

A STUDY ON THE FACTORS AFFECT E-LEARNING OUTCOMES OF THE PILOTS IN A SELECTED AIRLINE IN THAILAND

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ABSTRACT

E-Learning is a platform that is being used for training in the digital era. Many researchers try to identify the different influencing factors that affect E-Learning outcomes. The six (6) important factors, which appear in the literature, included Learner-Learner Interaction, Learner-Instructor Interaction, Learner-Content Interaction, Perceived Ease of Use and Readiness Factors, will be examined in this research. The respondents, numbering 205 pilots of Thai Airways who are using E-Learning for the pilot's ground school. However, only 200 are valid. The Pearson's Correlation results showed that all independent and dependent variables have positive relationship with each other. The results of multiple linear regression showed that three significant variables impact on E-Learning outcomes, which are Learner-Learner Interaction, Learner-Content Interaction and Readiness Factors. But three other variables, Learner-Instructor Interaction, Perceived Ease of Use and Computer Self-Efficacy, do not show a significant effect.

Keywords: E-Learning, Computer Based Training (CBT), Airbus Cockpit Experience (ACE), Outcomes, Learner, Instructor, Air Pilot.

INTRODUCTION

In recent years of aviation and education world, numerous attentions were focused on E-Learning and this sort of education encompasses a significant growth (Franceschi et al., 2009). The training trend is moving towards online-learning to create accessible education for all (Keramati, Afshari-Mofrad and Kamrani, 2011) and the number of E-Learning students is increasing rapidly (Michinov et al., 2011). E-Learning has the most vital advantage that it will increase flexibility through resources which encourages learning anytime and in anyplace (Michinov et al., 2011). Developing on the efficiencies of the web, educational establishments and organizations have been affected to quickly apply this kind of new technology for tutorial functions. The purpose of E-Learning is to attain the learning objectives (Selim, 2007). A lot of researchers study many semblances of E-learning and various approaches were adopted (Abu Sneineh, 2010). Modern researches have shown that about \$40 billion is invested each year on technology-based training (Johnson, Gueutal and Falbe, 2009). E-learning could be a great opportunity for organizations and universities to minimize the cost of training and enhance quality (Lim, Lee and Nam, 2007) however it needs to be financially ready due to its high investment prices (Schreurs and Ehlers, 2008). Thus, it is important to work out variables which might influence its outcomes. Technology-based educating is an emerging field and minor studies have already investigated the factors that contribute to E-learning's success or failure. (Michinov et al., 2011).

This research to review the influence factor that existed in the literature on the E-Learning outcomes and determine the level of significant on each factor. The researcher uses the multilinear regression to analyze the six important factors in E-Learning. The objectives of this research are shown as follows:

- To investigate the factors which influence on the E-Learning outcomes of the pilots from Thai Airways.
- To investigate the level of influence on the E-Learning outcomes of each factor.

LITERATURE REVIEW

Interactions (LLI, LII, and LCD)

Interaction is the exchange of data processes between sender and receiver. There are several correspondence methods which can be used in connecting to different partners within the e-learning circumstance, such as learners – instructors, learners –learners, etc. In 2006, Tung and Deng stated that the interaction could be regarded as a

common process of communication connecting people and computers. Piccoli et al. mentioned in 2001 that interaction grants users to transfer information, to get criticism, and also evaluate improvement in e-learning prosperity. Researchers discover that vital training circumstance gives substances which encourage interaction between the trainees and trainers thus advocate training effectively. In 2008 Guffey, acclaimed that interaction could be a communication process when the sender has a notion, encrypts notion into a message, then sends it through a channel such as phone, e-mail, or face to face. The message will then be decoded by the receiver. As reported by Te'eniin 2001, the interactive process is a communication process by at least two people to make a relationship by talking and action. In 2001, Lear, Ansorge, and Steckelberg stated that communication encourages the common interaction of students inside a class with attendant and instructor. In 1989, Moore introduced three types of interaction, which are: (a) learner-content interaction, (b) learner-instructor interaction, and (c) learner-learner interaction. However, due to the progression of technology, Hillman, Willis, and Gunawardena in 1994, added another type of interaction, which is learner-technology interaction.

Perceived Ease of use (PEU)

In 1989, Davis proposed the Technology Acceptance Model (TAM) which instructed that a lots of variables affect users' choice on how and when they are going to utilize an updated technology: seen value thus seen ease of use (Davis, 1989). Practically, the moment it is figured out (such as seen ease of use) suggests that clients will accept technology easier when technology ease of use is high (Venkatesh and Bala, 2008). Since technology is important in learning online, those programs which are simple to utilize will conduct higher learning demeanor (Lim et al., 2007). A few hypothetical models center over significance of trainees' recognitions in the ease of use, that is fruitful in forecasting and clarifying the user behavior and intention (Davis et al., 1989 and Davis, 1989). In such case, comprehended ease of use will be characterized as "the degree to which an individual believes that using a particular system would be free of physical and mental effort." (Davis, 1989).

Computer Self- Efficacy (CSE)

Self-efficacy appears to influence the behaviors of human over the implementation of activities. Furthermore, self-efficacy is a people's perception about their ability to exert the essential sources for project accomplishment (Wood and Bandura, 1989). Prior research instructed the significance of computer self-efficacy on the evolution of behaviours in E-Learning (Compeau and Higgins, (1995), Lim et al., (2007) and Hernandez et al., (2009)). According to social cognitive theory (Wood and Bandura, 1989), self-efficacy is presented to effect behavior of learners, many endeavors allowed to the behavior and the personal achievement. At this point, self-efficacy is hypothesized that it affects learning results in interpersonal aptitude training (Gist et al., 2006), specific computer assignments (Compeau and Higgins, 1995), military training programs (Tannenbaum et al., 1991), and training course of the home page design (Chou and Wang, 2000). Self-efficacy considerations change according to three aspects which have vigorous attainment meanings: generalizability, magnitude, and strength (Compeau and Higgins, 1995). Magnitude implies to the scale of job difficulty and complication which is categorized into three levels: low, moderate, and high. Persons with low magnitude judge themselves less capable to perform difficult tasks and activities than persons with higher magnitudes. On the other hand, strength refers to an individual's certainty in his/her competence to perform exercises and assignments. Finally, generalizability is the degree to which an individual's exploitis generalized over identical activity realms (Latham, 1998).

Readiness Factor (RF)

The role of readiness factors has been examined by many researchers in E-Learning results (Zhao, 2009). A previous study has demonstrated that one of the most significant factors affecting E-Learning results is technical readiness (Brush, 2003). Moreover, it is significant to pair suitable technology with suitable learning purpose (Kidd, 2010). This study, which is based on literature, researcher encounters, and respondents' explanations, readiness factor is classified into three categories, including technical, social, and organizational factors. Technical factors consisted of Internet access, Bandwidth, Content, Hardware, Software, and School's area. Organizational factors consisted of Experts, Organizational cultures, Organizational rules and Management permanence. Social factors consisted of Governmental rules, Social perception of learning online, and Administrative instructions.

E-Learning Outcomes (ELO)

According to Carswell in 2001, evaluating E-Learning results is imperative since people are less fulfilled with this framework have less propensities for selecting further E-Learning programs. Some model suggested to review at E-Learning outcomes (Cukusic et al., 2010, Piccoli, 2001; Faded, et al., 2008, Johnson et al., 2009). This study depended on past inquiries about three imperative variables that have been inspected: Instructors advance, understudies advance and get to instruction for all.

In 2000, Colquitt stated that numerous considerations have to assess the relationship between E-Learning factors and the results, by checking on the writing shows that they don't continuously successfully anticipate learning exchanges. In this study, part of the preparation components within E-Learning results will be evaluated.

RESEARCH FRAMEWORK AND METHODOLOGY

This conceptual framework was adapted by the researcher to analyze the factors that have the significant impact on E-Learning outcomes. There are six independent variables: Learner-Learner Interaction, Learner-Instructor Interaction, Learner-Content Interaction, Perceived Ease of use, Computer Self-Efficacy, Readiness Factor, that affect E-Learning Outcomes for Thai Airway International Pilot.

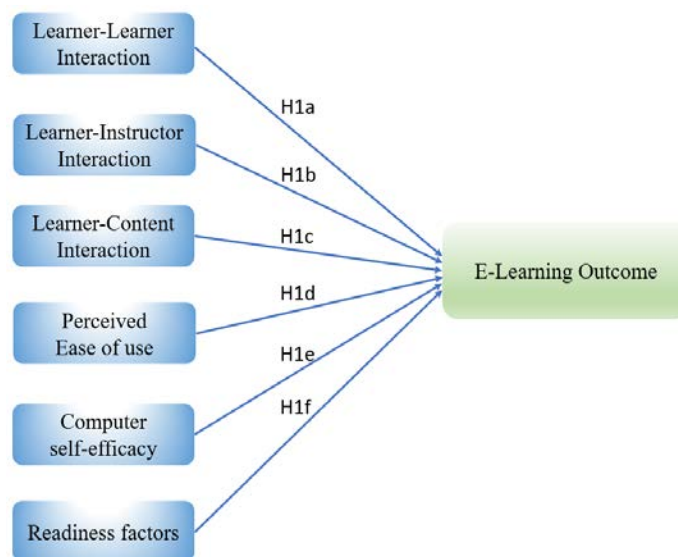


Figure 1. Conceptual Framework (adapted by the researcher for this research)

The hypotheses of this research are:

- H1a:** Learner-learner interaction (H1a) has a significant impact on E-Learning outcomes.
- H1b:** Learner-instructor interaction (H1b) has a significant impact on E-Learning outcomes.
- H1c:** Learner-content interaction (H1c) has a significant impact on E-Learning outcomes.
- H1d:** Perceived Ease of use (H1d) has a significant impact on E-Learning outcomes.
- H1e:** Computer self-efficacy (H1e) has a significant impact on E-Learning outcomes.
- H1f:** Readiness factors (H1f) has a significant impact on E-Learning outcomes.

Research Methodology

This research uses a quantitative approach to describe the factors' impact on E-Learning outcomes. The collection data was done by applying a non-probability convenience sampling and snowball sampling from the respondents who are pilots of Thai Airways, who are the target population. Multiple linear regression was used to analyze the impact of independent variables (H1a-H1f) using a Likert scale five- point ranking from 1 representing "Strongly disagree" to 5 representing "Strongly agree"

Measurement of variables

The target respondents of this research are pilots who work for Thai Airways and had an experience using E-Learning. The conceptual framework was developed to ensure that it is an appropriate model based on the literature review.

Population and sample

The research's questionnaire was distributed online and offline to 205 respondents who are pilots at Thai Airways using convenience sampling and snowball sampling to collect the data. However, only 200 questionnaires are valid. The least number of respondents required for this study should be 297 respondents in order to get 95% confidence level to represent 1,300 pilots of Thai Airways. However, due to limited time availability of pilots, the researcher can get only 205 respondents.

Reliability test

The reliability has been tested from the data of 30 target respondents that was conducted using Cronbach's Alpha Coefficient to test the reliable data of the questionnaire. In order to for the questionnaire to be accepted, the

Cronbach's alpha must be greater than 0.6 (Cronbach, 1951). Table 1 also shows the result that Cronbach's alpha of all variables are greater than 0.6 that means this questionnaire is reliable and acceptable.

Table 1. Consistency of Scales Test (N=30)

Variables	Cronbach's Alpha	No. of Items
Learner-Learner Interaction (LLI)	0.945	7
Learner-Instructor Interaction (LII)	0.955	7
Learner-Content Interaction (LCI)	0.948	7
Perceived Ease of use (PEU)	0.941	7
Computer Self- Efficacy (CSE)	0.941	7
Readiness Factors (RF)	0.941	7
E-Learning Outcomes (ELO)	0.945	7

DATA ANALYSIS

In the data analysis section, statistical analysis software has been used to find the impact of all independent variables towards E-Learning outcomes. The Multiple Linear Regression (MLR) was used to analyze the relationship according to the defined conceptual framework. There are 6 independent variables i.e. Learner-Learner Interaction (LLI), Learner-Instructor Interaction (LII), Learner-Content Interaction (LCI), Perceived Ease of use (PEU), Computer Self- Efficacy (CSE), Readiness Factors (RF) and one dependent variable which is E-Learning Outcomes (ELO).

Descriptive Analysis

The demographic factors as shown in Table 2 were conducted to describe the general information from 200 respondents who are pilots working at Thai Airways and had an experience the using E-Learning for pilot.

Table 2. Demographic Information of the target respondents (N = 200)

Demographic	Frequency	Percentage (%)
Age		
21-29 years old	126	63%
30-36 years old	38	19%
37-44 years old	19	9.5%
45-52 years old	10	5%
53-60 years old	7	3.5%
Education		
Bachelor's Degree	164	82%
Master's Degree or above	36	18%
Working with Thai Airway		
Less than 10 years	160	80%
10-20 years old	16	8%
20-30 years old	22	11%
More than 30 years	2	1%
Used to fly		
A300, A320, A330, A350 XWB, or A380	132	66%
B737, B747, B757, B767, B777 or B787	76	38%
There is no A/C Type assigned	7	3.5%
Aircraft Fleet		
Airbus Fleet	127	63.5%
Boeing Fleet	67	33.5%
There is no fleet assigned	10	5%

In the questionnaire, the screening question was specified in order to select respondents who are pilots working at Thai Airways and had an experience using E-Learning for pilots. Fortunately, 100 percent of respondents met the qualifications. Table2 shows the demographic information of respondents relating to age, education, number of years working with Thai Airways, types of aircraft flown by pilot, types of fleet assigned to pilots. The majority of respondents are 21-29 years old which is 63%; and the least number of respondents are 53-60 years old which is only 3.5%. For education, 82% of respondents are bachelor's degree graduates and 18% of respondents have master's degree or above. Since majority of the respondents are 21-29 years old, therefore 80% of respondents have worked for less than 10 years with Thai Airways. With regards to the types of planes flown by pilot, 66% of the respondents used to fly A300, A320, A330, A350 XWB, or A380 and 38% of respondent used to fly B737, B747, B757, B767, B777 or B787. Only 3.5% said that they have not been assigned any aircraft type. In terms

of the fleet that the respondents are assigned to fly, 63.5% of respondents are flying Airbus Fleet and 33.5% are flying Boeing fleet. The remaining 5% said that they have not been assigned on any Aircraft fleet.

Descriptive Research and Correlation Matrix

The researcher used the five-point Likert scale to test the variable ranging from 1 representing “Strongly disagree” to 5 representing “Strongly agree”

Table 3. Correlation Matrix for Hypothesis

	<i>Mean</i>	<i>Std. Deviation</i>	<i>LLI</i>	<i>LII</i>	<i>LCI</i>	<i>PEU</i>	<i>CSE</i>	<i>RF</i>	<i>ELO</i>
<i>Learner-Learner Interaction (LLI)</i>	<i>3.9014</i>	<i>0.52570</i>	-						
<i>Learner-Instructor Interaction (LII)</i>	<i>3.9700</i>	<i>0.57438</i>	<i>.668**</i>	-					
<i>Learner-Content Interaction (LCI)</i>	<i>4.2429</i>	<i>0.52491</i>	<i>.481**</i>	<i>.448**</i>	-				
<i>Perceived Ease of Use (PEU)</i>	<i>3.9250</i>	<i>0.60631</i>	<i>.442**</i>	<i>.486**</i>	<i>.544**</i>	-			
<i>Computer Self-Efficacy (CSE)</i>	<i>3.7805</i>	<i>0.63461</i>	<i>.408**</i>	<i>.459**</i>	<i>.426**</i>	<i>.654**</i>	-		
<i>Readiness Factors (RF)</i>	<i>3.9075</i>	<i>0.56604</i>	<i>.445**</i>	<i>.500**</i>	<i>.495**</i>	<i>.640**</i>	<i>.523**</i>	-	
<i>E-Learning Outcomes (ELO)</i>	<i>4.0975</i>	<i>0.61839</i>	<i>.527**</i>	<i>.503**</i>	<i>.557**</i>	<i>.598**</i>	<i>.528**</i>	<i>.619**</i>	-

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

Table 3 shows the Pearson’s Correlation Coefficients Matrix for H1a-H1f. Based on the analysis, all the independent and dependent variables have positive relationships with each other as P-value < 0.01 in Pearson

Correlation referring to the strength of correlation. The Learner-Learner Interaction (LLI) has a moderate positive relationship at 0.668 with the Learner-Instructor Interaction (LII). The Learner-Content Interaction (LCI) has a weak positive relationship with the Learner-Learner Interaction (LLI) and the Learner-Instructor Interaction (LII), at 0.481 and 0.448, respectively. The Perceived Ease of Use (PEU) has a weak positive relationship with the Learner-Learner Interaction (LLI) and the Learner-Instructor Interaction (LII), at 0.442 and 0.486, respectively. The Perceived Ease of Use (PEU) has a moderate positive relationship at 0.544 with the Learner-Content Interactive (LCI). The Readiness Factors (RF) has a weak positive relationship with the Learner-Learner Interaction (LLI) and the Learner-Content Interaction (LCI), at 0.445 and 0.495, respectively. The Readiness Factors (RF) also have moderate positive relationship at with the Learner-Instructor Interaction (LII), Perceived Ease of Use (PEU) and Computer Self-Efficacy (CSE), 0.500, 0.640 and 0.523, respectively. In addition, the E-Learning Outcomes (ELO) which is a dependent variable has a moderate positive relationship with all independent variables.

Inferential Analysis

This research used Multiple Linear Regression (MLR) analysis to test the hypotheses in order to define Inferential Analysis at P-value equal to 0.05 significance with Variance Inflation Factor (VIF) to examine the critical multicollinearity problem in this research at $VIF > 5$ (Ringle et al., 2015).

- H1a:** Learner-learner interaction (H1a) has a significant impact on E-Learning outcomes.
- H1b:** Learner-instructor interaction (H1b) has a significant impact on E-Learning outcomes.
- H1c:** Learner-content interaction (H1c) has a significant impact on E-Learning outcomes.
- H1d:** Perceived Ease of use (H1d) has a significant impact on E-Learning outcomes.
- H1e:** Computer self-efficacy (H1e) has a significant impact on E-Learning outcomes.
- H1f:** Readiness factors (H1f) has a significant impact on E-Learning outcomes.

Table 4. Result of multiple linear regression for H1; Dependent Variable E-Learning Outcomes (ELO)

Variables	Standardized Coefficients (Beta)	P-value	VIF
Learner-Learner Interaction (LLI)	0.175*	0.012	1.974
Learner-Instructor Interaction (LII)	0.039	0.581	2.068
Learner-Content Interaction (LCI)	0.191*	0.003	1.634
Perceived Ease of Use (PEU)	0.146	0.057	2.418
Computer Self-Efficacy (CSE)	0.120	0.074	1.869
Readiness Factors (RF)	0.270*	0.000	1.926
R Square	0.536		
Adjusted R Square	0.522		

Note: Beta coefficients are reported, * $p < 0.05$

Table 4 indicates that the result of R Square was 0.536 that means the dependent variable, which is E-Learning Outcomes (ELO) could be explained by six independent variables which are: Learner-Learner Interaction (LLI),

Learner-Instructor Interaction (LII), Learner-Content Interaction (LCI), Perceived Ease of Use (PEU), Computer Self-Efficacy (CSE) and Readiness Factors (RF) by 53.6% at 0.05 significance level. The p-value of three independent variables (Learner-Learner Interaction (LLI), the Learner-Content Interaction (LCI) and the Readiness Factors (RF) variables) are less than 0.05, which means that the independent variables have statistically significant impact to the dependent variable, hence H1a, H1c and H1f are supported. In addition, the Standardized Coefficients (Beta) shows that the Readiness Factors (RF) has the most impact to the E-Learning Outcomes (ELO) at Beta = 0.27. The second and third influential factors that impact to the E-Learning Outcomes are Learner-Content Interaction (LCI) and Learner-Learner Interaction (LLI) respectively.

However, the p-value of three independent variables (Learner-Instructor Interaction (LII), Perceived Ease of Use (PEU) and Computer Self-Efficacy (CSE)) are more than 0.05, which means that three variables have no statistically significant impact to the E-Learning Outcomes (ELO), hence H1b, H1d and H1e are not supported.

The variance inflation factors or VIF were described in order to determine any multicollinearity problem. It shows all of the independent variables values are less than 5.00, which means that the multicollinearity is not a critical problem in this research (Ringle et al., 2015).

CONCLUSIONS

This research emphasized on the factors that have an impact on the E-Learning outcomes of pilots at Thai Airways by using multiple linear regression (H1). The results clarify the relationships between Learner-Learner Interaction, Learner-Instructor Interaction, Learner-Content Interaction, Perceived Ease of Use, Computer Self-Efficacy, Readiness Factors, and E-Learning results.

The results of this research demonstrated that three independent variables (Learner-Learner Interaction, the Learner-Content Interaction and the Readiness Factors variables) have positively significant impacts on E-Learning Outcomes. The two independent variables' (Learner-Learner Interaction and Learner-Content Interaction) results are supported by Mbarek and Zaddem in 2013 including social cognitive theory, media richness theory and technology acceptance theory. For Readiness Factors (RF), the result is supported by (Keramati, Afshari-Mofrad and Kamrani, 2011)'s conceptual model of study which categorized the readiness factors into three categories as technical, organizational and social factors. In addition, Standardized Coefficients (Beta) shows that Readiness Factors has the most impact to E-Learning Outcomes at Beta = 0.27. The second and third influence factor that impact to the E-Learning Outcomes are Learner-Content Interaction (Beta = 0.191) and Learner-Learner Interaction (Beta = 0.175) respectively.

However, the independent variables (Learner-Instructor Interaction, Perceived Ease of Use and Computer Self-Efficacy) have no important effect on E-Learning outcomes in this research. For Computer Self-Efficacy, the result was supported by (Mbarek and Zaddem, 2013) as it also has no significant impact on the previous research. It implies that learners, who believe more in their aptitudes and capacities to utilize computer devices will not be contributed to perform their training more operational. The result of Learner-Instructor Interaction factor which is not affecting the E-Learning outcomes. This means that in context of using the E-Learning in Thai Airways, the pilot has more face to face interaction with each other than with the instructor, and the rest of the study is with the computer. The role of pilot ground instructor in Thai Airways is just to give guidelines for studying with the computer-based training hence, they only have brief encounters with the trainees. Therefore, majority of the training time, the pilots are face to face with the other pilots and the computer. This is the reason why the two independent variables (Learner-Learner Interaction and Learner-Content Interaction) have significant impact with E-Learning outcomes. For the Perceived Ease of Use, the result contrasts with the study of Ghazinoory and Afshari-Mofrad in 2012. For Thai Airways pilot, it implies that whether the computer-based training is easy to use or not, they have the responsibility to follow and finish all the lessons. In addition, with regards to the Airbus and Boeing aircraft, computer-based training modules have been developed for these types of aircraft with user-friendly functions, which is a mandatory specification of the E-Learning for the pilot. This is the reason why Perceived Ease of Use does not impact significantly on the E-Learning outcomes.

RECOMMENDATION AND FURTHER STUDY FOR FUTURE RESEARCH

Based on the results of the study, the researcher recommends that aircraft manufacturers (e.g. Airbus, Boeing) develop E-Learning instructional guides for the operation of their aircraft and the airline industry to use the E-Learning for their pilot's trainings. They must pay attention on the influencing factors that have positive significant impact to the E-Learning outcomes in order to meet their customers' expectations. For Thai Airways, as the result showed that Learner-Instructor Interaction has no significant impact to E-Learning outcomes, the pilot training department could have more face to face time with the pilots to get higher learning achievement which is supported

by “Further, trainer and trainee’s interaction was related to learning achievement. Lim et al. (2007) the importance of face to face meetings between trainees and trainers in enhancing e-learning achievement”.

Although this research demonstrated cautious and systemic endeavor to consolidate components of E-Learning, the research contains unavoidable limitations which ought to be taken with thought. First, this study is conducted in Thai Airways, Thailand circumstance only and thus likely to appear distinctive when it comes to other environments and nations. Second, the limit of time and assets could impact the outcomes.

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