4

Learning Performance and Satisfaction on Working Education

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1. Introduction

The emerging Internet and World Wide Web (WWW) brought about fast variations in the development of the learning process in the past ten years. There are various forms for learning, such as Computer-Aided Instructions (CAI), Intelligent Tutoring System (ITS), to Web-Based Learning (WBL), and e-learning systems. In present fast changing electronic world (e-world) knowledge is the key to maintaining the appropriate impetus and momentum in organizational and academic environments. In this situation continuous, convenient and economical access to training and qualifications assumes the highest priority for the ambitious individual or organization. With the booming development of Internet and information technology, the Internet has broken the limitation of time and space. Information and Communication Technology (ICT) have recently affected strongly on every field in the society; especially in recent years, e-learning is being applied widely in the areas of training around the world.

Generally speaking, e-learning is a mode of education that builds on a network technology-based and also uses a mix of computer and other ICTs, across time and space restricted to deliver instruction and provide access to information resources. It can be included delivery systems such as videotape, interactive audio-video, CD-ROMs, DVDs, video-conferencing, VOD, e-mail, live chat, use of the Web, television, satellite broadcasts and so on. It also includes the delivery of contents through Internet, intranet/extranet, audio and videotape, satellite broadcast, interactive TV, and CD-ROM". Access to these resources means that students can do homework at a time they feel free and convenience, therefore learning may conduct synchronously or asynchronously.

E-learning can provide content and knowledge as valuable as like traditional training environment. Conventional learning often requires learners to travel to different locations and gather in various classrooms at specific time, but e-learning has no such restrictions. Meeting face-to-face is no longer necessary and learners just need to meet with each other via electronic modes of delivery (e.g., chat rooms, discussion boards, instant messaging). The benefits of e-learning are not only to learners but also the organizations when they learned form this education training mode.

Taiwan in 1999 had the "Fundamental Science and Technology" concept to establish fundamental principles and directions for the development of science and technology. The

same year the government approved NTD 40 million within a 5-year period for the "National Science and Technology Program for e-Learning". Firms are aware of the need to become learning organizations and increase workers' skills in order to accommodate new technologies. The e-Learning offers not only the way for anytime, anywhere, flexible learning online, but is also a cost effective and flexible method, and one the public and private sectors have taken as a useful tool to train and educate the workforce.

For enterprises, e-Learning could be savings, increasing worker productivity, driving operational efficiencies, and streamlining corporate training. e-Learning initiative Basic Blue program in IBM, it would save $16 million in 2000. And after cooperating with their e-Learning management system-Platue Systems, the American Red Cross saved more than $10 million in seven-years. About Toyota Motor Sales USA in 2002 declared that the use of the Learning System to strengthen training, it would save more than $11.9 million in five years. Worldwide revenues in the e-Learning market will reach US$ 500 billion by 2010, and the growth of e-Learning market is expected to multiply by 6.

Learning Environment online is one of key factors that increase the learning satisfaction. e-Learning platform should include Content Management System (CMS) and Learning Management Systems (LMS). Modular Object-Oriented Dynamic Learning Environment (MOODLE) is a free and open source e-learning software platform and is designed to help educators create online courses with opportunities for rich interaction. It opens source license and modular design that people can develop additional functionality. Basing on MOODLE, e-learning system provides help and supports to learners through diverse technologies including real-time chat, messages boards, email, lecture material files, and so on. According to Clark and Mayer (2003), e-learning was defined as instruction delivered on a computer by way of CD-ROM, Internet, or Intranet with the following features:

- Includes content relevant to the learning objectives.
- Uses instructional methods to help learning.
- Uses media elements to deliver the content and methods.
- Linked new knowledge and skills to learning goals and to improved organizational performance.

This chapter proposes a theoretical model based on working safety training in construction and integrates the adoption and satisfaction of e-learning by labors. The objective are threefold:

1. To conceptualize a theoretical structural model based on e-learning.
2. To identify the factors affecting using e-learning system.
3. To make sure how factors in the proposed model influence labors' learning in working safety training of e-learning.

This chapter attempts to construct a conceptual model and then integrate the some external factors into the proposed model. The objectives/questions include the following:

Question 1: What are the factors that significantly influence labors using the technology in e-learning environments?

Question 2: How does the proposed model explain the variances of satisfaction?

2. Working safety training

In the face of no decrease occupational injuries, attaining a high and consistent level of safety-health management system is becoming an important issue for manufacturers and industry. According to the statistics, the major occupation accident rate of construction has been the highest among all industries. In Taiwan, the percentage of deaths from the construction professional accidents between 2001 and 2010 is around 0.031%, much higher than that during the same period in advanced countries in Europe, America and the UK, indicating that the situation of construction professional accidents in construction has become a very serious problem. Thus it's imperious to improve the construction worker safety management, in order to decrease the construction accident occurrence.

On the other hand, the working injury statistics revealed by Council of Labor Affairs in Taiwan, 75% of the casualties were caused by worker's unsafe behavior, and 75% of the unsafe behavior related injured workers were not properly trained by the employers on safety. It means working safety training will lower injuries and plays most significant role in reducing unsafe behaviors. Therefore, how to improve the effect of safety training is one of the key factors to reduce working injuries.

The general safety training courses in most companies still follow traditional oral teaching method and lack of discussion, practice, and simulation drill. And in order to reduce training cost, most of instructors are in-house employees that provide the boring courses. It will decrease the effect of training. This chapter derives the training and e-learning for labor safety and by analyzing the survey and setting up the e-learning procedures, it also establishes a good labor safety training planning and implementation mechanism which can be conformed the requirements of laws and regulation in construction.

3. Proposed model and hypotheses

3.1 Sample

This chapter obtained the valid samples from A construction and the purpose is to explore the relationship among education training and the relationship after training by e-learning. There were totally 185 questionnaires issued in this chapter, and 178 questionnaires are valid (effective sample rate is 96.2%). First, responses from the questionnaires were gathered and entered into SPSS 16. The significance level chosen for this study was .05. Descriptive statistics on all the data provided frequencies, percentages, means, and standard deviations.

The characteristics of this sample were calculated including age and gender of using e-Learning for labor working safety training by SPSS that also conduct Descriptive statistical analysis, Factor analysis, Reliability analysis, Analysis of variance, T-test, Duncan multiple T-comparison, and Regression analysis to probe this study. The reliability of data also assessed by computing Cronbach's alpha.

The sample consisted of 178 workers with 43.6% female and 54.4% male. For age, 12.3% of total respondents were over 50 years old, with about 28.6% in the age of 50-40 years old, about 38.9% in the age of 40-30 years old and about 20.2% in 30-20 years old.

3.2 Instrument development

On the questionnaire, four predictors-user interface, rich content, platform function, learning support to satisfaction on e-learning training, and two labor variables-age and gender were selected for further investigation. Figure 1 depicts the hypotheses of three groups. Every group shows the hypotheses to examine the effect of perceptions.

H1: System design (user interface, rich content, platform function, learning support) are positively related to satisfaction on e-learning training.

H2: System design (user interface, rich content, platform function, learning support) are correlated with labor variables of age and gender.

H3: Satisfaction on e-learning training is correlated with labor variables of age and gender.

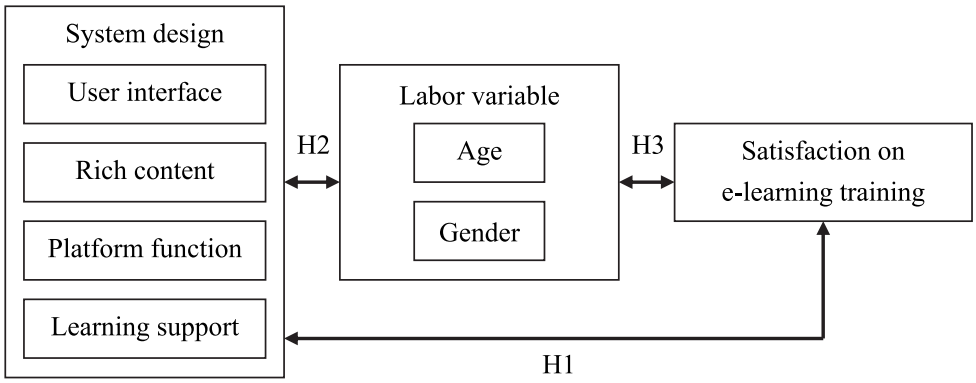


Fig. 1. The framework of Satisfaction on e-learning training

Team	Item	Measure
User interface	U1	Easy to use
	U2	Friendly interface
	U3	Colorful elements
Rich content	R4	Multi-media for design
	R5	Suitable training content
	R6	Tools for fast learning
Platform function	P7	Function with well done
	P8	Playing easily
	P9	Good network connection
Learning support	L10	Given learning direction
	L11	Help function design
	L12	Supporting online tutor
Satisfaction on e-learning training	S13	Increase the learning times by myself
	S14	Intensive training effect

Table 1. Variable Definition

A survey questionnaire was developed to measure the relevant constructs. Table 1 summarizes the operational definition as well as the references for each construct. A five-point Likert-type scale asked the subjects to rate the degree to which they agreed with the statements on a 1 to 5 scale-1 represented "strongly disagree" and 5 "strongly agree". And Table 2 presents the items and the respective loadings of the instrument.

4. Data analysis

4.1 Reliability and factor analysis

In verifying the scale for measuring these constructs, Cronbach's alpha was used to assess the reliability. The coefficient alpha values for user interface, rich content, platform function, learning support were 0.92, 0.81, 0.90, 0.93 and 0.87. Because the Cronbach's alpha values were above the conventional level of 0.7 (Nunnally, 1978), the scales for these constructs were deemed to exhibit adequate reliability.

It conducted a confirmatory factor analysis (CFA) to test the convergent validity of each construct. The loadings of items against the construct being measured were tested against the value 0.7 on the construct being measured and table 2 showed the results obtained for the loadings in relation to the latent variables. The factors structure in factor analysis went well with the structure of the questionnaire.

Item	Component				
	1	2	3	4	5
U1	**0.8912**				
U2	**0.8673**				
U3	0.3767				
R4		**0.9022**			
R5		**0.7891**			
R6		0.5236			
P7				**0.7816**	
P8				**0.8603**	
P9				**0.7928**	
L10			0.6156		
L11			**0.8993**		
L12			**0.8762**		
S13					**0.7837**
S14					**0.8619**

Table 2. Initial values of loadings

Based on the criteria that item loadings greater than 0.70, we analysis of the cognitive absorption construct shows that all items, and then U3, R6 and L10 are much lower than acceptable. These two items were dropped from the final model.

Once all the items that did not load satisfactorily had been removed, the model was rerun. Table 3 shows the results of testing the measurement model in the final run. The t-values for model loadings show that model loadings are all above 1.96 and significant.

T Statistics	SD	Item	Component				
			1	2	3	4	5
8.9035	0.0357	U1	**0.8912**				
7.0981	0.0218	U2	**0.8673**				
12.4582	0.0563	R4		**0.8972**			
7.0972	0.0371	R5		**0.7633**			
14.3156	0.0936	P7				**0.7655**	
22.9064	0.0367	P8				**0.8413**	
25.0673	0.0655	P9				**0.7836**	
10.3528	0.0887	L11			**0.8763**		
13.7835	0.0523	L12			**0.8359**		
14.3196	0.0348	S13					**0.7837**
9.3681	0.0762	S14					**0.8619**

Table 3. Final values of loadings

4.2 The relationship between System design and labor variables

For understanding the relationship, in case between gender and user interface, rich content, platform function, learning support by using T-test. The result showed both gender had significant to perceived each mean (p-value), and the result revealed that male (mean=5.03) and female (mean=4.34). It is indicates in Table 4.

	Mean			
	User interface	Rich content	Platform function	Learning support
Male	4.09	6.12	5.73	4.36
Female	4.35	5.02	4.63	4.17
t-statistic	3.26	4.15	3.87	4.56
df	212.95	214.33	214.76	214.28
p-value	0.00	0.00	0.00	0.00

Table 4. The relationship between system design and gender

As illustrates in Table 5, age level had many significant influence on the user interface, rich content and platform function (p-value = 0.00), and 20-50 years old generally make more interesting of all means.

	Mean			
	User interface	Rich content	Platform function	Learning support
Over 50 years old	1.13	4.89	5.26	0.57
50-40 years old	4.36	5.02	4.63	4.17
40-30 years old	5.39	5.36	5.14	4.06
30-20 years old	5.17	5.89	4.37	4.82
t-statistic	4.69	4.12	4.33	-0.86
df	57.63	57.09	57.82	51.87
p-value	0.00	0.00	0.00	0.68

Table 5. The relationship between system design and age

4.3 Structural model evaluation

The analyses of data include descriptive statistics and Structural Equation Modeling (SEM). SEM with LISREL 8.5 will be used to analyze the data from the respondents. It has a number of advantages over multiple regressions which is commonly used to validate aspects of the theory. The SEM consists of two parts, and they are the structural model and the measurement model. The structural model shows potential causal dependencies between endogenous and exogenous variables, and the measurement model shows the relations between the latent variables and their indicators. The structural model was evaluated using the following criteria:

a. Ability to explain variance
b. Significance of path coefficients

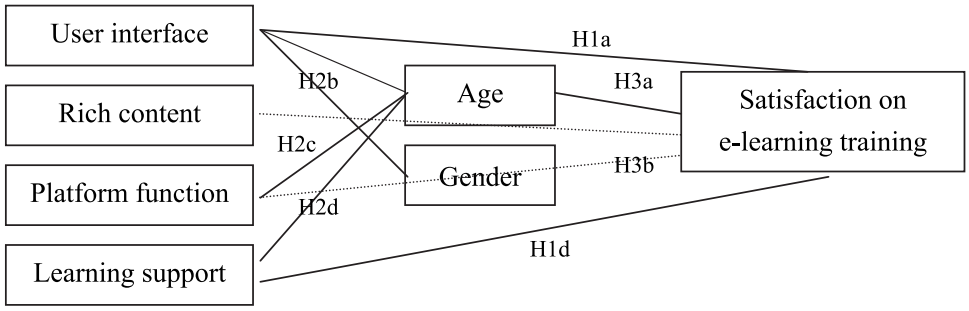


Fig. 2. Model with T-value path coefficients

The structural model was tested with the data from the entire data sample and each of labor variables respectively. The comparison of path coefficients are between system design and satisfaction on e-learning training, labor variables and satisfaction on e-learning training, system design and labor variables (shown as Fig.2). The significance of difference was calculated in Table 6 and Table 7. Following the figure show the results of SEM, include standardized, estimated and T-value model, as well.

Hypotheses	Effects	T-values	Result
H1a	user interface<-> satisfaction on e-learning training	3.256***	Supported
H1b	rich content <-> satisfaction on e-learning training	4.012***	Supported
H1c	platform function <-> satisfaction on e-learning training	3.763***	Supported
H1d	learning support <-> satisfaction on e-learning training	3.002***	Supported
H2a	user interface <-> age	4.786***	Supported
H2b	rich content <-> age	3.267***	Supported
H2c	platform function <-> age	-0.162	Not supported
H2d	learning support <-> age	0.268	Not supported
H2e	user interface <-> gender	0.157	Not supported
H2f	rich content <-> gender	2.767***	Supported
H2g	platform function <-> gender	-2.031	Not supported
H2h	learning support <-> gender	0.365	Not supported
H3a	age <-> satisfaction on e-learning training	4.629***	Supported
H3b	gender <-> satisfaction on e-learning training	1.903	Not supported

*p <0.05 (one-tailed test)
**p <0.01 (one-tailed test)
***p <0.001 (one-tailed test)

Table 6. Hypotheses test

Model hypotheses	Standardized Path Coefficients	Hypotheses Supported
H1	0.721**	Supported
H2	0.893**	Supported
H3	0.126	Not supported

*p <0.05 (one-tailed test)
**p <0.01 (one-tailed test)
***p <0.001 (one-tailed test)

Table 7. H1 to H3 hypotheses test results

It can be seen in the above figure, the T-value for eight factors are more than 1.96 suggested by Byrne (2001). H1a, H1b, H1c, H1d, H2a, H2b, H2f, H3a are supported by the data and the other hypotheses (H2c, H2d, H2e and H3b) are rejected. Significant differences were found in two groups of H1 and H2. Significant differences appeared in the path coefficients of all, they are system design and satisfaction on e-learning training, user interface and age, rich content and age, rich content and gender, age and satisfaction on e-learning training.

The results found in fact, for satisfaction on e-learning training, it has a substantially greater effect on system design. Both of their coefficients are significant, validating H1. H3 assumes the perceptions of labor variable are positively related to satisfaction on e-learning training. In this case illustrate partly influence between them, thus the results do not provide support for H3. H2 posit that system design attitude would have an affect on labor variable. However, findings illustrate only perceived "user interface and rich content" shows significant coefficient. Therefore, the findings do not totally support H2.

5. Factors influence labors' satisfaction of e-learning in working safety training

This section summarized some major findings which were discussed with the aims of the chapter:

- Majority of respondents on age of labor variable, it were between 30-50 years old with positively related to satisfaction.
- This case study found no direct effect on gender satisfaction and system design, but only a significant effect on rich content of system design. The non-significance of the direct effect is consistent with other recent researches.
- System design demonstrated much significant influence with satisfaction on e-learning training, such as user interface, rich content, platform function, learning support. These finding are also consistent with the prior studies.
- Based on e-learning satisfaction, it identified strongly four significant predictors of system design in the structural model of the SEM test: user interface (T-value=0.35***), rich content (T-value=4.012***), platform function(T-value=3.763***), and learning support (T-value=3.002***).
- H1 posit that satisfaction and system design would have a positive relation to e-Learning systems.
- H2 posit that system design and labor variable would have a positive relation to age of labors.
- H3 posit that labor variable and satisfaction would have no relation to e-Learning systems.

6. Discussion on e-Learning and working training

Recently, e-Learning has become an important teaching method, and to implement an e-learning system can make the whole training process to go through it smoothly without any limitation of time and space. Therefore, e-Learning has become the revolution in the 21st century, and it is not only the learning tendency in the future, but also the important part to

come into economic knowledge. Learning for people will become more self-initiated and individualized.

Internet already starts to change the industry of education. By the characteristics of instant and without boundary, Web-Based Training (WBT) has become an important trend for the enterprises' education and training. The e-learning training mode is one of WBT and popular for enterprises. For the limitation of cost and time, e-learning has become an important trend on training, and many enterprises build an e-learning system as employees' training tool. Some companies do not know how to implement e-learning step by step or what is the factor keys to success, especially in construction fields. The critical factors of enterprise e-learning are still unclear for them.

This chapter is attempted to establish an implementation model that may help construction understand the critical factors of e-learning for effective plans. Based on e-learning, it tries to find out those critical success factors influencing over implementing and performance. Furthermore, this found that if the learning quality is increased by conducting e-learning mechanisms that can achieve the goals of reducing cost and increasing the efficiency in working training.

Since e-Learning is one of the best tools to increase value on working training, the purpose of this chapter is to understand how constructions in Taiwan implement e-learning system, what key factors to effect the adoption and processes for the implementation. In the implementation procedure, there are effective factors– course, teaching materials, instructional design, multi-media technology and infrastructure, which affect the results of achievement and learning. Therefore, this research focuses on the user's satisfaction by investigating the e-Learning mode and the training ways. However, studies of user satisfaction when using e-learning systems are very limited. This study will discuss a comprehensive model and instrument for measuring learner satisfaction with e-learning systems.

After this, we set up three groups in accordance with the result of the different learning elements on learning satisfactory investigation. During data collection and analyze, it will carefully examine evidence of reliability, content validity, criterion- related validity from the samples of a case with e-learning system. The procedures used in conceptualizing the survey, generating items, collecting data, and validating are described. To further analyze the data, statistical methods such as T-test, Correlation Analysis, and Structural Equation Modeling could be conducted.

The findings and conclusions were made based on the analyzed data and related certification Hypothesis:

1. Different system design will influence learning motivation.
2. The labors could accept the e-Learning technology that depends on age and rich contents of e-learning.
3. The good system design of e-learning significant effects on grade satisfaction.
4. The exploration of satisfaction in e-learning based on different labor variables and items of learning system attitudes.

e-Learning also brings advantages of flexibility and low cost for working education so that the strong strength can not be ignored. Nevertheless there are no the theoretical essentials to how to create the learning management system according to the characteristic of the enterprises. The chapter applied SEM to explore the relation among satisfaction, labor variables and system design by analyzing factors in the e-learning environment. First of all, it will analysis the system style, such as user interface, rich content, platform function, learning support. Then we had conducted an experiment to compare the learning performance between e-learning teaching and the conventional teaching.

To promote the training satisfaction and performance, this chapter highly suggests that the construction should understand learning characteristics and learning behavior from workers with safety classes to fulfill the needs from learner. Therefore, the three basic principles in conducting evaluation are based on system design (user interface, rich content, platform function, learning support), labor variables (age and gender) and satisfaction on e-learning training.

The major findings of this chapter are as follows:

1. System style significant effects on grade and attitude towards the e-Learning.
2. The e-learning system should be based on labors' attitudes and different subjects.
3. The most efficient learning pattern will be explored in construction of working education.
4. The key factors for positively-correlated effect are between satisfaction and system design.
5. For good training program, to make the e-learning cost-efficient and to integrate information to suit for construction is important.

According to the chapter, a successful e-learning system is integrated with the application of technology and the design of system. Therefore, this chapter will provide valuable reference to the construction adoption of an e-learning system.

7. References

Chin, W. W., and Todd, P., 1995, On the use, usefulness, and ease of use of structural equation modeling in MIS research: a note of caution, MIS Quarterly, 19 (2), pp.237-246.

Clack R. C., Mayer R. E., 2003, E-learning and the Science of Instruction, Jossey Bass Pfeiffer.

Ma, Q., Liu, L., 2004, The technology acceptance model: a meta-analysis of empirical findings, Journal of Organizational and End User Computing, Vol.16, pp. 59–72.

Masiello, I., Ramberg, R. & Lonka, K. P. O., 2005, Attitudes to the application of a Webbased learning system in a microbiology course. Computers & Education 45, pp.171-185.

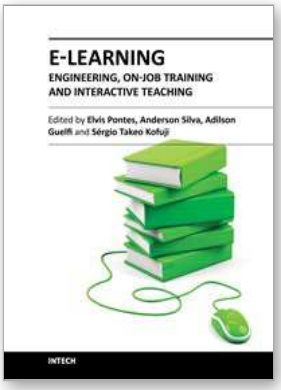
Nunnally, J. C., 1978, Psychometric theory, New York: McGraw-Hill.

Ong, C. S., Lai, J. Y. and Wang, Y. S., 1994, Factors affecting engineers' acceptance of asynchronous e-Learning in high-tech companies, Information and Management, 41(6), pp.795.

Raaij, E. M. V., Schepers J. J. L., 2008, The acceptance and use of a virtual learning environment in China, Computer & Education, Vol. 50, pp. 838-852.

Wang, K. H., Wang, T. H., Wang, W. L. & Huang, S. C., 2006, Learning styles and formative assessment strategy: enhancing student achievement in Web-based learning. Journal of Computer Assisted Learning 22, pp.207-217.

Wilson, B. G., 1996, Constructivist Learning Environments: Case Studies in Instructional Design, Educational Technology Publication, Englewood Cliffs, New Jersey.



E-Learning - Engineering, On-Job Training and Interactive Teaching

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Adaptive E-learning was proposed to be suitable for students with unique profiles, particular interests, and from different domains of knowledge, so profiles may consider specific goals of the students, as well as different preferences, knowledge level, learning style, rendering psychological profile, and more. Another approach to be taken into account today is the self-directed learning. Unlike the adaptive E-learning, the Self-directed learning is related to independence or autonomy in learning; it is a logical link for readiness for E-learning, where students pace their classes according to their own needs.This book provides information on the On-Job Training and Interactive Teaching for E-learning and is divided into four sections. The first section covers motivations to be considered for E-learning while the second section presents challenges concerning E-learning in areas like Engineering, Medical education and Biological Studies. New approaches to E-learning are introduced in the third section, and the last section describes the implementation of E-learning Environments.

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