

# Impact factor on learning achievement and knowledge transfer of students through e-learning system at Bach Khoa University, Vietnam

Quoc Trung Pham

School of Industrial Management, Bach Khoa University,  
VNU-HCM, Ho Chi Minh City, Vietnam  
[pqtrung@hcmut.edu.vn](mailto:pqtrung@hcmut.edu.vn)

Minh Chau Huynh

School of Industrial Management, Bach Khoa University,  
VNU-HCM, Ho Chi Minh City, Vietnam  
[huynhmchau@gmail.com](mailto:huynhmchau@gmail.com)

**Abstract**— E-learning is the application of IT and Internet in education to make it easier, spacious, and more efficient. Advantages of e-learning are recognized, but its impact on learning achievement and knowledge transferring are not confirmed clearly. Learning is considered the skills of students and knowledge gained through experience in the training process. Learning achievement has been defined as students' knowledge, skills and study habits in a training course and effectiveness of their application to their work. Based on previous research, this study suggested that learning achievement as a dependent variable affected by the capacity factors, such as: Computer Self Efficacy, Ease of Use, Perceived Usefulness, Face to Face Interaction, Email Interaction, and Social Presence. Besides, knowledge transfer is also affected by learning achievement. The study result showed that 3 factors: Easiness & Usefulness, E-mail Interaction, and Social Presence have positive impacts on Learning & Transferring knowledge through the e-learning system of Bach Khoa University (BKU). Based on analysis results, some managerial implications are suggested for improving the effectiveness of e-learning system at BKU.

**Keywords**— *e-learning system; learning achievement; knowledge transfer; Bach Khoa University; Vietnam*

## I. INTRODUCTION

Today, e-learning system becomes a popular method for supporting teaching and learning in many universities in the world. Advantages of e-learning are recognized worldwide, but its impact on learning achievement and knowledge transferring are not confirmed clearly. In Vietnam, e-learning systems are developed and applied in many schools and universities, especially used for distance learning or supported knowledge transfer for working students.

Bach Khoa University (BKU - a member of Vietnam National University in Ho Chi Minh City) built an e-learning system (Sakai) to support distance learning program since 2011. Besides, another e-learning system based on Moodle (an open sourced platform) had been implemented and deployed to support all other programs [7]. Although e-learning system can help students to access to learning materials, and to make it easy for learning and teaching process, but the using rate is still low, and real effectiveness of e-learning system on learning achievement and knowledge transfer process are not measured exactly. In fact, the number of students registered on distance learning program is decreased in recent years. Is there anything from e-learning system to be improved for increasing

students' achievement and for raising the number of recruiting students in this kind of program?

Learning is considered the skills and knowledge gained through experience in the training process. Learning achievement has been defined as students' knowledge, skills and study habits in a training course and effectiveness of their application to their work. Besides, Knowledge transfer is considered the changing of habits through learning on the job experience in the training process, which is very importance for working students and distance program. Previous researches ([21],[24]) showed that learning achievement is affected by students' ability, social interactions and technical factors, and knowledge transfer is affected by learning achievement of students.

According to network management department of BKU, about 50% of lecturers still not using e-learning system. This may reduce the interaction through e-learning system, and as a result, lower the total benefits of e-learning system on learning and teaching process of the University.

Therefore, understanding factors impacting on students' learning achievement and knowledge transfer through e-learning system is very important for BKU to improve the effectiveness of e-learning system, to increase the teaching quality and to attract more students for distance program.

The main objectives of this research include: (1) identify and measure the impact of some factors related to students' ability, social interaction and technical aspects on students' learning achievement, and then on knowledge transfer through e-learning system at Bach Khoa University; and (2) suggest several solutions based on analysis results for improving students' learning achievement and knowledge transfer through e-learning system. The structure of the paper is as follows: (2) Literature review & research model; (3) Research method; (4) Data analysis results; (5) Discussion & recommendations; and (6) Conclusion.

## II. LITERATURE REVIEW & RESEARCH MODEL

### A. E-learning

E-learning is a modern educational technologies to facilitate the learning and learners, with the help of software applications and virtual learning environment. There are various similar concepts to e-learning, such as Computer-based training (CBT), Internet-based training (IBT), and Web-

based training (WBT). E-learning helps to transfer knowledge from online sources to end-user through various devices, such as: desktop, laptop, and mobile devices... E-learning system often uses many types of media to deliver text, audio, images, and videos to learners [26][35].

**B. Social Cognitive Theory**

According to Bundura & Wood [7], social cognitive theory (SCT) assumed that individual personality is affected by 3 main factors: social environment, personal perception, and behavior. In which, personal perception/cognition is individual social psychological aspects, such as: value, belief, intention, feelings... related to biological characteristics; Behavior related to economic, political and cultural aspects.

**C. Social Presence (SP)**

Social presence is the outstanding level of other people presence in the interaction and their communication [24]. For this research, social presence is learners' perception about learning environment through e-learning system, where they can connect with other people and share their ideas actively. Although learning environment through e-learning system may not sufficient, a shared learning environment could be built by combining traditional learning community and technical supports. A limitation of e-learning system is a lack of social presence through face to face interaction. However, this problem could be solved by increasing peer to peer connections. With strong connections, each student could join learning process deeply and realize the value of training course through their online experience.

**D. Interaction**

Interaction is exchange of information/knowledge between stakeholders during training process (including: students, lecturers, officers, classmates...). Interaction allows individuals to share ideas, receive feedbacks, and evaluate progress [23]. Besides, several learning theories confirmed the center role of interaction in training process [18]. Through using synchronous communication tools, e.g. Chat, IM..., students can get feedbacks immediately and evaluate their ideas or questions. Therefore, it helps to increase the interaction between stakeholders, makes it easy for learners in acquiring knowledge, and transfers intangible values between people through knowledge sharing and experiencing.

**E. Related researches**

Related theories and researches could be summarized in the following table.

TABLE I. SUMMARY OF RELATED RESEARCHES

Author(s)	Description
Ajzen [3]	New technology adoption is one of popular topics in information system research. Theory of reasoned action (TRA) was developed in psychosocial perspective to identify factors of the trend-conscious behavior [4]. Theory of planned behavior (TPB) was proposed by Ajzen [3] from the original TRA with a new factor, perceived behavioral control.

Venkatesh et al. [31] [32]	Besides, technology acceptance model (TAM) based on the TRA to establish relationships between factors to explain human behavior regarding acceptance of the new information system. The most extended of TAM, namely TAM 2 [31], TAM 3 [32], exploring the determinants to perceived usefulness and perceived ease of use.
Venkatesh et al. [33]	Unified theory of acceptance and use of technology (UTAUT) is used to explore the intention and use behavior of the information system. Based on previous researches, UTAUT proposed 4 main factors of users' intention and use of new information system, which are: performance expectancy, effort expectancy, social influence, and facilitating condition.
Mbarek & Zaddem [19]	This research explored impact factors of e-learning effectiveness in Tunisia. Based on previous research about e-learning effectiveness, this research added a new factor of social presence, including: self-efficacy, perceived usefulness, ease of use, and interaction. Besides, impact of independent features, recognition features, and environment features on e-learning effectiveness is also explored. Sample data was collected from 410 employees in Tunisia; analysis results showed that there is significant impact of interaction, ease of use, and social presence on learning achievement through e-learning. And learning achievement has a positive impact on knowledge transfer through e-learning.

**F. Research model**

Based on above analysis, research model of Mbarek & Zaddem [19] is suitable with the objectives of this research, because it is not only based on TAM – a popular model – for understanding e-learning effectiveness, but also adding social presence and focusing on learning achievement and knowledge transfer of e-learning system. Therefore, this research model is selected for exploring impact factors of learning achievement and knowledge transfer through e-learning system of BKU. In summary, the suggested research model could be summarized in the following figure.

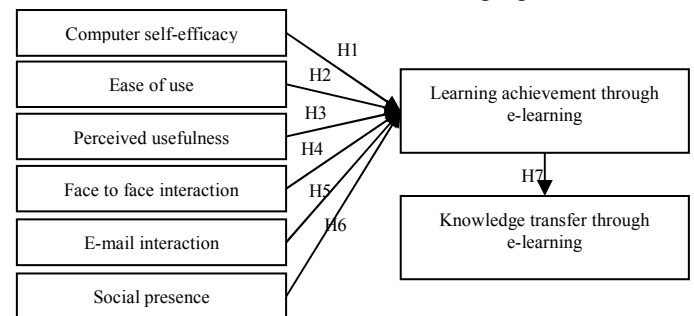


Fig. 1. Suggested research model

**Computer Self-Efficacy:** According to Mbarek & Zaddem [19], self-efficacy has an impact on each person's behavior. Therefore, computer self-efficacy could have an impact on

individual behavior to use e-learning system, and as a result on learning achievement of that person. Johnson et al. [16] suggested that computer self efficacy is significant in improving learning achievement through e-learning system. So, hypothesis 1 could be stated as follow:

H1: Computer self-efficacy has a positive impact on students' learning achievement through e-learning.

*Ease of Use:* According to TAM model of Davis [13], if the users think that it is easy to use e-learning system, they will use it more, and their learning achievement will also be increased. So, hypothesis 2 could be stated as follow:

H2: The ease of use has a positive impact on students' learning achievement through e-learning.

*Perceived Usefulness:* Davis [13] defined perceived usefulness as individual belief about increasing level of performance in using e-learning system. Moreover, Johnson et al. [16] showed that perceived usefulness has a positive impact on learning achievement through e-learning. So, hypothesis 3 could be stated as follow:

H3: Perceived usefulness has a positive impact on students' learning achievement through e-learning.

*Interaction and Social Presence:* During communication process, interaction is 2 way information exchange between sender and receiver. On e-learning system, students can communicate with each other and with lecturers using e-mail or face-to-face interaction. Aragon [6] showed that increasing social presence through e-learning system helps to improve interaction effectiveness and to increase learning quality. So, hypotheses 4, 5, and 6 are stated as follows:

H4: Face to face interaction has a positive impact on students' learning achievement through e-learning.

H5: E-mail interaction has a positive impact on students' learning achievement through e-learning.

H6: Social presence has a positive impact on students' learning achievement through e-learning.

*Learning achievement and Knowledge transfer:* Kraiger [17] assumed that suitable evaluation of learning outcomes should be measured by learning goals and working habit change. Knowledge transfer is considered the change in students' working habit through training process. Alliger et al. [5] showed that learning achievement has an impact on knowledge transfer. So, hypothesis could be stated as follow:

H7: Learning achievement has a positive impact on knowledge transfer through e-learning.

### III. RESEARCH METHOD

General approach: both qualitative and quantitative methods are used. The research process is divided into two stages: (1) qualitative research, and (2) quantitative research. The findings from step 1 will be used to modify and finalize the questionnaire used for step 2.

Qualitative research: This is made through the direct interviews with 5 lecturers and 15 students (distance program 5, undergraduate 5, and post-graduate 5), who already used e-learning system at BKU. The purpose of this stage is to select the best appropriate questionnaire as observation instruments

to finalize the measurement scales of constructs in the proposal model.

Quantitative research: This is to collect and analyze data for testing the research model. In order to satisfy the testing criteria, the sample size must be  $\geq 250$  students of various programs (distance, undergraduate, and post graduate program). Data collected will be analyzed using Cronbach Alpha, EFA, and multiple regression analysis of SPSS.

### IV. DATA ANALYSIS & RESULTS

There are 263 valid samples collected for the research. This number is suitable for data analysis.

#### A. Descriptive statistics of sample

TABLE II. DESCRIPTIVE STATISTICS OF SAMPLE

Features	Values	Freq.	Percent
Gender	Male	125	47.5
	Female	138	52.5
Age	18 - 23	138	52.5
	24 - 30	110	41.8
	31 - 40	13	4.9
	> 40	2	0.8
Type of students	Undergraduate	156	59.3
	Postgraduate	92	35
	Working students	15	5.7
Major	Business admin.	208	79.1
	Computer science	55	20.9
Training program	Distance learning	55	20.9
	Bachelor	111	42.2
	Master	97	36.9
Intakes	2011	63	24
	2012	97	33.1
	2013	111	42.2
	2014	1	0.4
Years of using e-learning	1 year	40	15.2
	2 years	109	41.4
	3 years	99	37.6
	$\geq 4$ years	14	5.3

In this sample, Female is taking 52.5%. Age from 18 - 23 years taken 52.5%. Most of respondents are undergraduate students (59.3%), and belong to School of Business administration (79.1%). About training programs: 42.2% bachelor, 36.9% master, and 20.9% distance program. The major group of students' intake is 2012-2013 (75.3%). Most of them have at least 2 years of experience (84.3%).

#### B. EFA & Cronbach alpha analysis

Assessment of the measurement scales is executed by 2 steps: (1) testing the reliability of individual scale, and (2) testing the discriminability and validity of scales. For individual scale, PAF (Principle Axis Factoring) method is used with Eigen value  $\geq 1$  and Promax rotation. The similar method is applied for other scales. EFA is used to identify meaningful factors suitable with theoretical proposal.

According to Tho [28], the reliability of scales for individual factor is valid with Cronbach Alpha's coefficient  $\geq 0.6$ . An item could be kept if its correlation  $\geq 0.3$ . After removing unqualified variables, Cronbach alpha test result could be summarized in the following table.

TABLE III. CRONBACH ALPHA ANALYSIS RESULT

ID	Factor	Alpha	Item-total correlations	No of items
1	Computer self-efficacy	0.775	0.313-0.561	7
2	Ease of use	0.833	0.584-0.665	5
3	Perceived usefulness	0.840	0.563-0.765	5
4	Face to face interaction	0.669	0.374-0.546	3
5	E-mail interaction	0.689	0.449-0.593	3
6	Social presence	0.800	0.399-0.682	5
7	Learning achievement	0.886	0.468-0.703	9
8	Knowledge transfer	0.834	0.583-0.713	4

To test convergent validity and discriminant of the scales, a joint EFA is executed with all scales above. In EFA analysis, some variables are removed and modifications. These changes could be summarized as follows:

- Computer self-efficacy must be broken into 2 factors, which include: Computer self-efficacy (CSE6, 7, 8, 9), and Self-study ability (CSE3, 4)
- Ease of use and Perceived usefulness must be combined into 1 factor, which will be renamed Easiness & Usefulness (8 variables remained).
- Face to face interaction factor must be removed completely (3 variables removed).
- Learning achievement & Knowledge transfer must be combined into 1 factor, which will be renamed Learning & Transferring knowledge (13 variables)

The analysis results show that all loading values are  $> 0.5$  and accepted. KMO and Bartlett test result are qualified as well with all Eigen-values  $> 1$  and total cumulative  $> 50\%$ . In summary, final EFA result is summarized in following table.

TABLE IV. EXPLORATORY FACTOR ANALYSIS RESULT

Old Factor	No of items	New Factor	No of items
Computer self-efficacy	7	Computer self-efficacy	4
		Self study ability	2
Ease of use	5	Easiness & usefulness	8
Perceived usefulness	5		
Face to face interaction	3		0
E-mail interaction	3	E-mail interaction	3
Social presence	5	Social presence	3
Learning achievement	9	Learning & transferring knowledge	13
Knowledge transfer	4		

### C. Revised model

Based on previous results, the research model must be revised and hypotheses must be re-stated as follows:

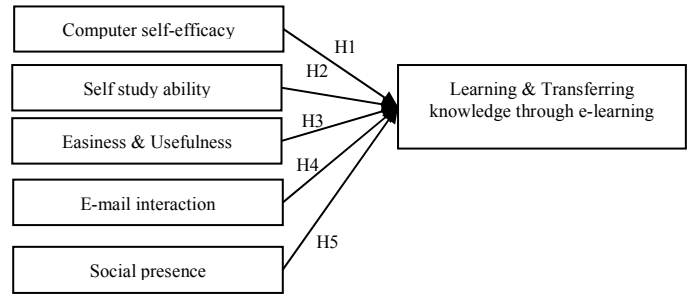


Fig. 2. Revised research model

H1: Computer self-efficacy has a positive impact on learning & transferring knowledge through e-learning.

H2: Self study ability has a positive impact on learning & transferring knowledge through e-learning.

H3: Easiness & Usefulness has a positive impact on learning & transferring knowledge through e-learning.

H4: E-mail interaction has a positive impact on learning & transferring knowledge through e-learning.

H5: Social presence has a positive impact on learning & transferring knowledge through e-learning.

### D. Hypothesis test

The multiple linear regression analysis is summarized in the following table. The R-square is 0.640 and adjusted R-square is 0.633, which is good to use the model to explain the impact on learning and transferring knowledge through e-learning system.

TABLE V. LINEAR REGRESSION ANALYSIS RESULT

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.313	.026		129.750	.000
Easiness & Usefulness	.371	.026	.544	14.499	.000
Computer self-efficacy	.165	.026	.242	6.455	.000
Social presence	.310	.026	.454	12.120	.000
E-mail interaction	.166	.026	.243	6.480	.000
Self-study ability	.099	.026	.145	3.858	.000

According to above results, all hypotheses H1 - H5 are supported. The strength of impact on learning and transferring knowledge through e-learning system could be summarized as follows (by descending order): Easiness & Usefulness (0.544), Social presence (0.454), E-mail interaction (0.243), Computer self-efficacy (0.242), and finally Self-study ability (0.145).

## V. DISCUSSION & RECOMMENDATIONS

### A. Discussion

In comparison with previous study of Mbarek & Zaddem [19], this result is similar in confirming the positive impact of independent variables on learning & transferring knowledge. Some differences could be identified as follows:

- Computer self-efficacy didn't have direct impact on learning achievement, but in this research it has direct

impact. Besides, a branch of computer self-efficacy, which related to self-study ability, also has positive impact on learning and transferring knowledge.

- The dependent variable in this research is a combination of learning achievement and knowledge transfer, therefore, the impact of learning achievement on knowledge transfer could not be confirmed. This result also showed a strong relationship and similarity between learning achievement & knowledge transfer.
- The strongest impact factor of previous research is Perceived usefulness (0.726), but in this research the strongest impact factor is Easiness and Usefulness (a combined factor from Ease of use and Perceived Usefulness). The supporting features of e-learning system are very important in encouraging students to use e-learning system, and to learn & to acquire knowledge through e-learning.
- Face to face interaction in previous research has a positive impact on learning achievement (0.081), but in this research, this factor has been removed after EFA. So this relationship could not be tested. However, through e-learning system, face to face interaction seems to be insignificant in practice.
- Self-study ability is new factor of this research, which is extracted from Computer self-efficacy, but it has practical meaning in case of distance program. In reality, students with higher self-study ability often get higher benefits from e-learning system.

#### B. Managerial Implications

Based on this research, some managerial implications for improving the benefits of e-learning system at BKU are summarized as follows:

- *Improving Easiness and Usefulness*

Network managers and e-learning project leaders should pay attention to features and characteristics of current e-learning system. To make it easy to use for students and lecturers, e-learning developers should add more supporting features, such as: online tutorial, Q&A, video guides... Moreover, organizing training courses frequently for new students and lecturers is also helpful. To increase perceived usefulness of users, the admin should conduct survey to get feedbacks from users for solving their problems and adding more functional modules.

- *Increasing Social Presence.*

In this research, the impact of social presence on learning and transferring knowledge through e-learning is the 2<sup>nd</sup> strongest impact factor. Therefore, board of management of BKU should try to increase social presence through e-learning system by some methods, such as: organizing some events that require sharing and interaction through e-learning system, assigning admin for each class or topic on e-learning system, integrating e-learning with other websites or information portals inside of the university... Adding some web 2.0

features, such as: comments, blog, polls, video sharing... to e-learning system may help to increase social presence.

- *Raising E-mail interaction & Computer self-efficacy.*

Although less important than above factors, e-mail interaction and computer self-efficacy also have positive impact on learning and transferring knowledge through e-learning system. Therefore, to improve the benefits of e-learning, the managers should encourage e-mail interaction through e-learning system. Some suggestions include: provide all students with a life-lasting e-mail address and encourage them to use for all interaction on e-learning system ; all notifications from university or lecturers to students should be transferred through this e-mail ; replace paper-based activities by online activities through e-learning system. Organizing free training courses/seminars for students in various computer related topics, such as: using e-learning system for supporting their learning process, how to search for academic information, how to use computer tools to collect, to analyze data, and to make proper citations...

- *Training self-study skills*

Although self-study ability has a lowest impact on learning and transferring knowledge, but this new factor shows the important role of learners' ability to gain knowledge to support their working demand. This skill is more critical for working students, distance program and postgraduate level students. So, the universities should pay attention to training self-study and soft-skills for their students. These skills could be transferred through some activities during training process, such as: orientation meetings, team works, group projects... It requires suitable change in teaching and evaluation methods. Therefore, training for lecturers and updating the curriculums frequently are also necessary.

#### VI. CONCLUSIONS

In general, this research explored the impact factors on learning achievement and knowledge transfer through e-learning system of BKU. The research model consists of 6 independent variables, including: Computer self-efficacy, Ease of use, perceived usefulness, Face to face interaction, E-mail interaction & Social presence. Two dependent variables, including: learning achievement and knowledge transfer.

After collecting 263 valid respondents for testing the research model, the revised model has been made. The revised model consists 5 independent variables (Computer self-efficacy, Self-study ability, Easiness & Usefulness, E-mail interaction, and Social presence) and 1 dependent variable (Learning & Transferring knowledge). The multiple regression analysis results showed that all 5 independent variables have positive impact on learning & transferring knowledge through e-learning system. The strength of impact could be summarized by descending order as follows: Easiness & Usefulness (0.544), Social presence (0.454), E-mail interaction (0.243), Computer self-efficacy (0.242), and finally Self-study ability (0.145).

However, Face to face interaction is eliminated from the research model because it does not suitable with the practical

data. The reason could be the limitation of direct interactions through e-learning system. Additional, learning achievement and knowledge transfer are combined together; this showed a strong relationship of 2 concepts. Learning and transferring knowledge may occur at the same time, so, it is difficult for students to distinguish between 2 processes. Besides, self-study ability is an important factor in improving the benefit of e-learning system, therefore, students' self learning skills should be taught for a better learning outcome.

Based on these analysis results, some recommendations have been made, including: improving easiness and usefulness of e-learning system, increasing social presence by adding web 2.0 features, and raising e-mail interaction & computer self-efficacy by organizing training courses.

There are several limitations of this research, including: (1) The small and limited sample size, (2) The lack of evaluating the impact of mediating factors & demographic variables on learning & transferring knowledge. Implications for future researches include: (1) Increase the sample size or extend the scope to other universities; (2) Identify new factors, such as: knowledge process, demographic variables; and (3) Using SEM-PLS for testing 2 ways affections between variables in the research model.

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