

# Validating E-learning factors affecting training effectiveness

Hyochang Lim<sup>a</sup>, Sang-Gun Lee<sup>b,\*</sup>, Kichan Nam<sup>c</sup>

<sup>a</sup>*Department of Management, College of Business Administration, Baekseok University, Cheonan, 330-704, Republic of Korea*

<sup>b</sup>*Division of e-business, College of Business Administration, Ajou University, Suwon, 443-749, Republic of Korea*

<sup>c</sup>*Department of Management, College of Business Administration, Sogang University, Seoul, 121-742, Republic of Korea*

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## Abstract

The development of information technologies has contributed to the growth in online training as an important education method. E-learning provides trainees with education opportunities in diverse ways. It has led to a range of innovative services offering one-stop educational solutions within the e-business sector. The online training environment enables trainees to undertake customized training at any time and any place. Moreover, information technology allows both the trainers and trainees to be decoupled in terms of time, place, and space.

The purposes of this research are twofold: (1) To discover the determinants of effective online training and; (2) To reveal how those variables affect learning performance and transfer performance, two important aspects of training effectiveness in the workplace.

This paper demonstrates, through empirical data, a positive relationship between individual, organizational and online training design constructs and training effectiveness constructs (learning and transfer performance).

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## 1. Introduction

Today, organizations are making great efforts to properly adjust to the changing business environment to enhance their competitiveness. In step with the development of information technology and the Internet, many businesses are replacing traditional vocational training with e-learning to better manage their workforce. However, it is questionable whether training programs actually change employee behavior after implementation. In the case of US companies, only 10–15% of training is applied to work (Sevilla & Wells, 1988).

As off-line learning concepts have been evolved into e-learning concepts along with the development of information and communication technology, e-learning have become an important field of study and a number of research papers have reported on this.

- (1) Recently, many MIS researchers have published e-learning studies in IT or MIS journals (Ijab & Anwar, 2004; Neville, Heavin, & Walsh, 2005; Ong, Lai, & Wang, 2004; Piccoli, Ahmad, & Ives, 2001; Wild,

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\*Corresponding author.

*E-mail addresses:* [lhc6688@bu.ac.kr](mailto:lhc6688@bu.ac.kr) (H. Lim), [slee1028@ajou.ac.kr](mailto:slee1028@ajou.ac.kr) (S.-G. Lee), [knam@ccs.sogang.ac.kr](mailto:knam@ccs.sogang.ac.kr) (K. Nam).

Griggs, & Downing, 2002; Zhang & Zhou, 2003). Specifically, study on e-learning effectiveness becomes one of popular themes and many studies are found since 2004 (Cappel & Hayen, 2004; Dougl & Van Der Vyver, 2004; Zhang, Zhou, Briggs, & Nunamaker, 2006). Under the e-learning context, these studies focus on the specific variables that have been developed through the past e-learning research trend. Our study differentiates from existing literatures by including variables found to be important in off-line training program and other conditional variables as well as e-learning specific variables.

- (2) For the theoretical background, our study refers to previous studies on the connection between learning and technologies (Chau & Wang, 2000; Parikh & Verma, 2002) and distance learning as a form of e-learning (Kodama, 2001; Theakston, 1999) published in International Journal of Information Management.

This study seeks to demonstrate the factors of a training system that enhance efficacy of corporate e-training. By reviewing design factors that affect traditional offline training, and defining factors affecting online training, we seek to identify their effects on learning performance and transfer performance.

## 2. Literature review and hypotheses

### 2.1. Designing factors of training programs

A review of related research led to identification of five dimensions which affect efficacy of online training: the trainee, training content, level of communication between trainer and trainee, ease of use of online website resources, and the organizational environment. These dimensions are based on motivation theory (Compeau & Higgins, 1995; Hicks & Klimoski, 1987), media richness theory (Daft & Lengel, 1986), technology acceptance theory (Davis, 1989), and institutional theory (Orlikowski, 1992).

#### 2.1.1. Trainees

In a training environment, motivation is defined as “the degree to which the learner is willing to make efforts to improve his or her performance of training and work” (Robinson, 1985) or the “special desire of participants to learn the contents of the training program” (Noe & Schmitt, 1986).

In the study by Mathieu, Tannenbaum, and Salas (1992), trainees showed more positive emotional responses when they had higher motivation. This was found to be proportionately related to improvement of work performance after the training. Another factor is appropriate selection and enabling of trainee’s participation. In other words, allowing those who will be trained to select and participate in proper training programs. Trainability is determined by the trainees’ level of ability and motivation for learning (DeSimone & Harris, 1998). The importance of learning motivation is expected to be the same in online education situations as well.

Computer self-efficacy is an important trainee characteristic for e-training situations (Chau & Wang, 2000). Compeau and Higgins (1995) indicated that a person’s self-efficacy regarding computers significantly affects the user’s expectations and performance. Hill, Smith, and Mann (1987) found that college students’ computer self-efficacy affects their decision to use computers. Other research has dealt with how self-efficacy affects training effectiveness under various circumstances such as computer software learning (Gist, Shwoerer, & Rosen, 1989), interpersonal skills training (Gist, Stevens, & Bavetta, 1991), military training program (Eden & Ravid, 1982), and homepage design training course (Chau & Wang, 2000).

This research intends to verify the relationships between trainees’ learning motivation and computer self-efficacy and the effectiveness of e-learning. The associated hypotheses are:

H1: The higher the trainee’s motivation for online training, the higher their learning effectiveness.

H1-1: The higher the trainee’s motivation for online training, the higher their learning performance.

H1-2: The higher the trainee’s motivation for online training, the higher their transfer performance.

H2: The higher the trainee’s computer self-efficacy regarding online training, the higher their learning effectiveness.

H2-1: The higher the trainee’s computer self-efficacy regarding online training, the higher their learning performance.

H2-2: The higher the trainee's computer self-efficacy regarding online training, the higher their transfer performance.

### 2.1.2. Training content

The content of any training program is intuitively important as a factor in effective vocational learning and in transferring that learning to job performance. Ford and Wroten (1984) suggested evaluating the work relatedness of a training program by reviewing the contents of the program. They further suggest using the evaluation results in redesigning the training program to be more aligned with actual work practices. Using this method, they argued, organizations could enhance trainee motivation levels to improve learning performance.

Bramley (1991) found that to be successful, a training program should be accomplished (or administered) in a similar environment to actual work surroundings and conditions; and further, the more common factors between the training and work environments, the more enhanced job performance becomes after training. He argued that giving trainees questions on how to apply the contents of the ongoing training to their real work during training was effective. Alliger, Tannenbaum, Bennett, Traver, and Shotland (1997) argued that when trainees recognized that the contents were practical, they applied knowledge and skills from the training to their real work.

H3: The more related the online training content is to actual work practices, the greater will be the effectiveness of online training.

H3-1: The more related the online training content is to actual work practices, the greater will be the trainees' learning performance.

H3-2: The more related the online training content is to actual work practices, the greater will be the trainees' transfer performance.

### 2.1.3. Communication between trainer and trainees

It must also be said that the success of a training program depends on the qualifications and attitudes of the trainer(s). A trainer must fully understand the basic direction of an education program, and have the knowledge and skills required to provide the training. Leduchwicz (1982) insisted that besides trainer ability, his/her duty, influencing power and characteristics of the organization systemically affect trainer effectiveness.

Trainer qualifications recommended by Randall (1982) in mobilization-style training include the ability to: (1) provide an overall outline, (2) emphasize the conceptual understanding, (3) effectively convey the message, (4) prepare training material in advance, (5) treat trainees in an appropriate way, (6) clearly respond to trainee questions and (7) encourage trainees to achieve their goal.

With regard to the level of interaction that takes place between the trainer and trainees, Collis (1995) and Latchem, Mitchell, and Atkinson (1994) find that higher frequency of interaction leads to greater training effectiveness. This applies to both traditional training environments and multimedia remote training. E-mail is considered to be a very useful method when the numbers of trainees are roughly 30 or more (Leidner & Jarvenpaa, 1995). Powley (1994) suggested that among remote trainees, those who meet their trainer regularly are more likely to complete their courses and actively participate in the class than those who do not. After analyzing a 10-week long training program for soldiers, he insisted that contact and support between the trainer and trainees do affect course completion rate and attitude of the trainees.

Based on previous research, interactions between the trainer and trainee can be viewed from a customer service context. In a service environment, the media by which the interaction takes place will influence the outcome or effectiveness of the communication. Fig. 1 depicts a continuum of communication media where conventional media is one extreme, and electronic media is the other. The differences in the relative strengths of the media make the choice of medium important in a customer service environment (King & Xia, 1997; Kodama, 2001). Five representative media types, including face-to-face meeting and e-mail, are highlighted in Fig. 1.

Conventional media, such as face-to-face and telephone contact, can provide increased reliability and empathy in the customer service exchange between trainer and trainee, because it allows both verbal and

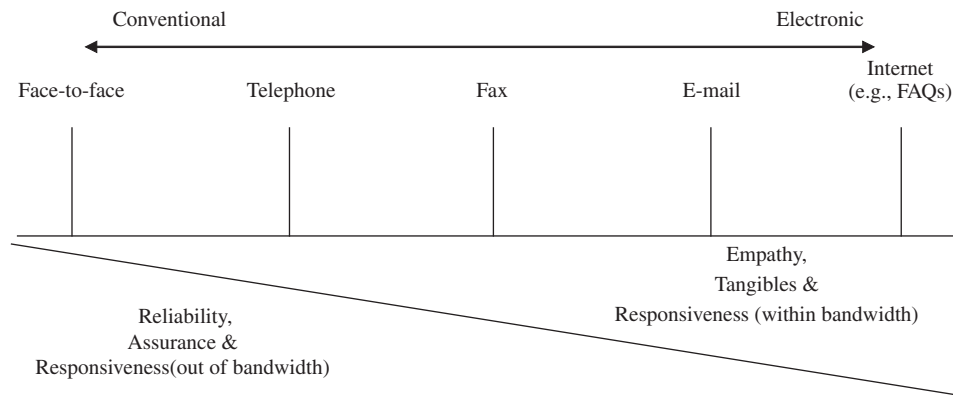


Fig. 1. Continuum of communication media. *Note:* Adapted from Kydd and Ferry (1991), who adapted the framework on Daft and Lengel (1986).

non-verbal communication. Specifically, face-to-face communication allows a broad range of stimuli and responses, leading to trainees' perception of personal interest, politeness, and attention from the trainer. Other benefits of face-to-face communication include better problem-solving, sincere interest, and immediate answers without ambiguity. Conventional media also permit richer affection than do electronic media. For example, conventional media are often considered a more natural form of group interaction than comparable non-in person forums (Daft & Lengel, 1986). E-mail communication between the trainer and trainees is a good example of responsiveness, allowing trainees to receive feedback at any time and any place. E-mail is also considered to be a very useful method when the number of trainees is roughly 30 or more (Leidner & Jarvenpaa, 1995).

Therefore, the communication media between a trainer and trainees must influence the effectiveness of online training:

H4: The more frequent face-to-face interaction between the trainer and trainees, the more effective will be online learning performance.

H5: The more frequent e-mail exchanged between trainer and trainees, the more effective will be online learning performance.

#### 2.1.4. Ease of interaction process

Theories of information system (IS) use have been examined through TRA (Theory of Reasoned Action) and TPB (Theory of Planned Behavior), which have proven successful in predicting and explaining behavior across business areas (Adams, Nelson, & Todd, 1992; Agarwal & Prasad, 1997; Christensen, 1987; Davis, 1989 and 1993). Based on TRA, Davis (1989) introduced the technology acceptance model (TAM) which provided an explanation of the determinants of computer acceptance by end users (Chau, 1996; Hu, Chau, Liu Sheng, & Tam, 1999; Venkatesh & Davis, 1996, 2000). TAM theorizes that perceived ease of use determine actual intention and usage behavior.

The online training environment must facilitate communications between physically and geographically separated trainers and trainees, provide for shared training material, and allow for debate among participants. The technical design and format will impact how easily the trainees (and trainers) can do these things. For example chat rooms and multimedia functions enable trainees to easily use the website.

Leidner and Jarvenpaa (1995) suggested simulations, three-dimensional virtual reality and debate rooms as a part of ease-of-interaction design process. Wells and Kick (1996) argued that trainee interest and motives can be captured when they can use a quality graphic and multimedia system providing an appropriate music and sound system. Therefore the following hypothesis is posed:

H6: Online training programs that are perceived to be easy to use will contribute to greater learning performance.

### 2.1.5. *Environment of an organization*

According to Institutional theory (Orlikowski, 1992), over time habitual use of practices such as ways of supervisor support, coordinating a meeting, or evaluating an employee eventually becomes institutionalized, forming the structural properties of organizations. These structural or institutionalized properties, called “structure,” are drawn on by humans in their ongoing interactions. This use, in turn, reinforces the structure. This process is known as “duality of structure.” Giddens (1976) overcame the dualism objective, structural features of organizations and subjective, knowledgeable action of human agent.

Though the success of training primarily relies on a program design itself, maximum training effectiveness can not be achieved without subjective factors such as organizational support. Noe (1986) in particular argued that knowledge interaction between senior managers and employees has a great impact on the work-site application rate. In other words, though the trainees were properly trained, they cannot fully apply it to the workplace if there is not enough support or the surroundings are not conducive for such application.

Baldwin and Ford (1988) insisted that senior management support and organization atmosphere have a direct impact on training effectiveness and application rate. According to their argument, training effectiveness affects application rate, and senior management support and working atmosphere are directly linked with application rate.

Based on previous research, Tracey, Tannenbaum, and Kavanagh (1995) developed a new definition of continuous learning culture: designing a challenging work responsibility schedule to develop employees’ potential, fully compensating for self-developing effort, and emphasizing the improvement and renovation of the working environment. They obtained results showing continuous learning culture has significant impact on training and application rate. The argument that organizational environment affects training effectiveness has been proved in Korea as well (Lee, 1995).

The relationship between organizational environment and training effectiveness is equally important in the online training environment and leads to the following hypothesis:

H7: The more support trainees receive from their seniors, the better training effectiveness will be achieved.

H7-1: The more support trainees receive from their seniors, the better learning performance will be achieved.

H7-2: The more support trainees receive from their seniors, the better transfer performance will be achieved.

H8: More reliable continuous learning culture will lead to better training effectiveness.

H8-1: More reliable continuous learning culture will lead to better learning performance.

H8-2: More reliable continuous learning culture will lead to better transfer performance.

### 2.1.6. *Training effectiveness*

Many scholars who study traditional vocation training point out the importance of training effectiveness evaluation, while recognizing its difficulty (Alliger et al., 1997; Carnevale & Schulz, 1990).

Most research related to training evaluation has focused on measuring trainee reactions to the training program and the degree of learning from the program (Tracey et al., 1995). Reaction to the training program is measured as trainee attitudes toward the content, methods and trainers; while the degree of learning is measured by improvement in abilities including knowledge, skills and attitudes.

Reaction and learning are studied as major indicators of training outcomes; however, these variables are not the appropriate indicators of the final desired outcome of training programs—transference of learning to the job. An appropriate evaluation of training outcomes is made by measuring changes in job performance and relating it to measurements of achievement of learning goals (Kreiger, Ford, & Salas, 1993).

Implementation of a training program is intended to improve performance of the corporate organization; however, if the trainees do not have the will to apply the skills or knowledge learned during training, then the implementation of training has failed. As well, organizational factors may hinder the application of newly learned skills or knowledge. Therefore, trainers in charge must identify the effectiveness of training by evaluating both learning performance as the primal goal of training and transfer performance as the ultimate goal.

Baldwin and Ford (1988) presented an integrated model on the process of learning and transfer. According to them, the trainees’ personal characteristics and organizational environments affect both learning performance and transfer performance. However, the design and methods of training, composition of materials, and learning theories affect only learning performance. Learning performance, in turn, affects transfer performance. Based on the above research, the relation between learning and transfer is hypothesized as follows:

H9: The higher the trainees’ learning performance, the higher their transfer performance.

This study is based on the cause and effect relationship shown in the transfer model by Baldwin and Ford (1988), incorporating appropriate variables for online training to expand the model. As shown in Fig. 2, learning motivation, training content, support of supervisors, and consistent learning culture are variables drawn from existing traditional training environments. Self-efficacy, direct meeting, e-mail exchanges and user-friendliness are variables added to address the unique online training environment.

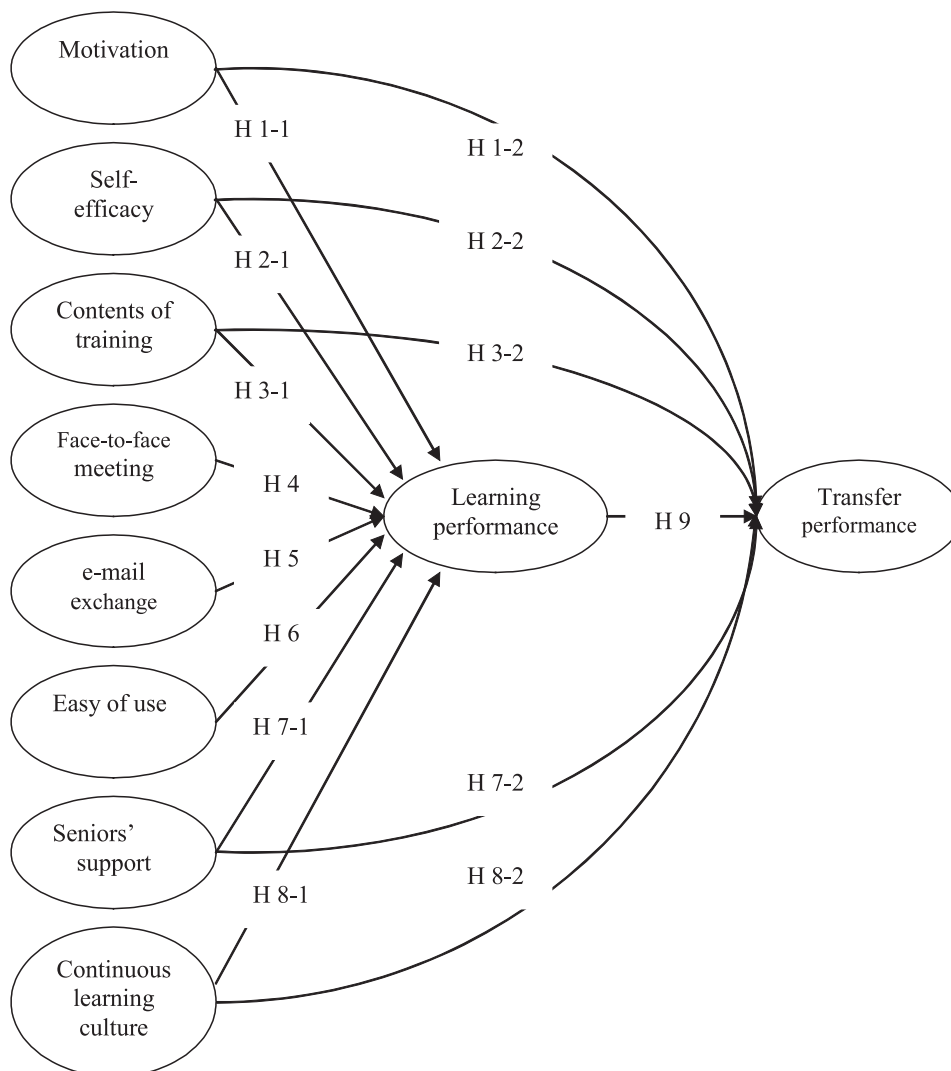


Fig. 2. Research model.

### 3. Research method

#### 3.1. Data subject

Employees of three corporate firms (Samsung, Hyundai, and LG) located in Korea were chosen as a sample base because the subjects had participated in online training between 1 and 6 months. Two hundred twenty questionnaires were distributed with an initial response of 170. Only 151 were valid responses yielding a response rate of 68.6%. Subjects with valid questionnaires show the following demographics:

- The proportion of males to females is 82.2 percent to 17.2 percent.
- For more than 5 years 68.2 percent have been continuously working for their company; 23.8 percent from 6 to 10 years; more than 90 percent of the subjects reported working for their current company for less than 10 years.
- Forty-three percent work in management, 27 percent in manufacturing, and 13.2 percent for R & D.
- In all, 84.8 percent completed a college or university degree, 7.9 percent held graduate degrees.

#### 3.2. Definition of variables and items for the measures

##### 3.2.1. Learning motivation

Learning motivation of trainees is the desire or aspiration to acquire the knowledge from the online training program. In order to measure motivation, five items were adopted from Hicks and Klimoski's (1987) survey. Participants indicated their level of agreement on a five-point Likert scale to statements such as "I think this was a good chance to improve my task ability?" and "I gave 100% effort to learn as much possible during the training?" Responses ranged from strongly agree to strongly disagree.

##### 3.2.2. Computer self-efficacy

Self-efficacy is based on the trainee's perception of their ability to carry out a series of tasks using a computer and to cope with any difficulties regarding computer use. Five items, also scored on a five-point Likert scale, were adopted from Compeau and Higgins (1995). Statements such as "I feel confident in my ability to use a computer." and "I am sure I can use a computer by referring to the instruction manual." were used.

##### 3.2.3. Training content

The training content refers to what the trainees were actually taught during the program. In this paper, training content is measured by asking the trainees about training they received for particular job-related tasks. Their responses indicate whether the training content helped them perform the job-related tasks.

Four items were adopted from Grove and Ostroff (1991). For example, employees were asked to respond to statements such as "The online training content included the most recent guidelines," and "The guidelines provided during online training are helpful in improving job task achievement." These questions ask the employee to recall training content and evaluate whether it contributed to actual work activities. Again, these responses were reported on a five-point Likert scale ranging from strongly agree to strongly disagree.

##### 3.2.4. Face-to-face meeting

In evaluating impact of personal interaction between trainers and trainees, the level of face-to-face contact was measured. Four items were adopted from Leidner and Jarvenpaa (1995) to indicate whether face-to-face interaction occurred, whether trainees were encouraged during the interaction, and whether the interaction was considered helpful. The measure also uses a five-point Likert-scale response. Examples of the survey items are "I was encouraged to have face-to-face meetings with my instructors," and "I met with one or more instructors during the program."

### 3.2.5. E-mail communications

E-mail communication was also measured on a scale of five points, using four items from [Leidner and Jarvenpaa \(1995\)](#). The foci of the measure were to examine whether e-mail communication was encouraged between the instructors and trainees and if it actually happened. In addition, the measure assessed whether e-mail communications were helpful to the trainees. Examples survey items include “The instructors communicated with me via e-mail,” and “I was encouraged to interact with instructors in order to resolve my questions regarding the class.”

### 3.2.6. Ease of use

Items tapping ease of use measure how easy it is for trainees to access the online resources. Three items from [Liedner and Jarvenpaa's \(1995\)](#) questionnaire were used. Examples of statements used are “I feel the response speed of the educational training system was fast enough to carry out the class,” and “I feel the training site was user-friendly enough to carry out the class.”

### 3.2.7. Support from supervisors

Items tapping support ask whether supervisors provided the opportunity to adopt what the trainees had learned to the job, and whether they had been guided on how to adopt them. Some of the questions were based on [Tracey et al.'s \(1995\)](#) questionnaire and used a five-point scale. Statements such as, “Supervisors provided opportunities to attend educational training programs” or “Supervisors guided me on how to apply the training to my work” were used to measure this construct.

### 3.2.8. Encouraging learning environment

By a continuous, encouraging learning environment [Tracey et al. \(1995\)](#) means that members of the organization believe learning or training plays a crucial role in their job tasks. The learning environment measure checks task allotment, and incentive for self-development. Four of Tracy's questionnaire items were adopted for this study. Statements such as “I feel the organization values employee self-development and progressive innovation” and “The organization provides me with an appropriate job and role” were used to measure this item.

### 3.2.9. Learning performance

Learning achievement encompasses to what degree the trainees learn and improve through the training program in terms of knowledge, skills and attitude for the job task. [Lee's \(1995\)](#) questionnaire item was adopted with a five-point scale. The items measured trainees' perception of their own achievement. Questions such as “I have learned new techniques/methods through this program” and “I believe that I've learned better than the others” were used.

### 3.2.10. Transfer performance

Trainees' achievement of transfer refers to how well the trainees applied what they learned in training to their job tasks. The questionnaire items were adopted from [Rouiller and Goldstein \(1993\)](#) research model and measure the trainees' perceptions of their own transfer performance. Examples of the questions used are: “I feel I am using what I learned from the training in my daily work” and “My job performance has improved since completing the training program.”

## 3.3. Assessment of measurement

### 3.3.1. Reliability analysis

In this research, reliability was examined on all the remaining items from the one-dimension assessment. As a test of reliability, Cronbach's  $\alpha$  was adopted to represent internal consistency. [Table 1](#) shows the results of the reliability test, with all values greater than [Nunnally's \(1978\)](#) threshold of .60. Therefore we conclude that the items are reliably measuring the defined constructs and variables.



Table 1  
Results of reliability test

Variance	Number of items	Cronbach's $\alpha$ value
Effectiveness of training program		
Learning achievement	4	.9354
Transfer achievement	3	.9543
Trainees		
Learning motivation	3	.8686
Computer self-efficacy	4	.8267
Contents of program	3	.7832
Instructors of the program		
E-mail	4	.9365
Face-to-face	4	.9076
Easy to use/access the site	2	.8897
Organization environment		
Support from the supervisors	3	.9301
Consistent learning environment	4	.8991

### 3.3.2. Validity analysis

Variance models are composed of two primary models such as a measurement model and a structural model. Validity analysis refers to measurement model. For the assessment of validity, exploratory factor analysis and confirmatory analysis was performed on each concept using SPSS 12 and LISREL 8.5.

The result of confirmatory factor analysis toward external variances is shown in Table 2. Factor loading appears higher than 0.04. Although the  $p$ -value of  $\chi^2$  value does not satisfy the standard ( $\chi^2 = 416.28$ ,  $df = 48$ ,  $p = 0.00$ ), other fitness indices suggest no problem with the measurement model. Also, the  $t$  value of the factor loading of the measurement appears more than  $\pm 3.291$  ( $p < .001$ ) implying that factor loading of the measurement toward each measure item is statistically significant.

The result of confirmatory factor analysis toward internal variances is shown in Table 3. Factor loading of measurement items toward construct concept is significant and has discriminative validity for the measures.

### 3.4. Results of hypothesis verification

Correlation among the concepts of the model has been verified and assessed by the use of variance structural analysis. The fitness of the research model has been assessed using LISREL 8.50 resulting in a  $\chi^2 = 33.73$  ( $p = 0.00009944$ ) and fitness indices GFI 0.9789, NFI 0.9670, CFI 0.9747, IFI 0.9756. Despite an unsatisfactory  $p$  value associated with the  $\chi^2$ , the fitness of the model can be established through the other fitness indices. Previous research has shown when a model is correct but its conditions are likely incorrect, the  $\chi^2$  value is likely to appear larger; thus there is a problem with  $\chi^2$  as an indicator of fit: the greater the sample size, the lower the  $\chi^2$  value.

From this perspective, it is therefore advisable to use the  $\chi^2$  value in conjunction with other fitness indices. In this study the fitness of the overall model is assumed appropriate on the grounds of high fitness indices including GFI. As shown in Table 4, each hypothesis has been verified by measuring values of standard path, being assessed on the basis of statistical significance of  $t$  value.

As shown in Table 4, some of the factors influencing trainees' learning performance are learning motivation, computer self-efficacy, contents of training program, face-to-face meeting between instructors and trainees, how easy it is to use or to access the site, support from supervisors, and consistent learning environments. However, influences of e-mail communication and support from supervisors to trainees' learning achievement seem unsupported.

Factors influencing trainees' transfer achievement include learning motivation, content of the training program, support from supervisors and learning achievement. However, the influence of self-efficacy and consistent learning environment to transfer achievement, which is hypothesized, has turned out very weak and invalid.

Table 2  
Confirmatory factor analysis of external variance

Variance	Item	Learning motivation	Self efficacy	Contents of training	Face-to-face meeting	E-mail communication	Easy to use	Support from supervisors	Consistent learning culture	t-Value
Learning motivation	Mot1	0.67	0	0	0	0	0	0	0	13.00
	Mot2	1.15	0	0	0	0	0	0	0	19.82
	Mot3	0.61	0	0	0	0	0	0	0	12.87
Self-efficacy	Eft1	0	0.42	0	0	0	0	0	0	9.50
	Eft2	0	0.67	0	0	0	0	0	0	14.62
	Eft3	0	0.82	0	0	0	0	0	0	18.47
	Eft4	0	0.80	0	0	0	0	0	0	16.90
Contents of training	Con1	0	0	0.67	0	0	0	0	0	17.73
	Con2	0	0	0.48	0	0	0	0	0	10.79
	Con3	0	0	0.72	0	0	0	0	0	13.82
Face-to-face meeting	Mee1	0	0	0	0.84	0	0	0	0	18.28
	Mee2	0	0	0	0.46	0	0	0	0	17.44
	Mee3	0	0	0	0.59	0	0	0	0	16.09
	Mee4	0	0	0	0.60	0	0	0	0	15.96
E-mail communication	Emal	0	0	0	0	0.94	0	0	0	17.65
	Ema2	0	0	0	0	0.93	0	0	0	18.61
	Ema3	0	0	0	0	1.03	0	0	0	17.84
	Ema4	0	0	0	0	0.93	0	0	0	18.44
Easy to use	Use1	0	0	0	0	0	0.98	0	0	19.48
	Use2	0	0	0	0	0	0.85	0	0	16.83
Support form supervisor	Sup1	0	0	0	0	0	0	0.87	0	21.84
	Sup2	0	0	0	0	0	0	0.88	0	23.04
	Sup3	0	0	0	0	0	0	0.75	0	17.21
Continuous learning culture	Cul1	0	0	0	0	0	0	0	0.78	17.81
	Cul2	0	0	0	0	0	0	0	0.64	46.54
	Cul3	0	0	0	0	0	0	0	0.61	18.22
	Cul4	0	0	0	0	0	0	0	0.67	16.80
Fitness	$\chi = 416.28$ , $df = 48$ , $p = 0.00$ , $GFI = 0.83$ , $NFI = 0.87$ , $CFI = 0.88$ , $IFI = 0.89$									

Table 3  
Confirmatory factor analysis toward internal variances

Variance	Items	Learning achievement	Transfer achievement	t Value
Learning performance	LEA1	0.84	0	19.91
	LEA2	0.90	0	231.56
	LEA3	0.76	0	18.33
	LEA4	0.72	0	17.65
Transfer performance	TRA1	0	0.84	22.11
	TRA2	0	0.73	21.37
	TRA3	0	0.79	20.73
Fitness	$\chi = 229.35$ , $df = 13$ , $p = 0.00$ , $GFI = 0.80$ , $NFI = 0.9$ , $CFI = 0.91$ , $IFI = 0.91$			

#### 4. Discussion and conclusion

The purpose of this paper is to explore online training program design factors to improve learning performance and transfer performance. To do this, we constructed hypotheses based on a literature review and

Table 4  
Inferred value of research model

Hyp.	From → to	Name of path	Standard path	t Value	Significance	Adopted or denied
H1-1	Motivation → transfer achievement	$\gamma_{11}$	0.5098	7.5276	$P < .01$	Adopted
H1-2	Motivation → learning performance	$\gamma_{21}$	0.4279	8.4914	$P < .01$	Adopted
H2-1	Self-efficacy → learning achievement	$\gamma_{12}$	0.1894	3.8988	$P < .01$	Adopted
H2-2	Self-efficacy → transfer performance	$\gamma_{22}$	0.0401	1.1588	n.s.	Denied
H3-1	Training contents → learning performance	$\gamma_{13}$	0.2578	3.1655	$P < .05$	Adopted
H3-2	Training contents → transfer performance	$\gamma_{23}$	0.2869	5.1026	n.s.	Adopted
H4	Face-to-face meetings → learning performance	$\gamma_{14}$	0.1616	2.3550	$P < .05$	Adopted
H5	E-mail → learning performance	$\gamma_{15}$	0.0850	1.9029	n.s.	Denied
H6	Easy of use → learning performance	$\gamma_{16}$	0.2407	2.4360	$P < .01$	Adopted
H7-1	Support → learning performance	$\gamma_{17}$	0.1318	1.9503	n.s.	Denied
H7-2	Support → transfer performance	$\gamma_{27}$	0.2898	602883	$P < .01$	Adopted
H8-1	Consistent learning → learning performance	$\gamma_{18}$	0.1988	3.3709	$P < .01$	Adopted
H8-2	Consistent learning → transfer achievement	$\gamma_{28}$	0.0355	0.8725	n.s.	Denied
H9	Learning achievement → transfer achievement	$\beta_{21}$	0.2446	6.1150	$P < .01$	Adopted

$\chi = 33.7388$ ,  $df = 9$ ,  $p = 0.00$ ,  $GFI = 0.9789$ ,  $NFI = 0.9670$ ,  $CFI = 0.9747$ ,  $IFI = 0.9756$

then tested the hypotheses by surveying subjects from a large group of trainees, who had participated in task-related online training. The research results are as follows.

First, the higher online learning trainees' learning motivation, the better learning performance and transfer performance based on the analysis. Specifically, trainees' learning motivation has the largest magnitude among endogenous constructs. That is, trainees' motivation is a relatively important variable in learning performance (learning motivation → learning performance:  $\gamma_{11} = 0.5098$ , and transfer performance (learning motivation → transfer performance:  $\gamma_{12} = 0.4279$ ). This result means that, like traditional offline education, trainees' volition of education is the most important factor in online educational training.

Second, the higher the trainees' computer self-efficacy, the higher the learning performance. This result is in accordance with [Compeau and Higgins \(1995\)](#) study. In order to undertake online learning, some computer proficiency is needed. Thus, attitude and self-efficacy toward computers seem to positively affect online learning success. However, in this study, trainees' computer self-efficacy is not statistically significant with transfer performance. This result means that the transfer performance is channeled through learning performance, thus demonstrating the mediating role of learning performance with online learning, which is consistent with [Lee, Choi, and Lee \(2004\)](#).

Third, task-related content increases transfer performance as [Alliger et al. \(1997\)](#) insisted, and this study has shown. Moreover, task-related content directly affects trainees' learning performance. The ultimate goal of introducing a training program is to increase task-ability with advanced trainees' knowledge, technology, and attitude.

Fourth, when an online site is designed, face-to-face meetings between trainer and trainees, and the site's ease of use should be considered important factors. There is no reason to exclude face-to-face meetings between trainers and trainees even in an online learning situation. [Powley \(1994\)](#) claim that offline regular meetings and telephone feedback increase learning performance. This study supports their findings. However, unlike [Liedner and Jarvenpaa's research \(1995\)](#), this research does not attest to the effect of communication through email on learning performance. Hence, we suggest additional study about email communication is needed.

Fifth, the idea regarding organization environment for effectiveness is partially supported. Interestingly, unlike other constructs, support from supervisors and a consistent learning environment do not affect learning performance, but rather they influence transfer performance. These results differ from [Baldwin and Ford \(1988\)](#) in that supervisors' support directly affects trainees' learning performance. In this study, we defined supervisor support as the degree of support in helping trainees' learn to apply the current task. We may infer that supervisor support directly relates to transfer performance. By contrast, maintaining a consistent learning environment is not significant with transfer performance, but rather with learning performance. That is, when

the organization environment emphasizes innovation, and the organization rewards trainees' self-development efforts, trainees learning performance will be higher.

Finally, from the perspective of online and traditional education, the traditional education factor is still important in online education. Trainees' motivation, face-to-face meetings and training contents directly affect learning performance. Specifically, motivation directly affects transfer performance, even though face-to-face meetings and training contents indirectly influence transfer performance. Ultimately, this study shows that effective virtual education or e-education needs ease of interaction, computer self-efficacy, and efficient communication in the virtual perspective as well as institutional factors such as support of seniors and continuous learning culture.

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**Hyochang Lim** (lh6688@bu.ac.kr) is an assistant professor at Baekseok University, Cheonan, Korea. He holds a Ph.D. from Sogang University, Seoul, Korea. He has published more than 30 papers in national and international journals including *Asia Pacific Journal of Tourism Research*, *Korean Management Review*, *Daehan Journal of Business*, *Review of Business and Economics*, and *Korean Personnel Administration*. His research interests deal with e-learning, trust, and human resource development.

**Sang-Gun Lee** (slee1028@ajou.ac.kr) is an assistant professor at Ajou University, Suwon Korea. He received Ph.D. from the University of Nebraska — Lincoln. He did part of his doctoral work at Waseda University in Japan and has worked as an editor-in-chief in *Daehan Journal of Business*. He has published articles in *International Journal of Production Research, Information and Management, Journal of Internet Commerce, International Journal of Management Science, Journal of MIS Research, and Korean Management Science Review*, and will be published in *Industrial Management and Data Systems*.

**Kichan Nam** (knam@ccs.sogang.ac.kr) is an associate professor in the College of Business Administration at Sogang University in Korea. He holds a Ph.D. in MIS from State University of New York at Buffalo. His articles have been published in *JMIS, European Journal of Operational Research, Information Systems Research, and Communications of the ACM* and will be forthcoming in *International Journal of Information Management*. His research interests include IT outsourcing, application service provider, and service level agreement.