A STUDY ON PERCEPTION OF PERCEIVED EASE OF USE TOWARDS PERCEIVED USEFULNESS ON SMART EDUCATION

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ABSTRACT
Internet of Things (IoT) has changed things over the decades. The education method has shown small improvement only in some areas. SMART education has been introduced. Some of the concepts of SMART education has been implemented in other forms. Thailand has introduced Thailand 4.0 policy, which includes the SMART city as a new engine growth of a nation. SMART education is a part of the SMART city. This paper is aiming to understand the perception of perceived ease of use towards perceived usefulness on SMART education. The Technology Adoption Model (TAM) has been used to measure the concept focusing on perceived ease of use and perceived usefulness. There are 424 respondents using convenience sampling and snowball methods. The research uses statistical software with the Pearson correlation, single linear regression, and multiple linear regressions to measure the result. All SMART components are perceived as useful except Resource Enriched. The strongest perceived usefulness is Technology Embedded (TE). The second and third strongest perceived usefulness is Adaptive (AE) and Motivate (ME). The least perceived usefulness is Self-directed (SE). The study can benefit the institute to focus on any part of SMART education components based on their focus by their priority in terms of implementation, development, and budget allocation for investment.
Keywords SMART education, SMART University, TAM, Education, Self-directed, Motivation

INTRODUCTION

The Internet of Things (IoT) has been playing an important role in our daily life. It is considered as an opportunity and threat in almost every industry. Over the decades, the time passed, and things changed while an education system has remained the same or change only a few components. The changing of technology permits many opportunities as a tool to integrate new concepts, technology, and methodology in the education system (Riezebos,2016). However, an actual education development over the decades has been still unclear and applied slowly to the concept, technology, and methodology.

Thailand faces a decline in student numbers on a graduate degree and above due to the generation's behavioral change. Moreover, Thailand has announced government policy to be Thailand 4.0 to drive the nation's economy as a new engine growth. SMART city is one of the priorities for Thailand's innovation plan, which including SMART education. Aligning with the Thai government's policy and global technology change, an acceptance of SMART education components should be studied from the perception of the student for future development by the institute. Education methods should be developed to align with technology and present world trends (Curry, 2011).

This paper aims to study perception in terms of acceptance of the SMART education method using the Technology Acceptance Model (TAM Model), which focuses on perceived ease of use toward perceived usefulness. Current education methodology is already applied to some SMART education concept. The result of this study will enable the institute to find the improvement area in their school for further development, investment, or improvement priority from SMART education components.

LITERATURE REVIEW

This research study on conceptual of SMART education components but not focus in term of new-technology or technical terms which will enable this paper not to be limited only technology at the time conducting research. The Technology Acceptance Model (TAM) also studied in this paper to understand the concept of future actual

system use. The model can explain the perception of perceived ease of use and the perceived usefulness of SMART education (Koper, 2014).

SMART Education

The SMART education theory in this paper reference from The Ministry of Education, Science and Technology of the Republic of Korea (2011) which categorized SMART education concept into five main categories containing:

1. Self-directed: an expansion of education time
2. Motivated: an expansion of education methods
3. Adaptive: an expansion of education capacity
4. Resource enriched: an expansion of education content
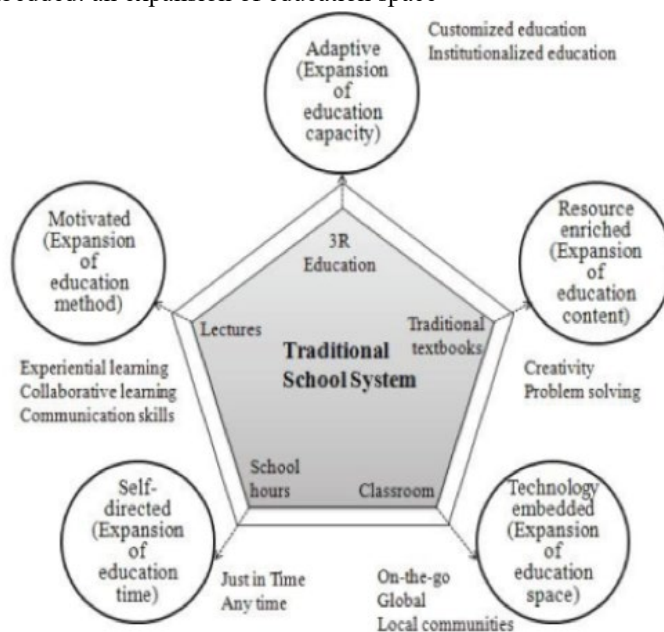5. Technology embedded: an expansion of education space

Figure 1. Basic characteristics of intelligent learning. Source: Ministry of Education, Science and Technology of the Republic of Korea (MEST) (2011), extracted from Sung, M (2015). A study of adults' perception and needs for smart learning. *Procedia-Social and Behavioral Sciences*, 191, 115-120.

Figure 1 has illustrated the new shift of the traditional education system into the SMART education system as a modern platform. However, the modern concept is not fixed to any new technology which can be developed and implement new technology or method into SMART education (Choi,2013).

Technology Acceptance Model

The research studied using the Technology Acceptance Model (TAM) (Davis, 1989). Perceived usefulness (PU) and the perceived ease of use (PEOU) are mentioned by the TAM framework, which creates behavioral intention to use for further system use.
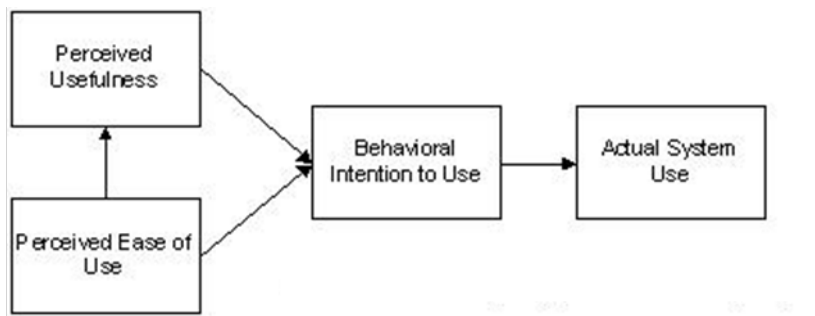
Source: Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-339.

Figure 2. Technology Acceptance Model

RESEARCH FRAMEWORK

The framework in this research is adopted framework from the published research paper Analysis of the Scientific Literature Published on Smart Learning (Sánchez, García, Río-Rama, Lalangui, 2018), combining with Technology Acceptance Model (TAM) (Davis, 1989). In this study, the perceived SMART education was measured with the Technology Acceptance Model, perceived ease of use, and perceived usefulness(Alharbi, Drew, Saleh, Drew, 2014). Then, the perceived ease of use on SMART education will be to measure the perceived usefulness. Hypothesizes are proposed as below:

H1   The perceived ease of use (PEOU) in SMART education is effect to perceived usefulness (PU)
H1a   The perceived ease of use (PEOU) in Self-directed is effect to perceived usefulness (PU)
H1b   The perceived ease of use (PEOU) in motivation is effect to perceived usefulness (PU)
H1c   The perceived ease of use (PEOU) in Adaptive is effect to perceived usefulness (PU)
H1d   The perceived ease of use (PEOU) in Resource Enriched is effect to perceived usefulness (PU)
H1e   The perceived ease of use (PEOU) in Technology Embedded is effect to perceived usefulness (PU)
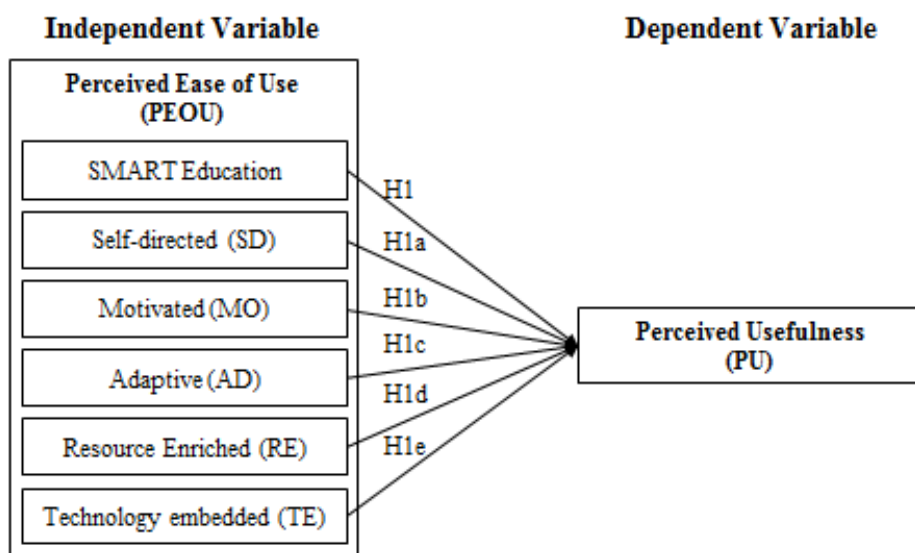

Figure 3. Research Conceptual Framework

RESEARCH METHODOLOGY

This research questionnaire was distributed via an online channel to collect quantitative data with a non-probability sampling method by convenience sampling and snowball technique. The questionnaire designed use the Five-Point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) to measure the hypotheses.

There are 42 questions (exclude demographic) to measure the respondent's perception. The proposed framework's questions are as follows:

- Self-directed (Expansion of time)
- Motivated (Expansion of education methods)
- Adaptive (Expansion of education capacity)
- Resource Enriched (Expansion of educational content)
- Technology embedded (Expansion of space)
- Perceived Usefulness

Measurement of variables

The target respondents are Thai people who used to or studying in higher education, either public or private universities.

Population and Sample

The number of respondents in this study was reached 424 respondents to represent the Thais population. Convenience sampling and snowball methods were used in this study.

Reliability test

The 30 sets of pilot questionnaires were distributed to target respondents. This research used Cronbach's Alpha Coefficient to test the reliability of pilot questionnaires. All results after test with independent variable meet the Cronbach's Alpha Coefficient greater than 0.6 (Cronbach, 1961) as below:

Table 1: Reliability Test of Pilot Questionnaires (N=30)

Variable	Cronbach's Alpha	Number of Items
Self-directed (SD)	0.759	5
Motivated (MO)	0.74	5
Adaptive (AD)	0.762	3
Resource Enriched (RE)	0.704	4
Technology embedded (TE)	0.813	4
Perceived Usefulness (PU)	0.896	21
Overall Reliability	0.844	42

RESULTS AND DISCUSSION

This research use Pearson correlation, multiple linear regression by statistical software to find the statistic result and relationship of dependent and independent variable.

Data analysis

Table 2: Demographic information of respondents

Demographic Information (N=424)		Frequency	Percentage (%)
Gender (N-424)	Female	250	61%
	Male	162	39%
Age (N-424)	22-37	375	91%
	38-53	34	8%
	54-72	3	1%

Status (N-424)	Married	37	9%
	Single	375	91%
Education (N-424)	Bachelor's Degree	224	54%
	Doctoral Degree	5	1%
	Master's Degree	183	44%
Previous Education (N-424)	Private Study	82	20%
	Public Study	330	80%
Occupation (N-424)	Business owner	25	6%
	Employee	321	78%
	Freelance	29	7%
	I am a student	34	8%
	Unemployed	3	1%
Income (THB per month) (N-424)	<15,000	5	1%
	15,001-30,001	161	39%
	30,001-45,000	128	31%
	>45,001	118	29%

There are 424 respondents completed the questionnaire. There are female 61 %, and male 39 %. The majority of respondent's age is between 22 – 37 years old at 91%.The respondents' age from 38 – 53 are at 8%. Consequently, there are three people who are between 54 – 72 at 1%. The majority of respondents are single at 91 %, followed by 9 % for married. There are 54 % of respondents who studied Bachelor's Degree, 44 % studied Master's Degree, and 1% studied Doctoral Degree. Most of the respondents presently studied in Public Study at 80 %. There is only 20 % studied Private School. Majority of them are work as an employee at 78%. Other respondents are studying, freelance, and business owners with 8%, 7%, and 6%, respectively. Most of them have an income level between 15,000 to 30,001 THB per month at 39%. Follow by 30,001 to 45,000 THB per month at 31%, more than 45,001 THB per month at 29%, and less than 15,000 THB at 1%.

Pearson's Correlation Matrix

Table 3:Result Descriptive analysis and correlation matrix (N-424)

	Mean	Std Deviation	SE	ME	AE	RE	TE	SMART	PU
SE	3.6042	0.67784	1						
ME	3.4670	0.74329	.366**	1					
AE	3.4615	0.79669	.332**	.536**	1				
RE	3.7034	0.61889	.174**	.366**	.389**	1			
TE	4.0548	0.60590	.342**	.354**	.244**	.367**	1		
SMART	3.9146	0.49524	.463**	.561**	.560**	.336**	.530**	1	
PU	3.6582	0.47898	.639**	.776**	.755**	.643**	.636**	.712**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows the Pearson correlation from 0.174 to 0.776. P-values of all variables are tested at less than 0.01 significant levels. The highest positive value is between perceived ease of use in motivated (ME) and perceived usefulness (PU). The second highest positive value is from perceived ease of use in adaptive (AE) and perceived usefulness (PU) at 0.755. The perceived ease of use (PEOU) and perceived usefulness (PU) has the third-highest positive at 0.712. The weakest positive relationship is at perceived ease of use on resource enriched (RE) and self-directed (SE) at 0.174. The second most weak positive value is between perceived ease of use on adaptive (AE) and technology embedded (TE) at 0.244. The third weak positive relationship is the perceived ease of use on self-directed (SE) and adaptive (AE) at 0.332.

Based on the SMART education concept with Pearson correlation, all sub-variable, self-directed (SE), motivated (ME), adaptive (AE), resource enriched (RE), technology embedded (TE) are highly related to perceived usefulness. The r value is greater than 0.50.

The results tell that factor that easy to use for perceived ease of use (PEOU) with highly significant is ME (0.561), AE(0.560), TE (0.530), while SE (0.463), RE (0.336) are moderate significant.
From the mentioned result, the least significant with perceived usefulness are self-directed (0.639), resource enriched (0.643), and technology embedded (0.636). This mean motivated (0.776) and adaptive (0.755) are perceived as more useful than SE, AE, and RE.

Overall, perceived ease of use (PEOU) in SMART education is strongly significant with perceived usefulness (PU) at 0.712.

Simple Linear Regression

Table 4: Simple Linear Regression for H1

Variable	B	Sig.	VIF
(Constant)	1.220	0.000	
SMART	0.737	0.000	1.000
R Square	0.507		
Adjusted R Square	0.506		

a. Dependent Variable: PU

Table 4 is explaining that perceived ease of use on SMART education is significant at 50.7% from R Square at the significant level of 0.05. The standard coefficient is 0.737. The result of VIF is 1. So, the result shows that perceived ease of use on SMART education is a positive effect on perceived usefulness (PU), which supports H1.

Multiple Linear Regressions

Table 5: Result of Multiple Linear Regressions (MLR) for H1.

Variable	Standardized Coefficients beta (β)	Variance Inflation Factor (VIF)	Sig.
SE	0.171	1.266	0.000
ME	0.223	1.593	0.000
AE	0.311	1.538	0.000
RE	-0.014	1.326	0.711
TE	0.322	1.314	0.000
R Square	0.544		
Adjusted R Square	0.538		

a. Dependent Variable: PU

An above table was run to predict perceived usefulness (PU) from self-directed(SE), motivated (ME), adaptive (AE), resource enriched (RE), and technology embedded (TE). These variables statistically significantly predicted perceived usefulness (PU), $F(5, 418) = 99.698$, $p < .0005$, $R2 = .577$. Four of the variables included self-directed(SE), motivated (ME), adaptive (AE), and technology embedded (TE) are statistically significant to the prediction, $p < .05$. However, resource enriched (RE) is rejected because of the significant level at 0.711.

CONCLUSIONS AND RECOMMENDATIONS

This research is aiming to find how the relationship between perceived ease of use of SMART education, self-direct, motivation, adaptive, resource enriched, and technology embedded affect the perceived usefulness. This

research is used 424 respondents' online questionnaire by using convenience and snowball method for data collection.

Table 6: Result of Hypothesizes

	Hypothesizes	Result
H1	The perceived ease of use (PEOU) in SMART education is effect to perceived usefulness (PU)	Supported
H1a	The perceived ease of use (PEOU) in Self-directed is effect to perceived usefulness (PU)	Supported
H1b	The perceived ease of use (PEOU) in motivation is effect to perceived usefulness (PU)	Supported
H1c	The perceived ease of use (PEOU) in Adaptive is effect to perceived usefulness (PU)	Supported
H1d	The perceived ease of use (PEOU) in Resource Enriched is effect to perceived usefulness (PU)	Not Supported
H1e	The perceived ease of use (PEOU) in Technology Embedded is effect to perceived usefulness (PU)	Supported

The above table show that all hypothesizes are accepted except H1d; the perceived ease of use (PEOU) in Resource Enriched is an effect on perceived usefulness (PU).

Self-directed (SE), Motivated (ME), Adaptive (AE), Technology Embedded (TE) are perceived as useful (PU). The strongest perceived usefulness is Technology Embedded (TE). The second and third strongest perceived usefulness is Adaptive (AE) and Motivate (ME). The least perceived usefulness is Self-directed (SE). Resource Enriched (RE) is not a supported hypothesis.

The job of the institute is required to balance the perceived ease of use with the perceived usefulness. The institute shouldfocus on the most useful item, Technology Embedded (TE) and Adaptive (AE). For Motivated (ME), the institute should develop a methodology to be more useful. Also, the institute should make it less useful to be more useful and easy to use, Self-Directed (SE). Resource Enriched (RE) that not supported by hypothesis should be focus most. All mentioned will help to create an attitude towards using SMART education and create behavioral intention to use for actual use consequently.

The study will help enhance the value of institute, and to align with the present global trend on IoT. The benefits which enable institute from this research are as below;
1) Priority to the first implement
2) Priority to develop
3) Priority to allocate the budget for further investment

The three mentioned items are dependent on which part the institute concern with. The future is coming with technology around us. To be a real Integration with technology is another key important to apply to SMART education for better efficiency, better effect in future education for the world, which needs a priority by visionary institute onward.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH
The study includes only perceived ease of use and perceived usefulness on the Technology Adoption Model (TAM), which excludes behavioral intention to use and actual system use (Davis, 1993). The SMART education model is a study on conceptual without specific present technology use today, such as artificial intelligence (AI), blockchain, machine learning, wireless communication, video conference, virtual reality, etc. The future research

can study on whole TAM model and specific present technology use to know the perception of the technology platform (Ajzen and Fishbein, 1975).

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