective self-regulatory strategies at the different levels of ability. Conclusively, self-efficacy enhances learners' performance.

According to previous information that has been obtained, the researcher is interested in developing a causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century. This paper is divided into two sections: The first section contains a synthesis of the framework of the causal relationship model of the technology acceptance process of learning innovation for undergraduate students in the 21ST Century. The second section proposes the design for the model.

II. RESEARCH OBJECTIVES

1. To synthesize the concept of the framework of causal relationship model of the Information and Communication Technology skill affect the Technology Acceptance Process in the 21ST Century for undergraduate students.

2. To design a concept framework of causal relationship model of the Information and Communication Technology skill affect the Technology Acceptance Process in the 21ST Century for undergraduate students.

III. RESEARCH QUESTION

What is causal relationship model of the Information and Communication Technology skill affect Technology Acceptance Process in the 21ST Century for undergraduate students?

IV. LITERATURE REVIEW

A. Technology Accept Model (TAM)

TAM is one of the most well-known and commonly used model with regard to ICT acceptance. TAM is also a fundamental theory that many experimental studies have related to technology use. TAM proposes a distinction between perceived usefulness, perceived ease of use [18], attitude, and behavioural intention.

B. Perceived Usefulness (PU)

Perceived usefulness is an important factor in Technology acceptance model which affects on attitude, behavioral intention. [19], [20]. An advantage derived from the attributes of technology that are being used is the perceived usefulness. This can be physiological, psychological, sociological or material in the nature [26]. The extent to which this utilitarian value of social media is perceived to be beneficial determines the perceived usefulness.

C. Perceived Ease of Use (PEU)

Perceived ease of use is one of the elements in the technology acceptance model [21]. It affects directly to perceived usefulness, attitude and behavioural intention using the technology as an essential element.

D. Attitude (AT)

Attitude is a factor in technology acceptance model. It has two parts: attitude towards the object and attitude towards the behavior [24]. It influenced directly to behavioral intention and attitude is the association between usefulness and ease of use of a model.

E. Behavioral Intention (BI)

A personally expected or intended future behaviour is explained in the model by the individual's behaviour in terms of his intention to use [19]. The expectancies that a person has concerning a particular behaviour in a specific situation. Moreover, if the intention can be calculated precisely, behaviour can also be forecast [24] with regard to using technology.

F. Self- Efficacy (S-E)

A key determinant of the degree of effort or perseverance is the self-efficacy that a person demonstrates with regard to investing in performing behaviour [22]. It also has its origins in the degree of ICT self-efficacy [23]. ICT

TABLE I.
BASIC ELEMENTS OF ICT DIGITAL LITERACY [15]

Basic Elements of Digital Literacy		
Elements	*Definitions*	*Competencies*
Access	Knowing about and knowing how to collect and/or retrieve information.	Search, find, and retrieve information in digital environments.
Manage	Applying an existing organizational or classification scheme.	Conduct a rudimentary and preliminary organization of accessed information for retrieval and future application
Integrate	Interpreting and representing information - summarizing, comparing, and contrasting.	Interpret and represent information by using ICT tools to synthesize, summarize, compare, and contrast information from multiple sources.
Evaluate	Making judgments about the quality, relevance, usefulness, or efficiency of information.	Judge the currency, appropriateness, and adequacy of information and information sources for a specific purpose (including determining authority, bias, and timelines of materials).
Create	Generating information by adapting, applying, designing, inventing, or authoring information.	Adapt, apply, design, or invent information in ICT environments (to describe an event, express an opinion, or support a basic argument, viewpoint or position).
Communicate	Communicate information persuasively to meet needs of various audiences through use of an appropriate medium	Communicate, adapt, and present information properly in its context (audience, media) in ICT environments and for a peer audience.

self-efficacy is an element of self-efficacy which has been characterized as an individual's human perception when it comes to using ICT [24].

G. Basic ICT Skill (BICTs)

Nowadays, information technology is an important factor in terms of improving the skills of university students. Thus, these institutions have to create a strategy relating to learning that is continuously changing. The institutions also need to consider the competencies of the students, especially information technology skills that are in accordance with the concept of ICT digital literacy. These are as followings: 1. Access 2. Manage 3. Integrate 4. Evaluate 5. Create and 6.Communicate information [15] in order to function in a knowledgeable society (see Table 1).

In order to select the research to inform the development of the causal relationship model, thirteen related subject resources, including official public research and journal articles, were used to scope out the content of the concept framework as follows. [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13] (see Figure 1)
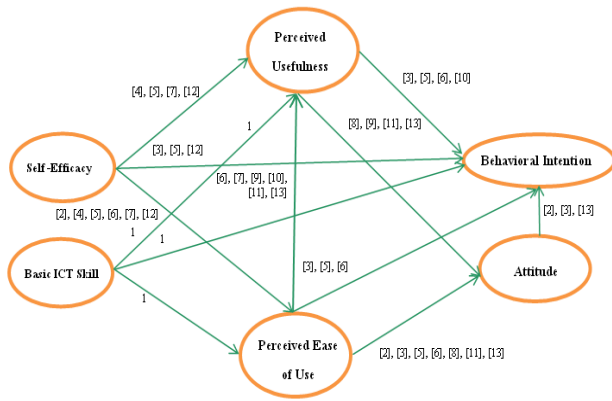
Figure 1.   The research model

V.   VARIABLE

Research variables considered in this study are:

1. Exogenous latent variables: basic ICT skills and self-efficacy;
2. Endogenous variables:
   a. Mediating latent variables: perceived ease of use, perceived usefulness and attitude.
   b. Outcome latent variables: behavioral intentions

VI.   RESEARCH HYPOTHESE

This study employed correlational research to developing twelve hypotheses and then tests the relationships between variables.

H1   Basic ICT Skill has a positive effect on perceived usefulness.

H2   Basic ICT Skill has a positive effect on perceived ease of use.

H3   Basic ICT Skill has a positive effect on behavioural intention.

H4   Self-efficacy has a positive effect on perceived usefulness.

H5   Self-efficacy has a positive effect on perceived ease of use.

H6   Self-efficacy has a positive effect on behavioural intention.

H7   Perceived Ease of Use has a positive effect on perceived usefulness.

H8   Perceived Ease of Use has a positive effect on attitude.

H9   Perceived Ease of Use has a positive effect on behavioural intention.

H10   Perceived usefulness has a positive effect on attitude.

H11   Perceived usefulness has a positive effect on behavioural intention.

H12   Attitude has a positive effect on behavioural intention

VII.   RESEARCH METHODOLOGY

The first stage is the synthesis of the framework of causal relationship model of the information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century

The second stage proposes the design of the causal relationship model of the Information and Communication Technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST Century.

VIII.   CONCLUSION

The causal relationship model of the information and communication technology skills that affect the Technology Acceptance Process for undergraduate students in the 21ST century includes perceived usefulness, perceived ease of use, attitude, and behavioural intentions. These factors show the affects of the degree of end users' technology acceptance. The other two factors, self-efficacy and basic ICT skills are also important as they are considered the essential ICT skills for university in the 21ST century. The result of this research is invaluable as this model would not only facilitate the management of the university's administrators, but it would also help promotes teaching and learning.

REFERENCES

[1] Kathryn Mac Callum and Lynn Jeffrey, "The influence of students' ICT skills and their adoption of mobile learning", Australasian Journal of Educational Technology, vol. 29, no. 3, pp. 303–314, 2013

[2] Maria Luiza Azevedo de Carvalho, Helga Campos de Azevedo Guimarães, Anna Maria Calvão Gobbo, Angilberto Sabino de Freitas, Jorge Brantes Ferreira, Cristiane Junqueira Giovannini, "Intention to Use M-Learning in Higher Education Settings" Xxxvi Encontro da ANPAD. Rio de janeiro / RJ-22a26 de sete,brp de. 2012.

[3] Oluwaseun Gbenga FADARE , Oluleye Hezekiah Babatunde, "Behavioral Intention for Mobile Learning on 3G Mobile Internet Technology in South-West Part of Nigeria" World J of Engineering and Pure and Applied Sci, vol. 1, no. 2, pp. 19-28, 2011.

[4] Jung-Wan Lee, and Samuel Mendlinger, "Perceived Self-Efficacy and Its Effect on Online Learning Acceptance and Student Satisfaction" Journal of Service Science and Management, vol. 29, pp. 243-252, 2011. http://dx.doi.org/10.4236/jssm.2011.43029

[5] Fadare Oluwaseun Gbenga, Aladeselu Victor E., Ekuobase Godspower, Aboderin Olukayode Solomon, Ado-Ekit Kumuyi Gbemisola Janet, "Adoption of mobile learning among 3g-enabled handheld users using extended technology acceptance model" World Journal on Educational Technology, vol. 5, no 3, pp. 420-430, 2013.

[6] Vasileios Terzis , Christos N. Moridis , Anastasios A. Economides, "How student's personality traits affect Computer Based Assessment Acceptance: Integrating BFI with CBAAM" Computers in Human Behavior, vol. 28, pp. 1985-1996, 2012. http://dx.doi.org/10.1016/j.chb.2012.05.019

[7] Ying-Hsiang Chuo, Chung-Hung Tsai, Yu-Li Lan and Chang-Shu Tsa, "The effect of organizational support self efficacy and computer anxiety on the usage intention of e-learning system in hospital" African Journal of Business Management, vol. 5, no 14, pp. 5518-5523, 2011.

[8] Chi-Cheng Chang,Chi-Fang Yan,Ju-Shih Tseng, "Perceived convenience in an extended technology acceptance model: Mobile technology and English learning for college students" Australasian Jounal of Educational Technology, vol. 28, no 5, pp. 809-826, 2013.

[9] Philipp Wunderlich1, Johann Kranz2, Dirk Totzek1, Daniel Veit, and Arnold Picot, "The Impact of Endogenous Motivations on Adoption of IT-Enabled Services: The Case of Transformative Services in the Energy Sector" Journal of Service Research, vol. 0, no 0, pp. 1-16, 2012.

[10] Iuan-Yuan Lu,Tsuang Kuo, Wen-Pin Lee, "Examining the Effects of Information Quality on Behavioral Intention of Knowledge

Management System" Journal of Quality, vol. 17, no 4, pp. 297-309, 2010.

[11] Jazihan MAHATa, Ahmad Fauzi MOHD AYUBb & Wong SU LUAN, "Factors influence the acceptance of m-Learning in malaysia: Perceived Usefulness, Perceived Ease of Use and Attitude" In Proceeding(s) of the 21st International Conference on Computers in Education, 2013.

[12] Norshidah Mohamed and Nor Shahahriza Abdul Karim, "Computer Application Anxiety, Self-Efficacy and Open Source Learning Management System Acceptance" Latest Advances in Information Science and Applications, pp. 274-278, 2012.

[13] Boštjan Šumak, Marjan Heričko, Maja Pušnik, and Gregor Polančič, "Factors Affecting Acceptance and Use of Moodle: An Empirical Study Based on TAM" Journal of Quality, vol. 35, pp. 91-100, 2011.

[14] Thailand's ICT Policy Framework B.E. 2554-2563, Ministry of Information and Communication Technology, 2000.

[15] California ICT Digital Literacy Assessments and Curriculum Framework, "BASIC OF DIGITAL LITERACY" http://mn.gov/mnddc/asd-employment/6a-ict competencies.html. last accessed: July 2014.

[16] National Education Act of B.E. 2542, Office of the National Education Commission and Office of the Prime Minister, Thailand, 1999.

[17] Frank Pajares, "Self-Efficacy Theory" http://www.education.com/reference/article/self-efficacy-theory/. last accessed: July 2014.

[18] F.D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology" MIS Quarterly, September, vol. 13, no 3, 1989.

[19] Swan, J. E., "Disconfirmation of Expectations and Satisfaction with a Retail Service" Journal of Retailing, vol. 54, pp. 49-66, 1981.

[20] H.C. Triandis, "Values attitudes and interpersonal behaviour" Lincoln, NE: University of Nebraska Press, 1980.

[21] F.D. Davis, and A. Arbor (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, September. http://dx.doi.org/10.2307/249008

[22] E. L. Usher, and Pajares, F., "Sources of self-efficacy in school: Critical review of the literature and future directions" Review of Educational Research, vol. 78, pp. 751-796, 2008. http://dx.doi.org/10.3102/0034654308321456

[23] M. S. Eastin, and R. LaRose, "Internet self-efficacy and the psychology of the digital divide" Journal of Computer-Mediated Communication, vol. 6, no 1, 2007.

[24] M. Fishbein, and I. Ajzen, "Belief Attitude Intention and Behavior: An introduction to theory and research" MA: Addison-Wesley, 1975.

[25] Ajzen, I., & Fishbein, M., "Attitudes and the attitude–behavior relation: Reasoned and automatic processes", In W. Stroebe & M. Hewstone (Eds.), European review of social psychology, vol.11, pp. 1–33, 2000.

[26] Gutman J., "A means-end chain model based on consumer categorization processes", http://www.jstor.org/stable/3203341. last accessed: July 2014.

AUTHORS

Pallop Piriyasurawong is an Assistant Professor at Division of Information and Communication Technology for Education, Faculty of Technical Education, King Mongkut's University of Technology North Bangkok (KMUTNB), Bangkok, Thailand, 10800 (e-mail: palloppi@gmail.com).

He has experience in many positions such as Computer curriculum specialist Level of basic education Institute for the Promotion of Teaching Science and Technology (IPST). And he is Chairman of the Board of Courseware Series of Teaching in Undergraduate Information Technology Systems of e-Learning of Office the Higher Education Commission

Thanyatorn Amornkitpinyo work at Faculty of Arts at Assumption University, Bangkok, 102400, Thailand (e-mail: nuying3125@hotmail.com).

She is studying in Doctoral program Information and Communication Technology for Education, Faculty of Technical Education, King Mongkut's University of Technology North Bangkok (KMUTNB), Thailand.