온라인 교육이 훈련교과성에 미치는 영향에 관한 실증적 연구

Effect of Online Education on Training Effectiveness: Conceptual Framework and Empirical Validation

김정욱(Jeongwook Kim)*, 남기찬(Kichan Nam)**

초 록

최근의 정보기술 개발은 온라인 훈련에 기여하였으며 이러닝 혹은 가상 교육 등과 같이 유사한 개념으로 사용되고 있는 기업에서의 온라인 교육은 피교육자에게 다양한 방법으로 교육 기회를 제공하고 있다. 또한 전자적인 측면에서 원활 서비스 체제의 솔류션을 제공하는 혁신 서비스로서의 기능을 제공하고 있으며 온라인 교육 환경하에서는 교육자와 피교육자가 시간과 장소에 구애받지 않고 개인화된 교육 패키지를 공급할 수 있게 한다. 본 논문에서는 온라인 교육에 영향을 미치는 요인들을 독립 변수로 하고 교육 성과와 전달 성과의 두 가지 측면에서의 교육 효과성을 종속 변수로 하는 관계를 실증적으로 검증하였다. 기존의 연구 결과를 기반으로 8개의 가정을 설정하고 설문서를 작성하여 LISREL을 이용하여 분석한 결과 피교육자에 기인된 개별적 변수와 조직 변수가 훈련 효과성과 유의성이 있는 것으로 나타났다

ABSTRACT

The development of information technologies has contributed on line training as one of important education methods. On-line training in firms, which is similar to e-learning or virtual education, provides trainees with more education opportunities in diverse ways. It has developed a range of innovative services with a one-stop solution of education within the electronic sector. Also under the on-line training environment, trainees can undertake customized training packages at anytime and any places. Morcover, information technology allows both the trainers and other trainees to be decoupled in any of the elements of time, place, and space.

Two research questions are investigated : what are the determinants affecting the on-line training effectiveness and how those variables affect the two aspects of training effectiveness: learning performance and transfer performance. Based on the previous literature conducted on the traditional training environment, the determinants of training effectiveness are derived. Eight hypotheses are developed based on literature reviews and tested by questionnaires survey data. The collected data have been analyzed by LISREL. It is found that the relationship between individual, organizational and on line site design variables and training effectiveness (learning and transfer) are significant. The contribution and limitations of this research are also discussed with future studies.

키워드 : 온라인 교육, 이러닝, 가상교육, 웹기반교육, 훈련효과성
On-Line Training, E Learning, Virtual Education, Web-Based Learning, Training Effectiveness

* 세종대학교 경영학과 교수
** 서강대학교 경영학과 교수

1. Introduction

Nowadays, companies are making efforts to properly adjust to the changing environment in order to enhance their competitiveness in the rapidly changing business environment. Especially, in step with the development of information technology and the Internet, for the sake of better manage their workforce, many businesses are replacing traditional convocation training with cyber training using the Internet.

Cyber employee training is an activity that enables learning activities through the Internet on the purpose of offering more education opportunities to trainees and enhancing the quality of learning. It can be defined as an open system that, under the computer-based circumstances, learning participants can access education anytime, anywhere.

This new way of learning has plenty of merits compared with traditional offline education. For example, e-learning enables more convenience, flexibility, cost-effectiveness, easy distribution of education materials and overcoming of geographical limits (Ahmad and Ives, 1998). Online training draws keen attention from corporate training managers in that it saves overlapping investments in equipment, facilities and development of materials, thus enabling investments in other necessary fields, which helps build a low-cost and high-efficiency learning/training environment that maximizes the efficiency (Walsh and Reese, 1995). In the case of company "A" in Korea, it was surveyed that its online training took merely a ninth the cost and a half the operating staff of its convocation training to finish the same course 8.5 times faster (Sooyoung and Moon, 1999). In the case of company "B," it determined to implement 50% of its employee training online scheduled for 2001 (Jongwon, Park, 2001). These examples reflect the growing attention from companies to online learning/training. Therefore, for online education to be implemented efficiently, systematic researches on its achievements and effectiveness need to be preceded.

Meanwhile, the ultimate goal of introducing online education by companies is transfer performance, which involves improving learning results through online learning/training and thus enhancing trainees' work capabilities.

If a certain e-training program fails to improve the participants' learning performance or enhance transfer performance by applying what's learned from the program to their job performance, from the perspective of the client company the program will end up a waste of time and money, undermining organization effectiveness (Milheim, 1994).

It is questioned whether various training programs done by companies actually changed the behavior of employees after their implementation. In the case of US companies, it is known that only 10~15% of the training is applied to work (Sevilla and Weels, 1998).

These data evidence how essential it is to establish a systematic training program that enables enhancement of trainees' learning performance and thus transference of the learning improvement to better implementation of their work. Other precedent researches on traditional convocation training, however, focused mostly on the employees' responses and the amount of learning through the training and researches on the value of training for practical business affairs were not done much.

Alliger and Janak (1989), regarding this, pointed out that only 4% of researches related to evaluation of training dealt with changed brought about after training.

Therefore, recently, faced with changes in the environment that corporate online education programs driven by various information technologies, online training will be guaranteed the validity of its introduction and operation only when its value in practical work is acknowledged.

In other words, in conducting a research on online training, not only how directly online training affects learning performance, but also what transfer performance effects on practical work need to be included.

Based on these, this research intends to demonstrate constituting factors of a training system that enhances efficacy of corporate online training. To that end, it has the purpose of drawing designing factors that affected the results of traditional offline training and online education designing factors and thus identifying what effects these have on the learning performance of online education and its transfer performance.

2. Literature Review and Deriving of Hypotheses

2.1 The concept and characteristics of online training

Online training, in its purpose to provide more learning opportunities to trainees and enhance the quality of learning enables learning activities through a computer-based telecommunication network. It is used as a similar concept to virtual classroom, virtual class and virtual university (Harasim, 1996). Online training offers learners learning opportunities anytime and anywhere and at the same time enables chances to interact between trainers and trainees and among trainees themselves. Its characteristics are as follows.

First, online training enables sophisticated interactive communication.

It makes possible not only simultaneous interaction as in traditional education scenes, face-to-face classes and phone calls but also non-simultaneous interaction transcending time and space (Romiszowski and Mason, 1996). These features induce active interaction between trainees, training implementers and among trainees as well as interaction between the contents of learning and individual trainees.

Second, online training provides effective means of data exchange. It enables the fastest exchange of a vast amount of recent data in a short time frame (Chung, 1991).

Third, online training encourages learners to actively participate in learning activities without social psychological burdens. In the process of e-training, learners participate in media communication not in direct meeting so that they can actively interact with others with no social psychological burdens from external conditions or prejudices such as one's social/economic backgrounds and gender. And those who don't get along with others or are passive are offered opportunities of participation easier than meeting others in real life (Junghoon and Lee, 1998).

Fourth, online training involves sophisticated technologies of information technology engineering. In other words, it is realized through technologies of communications networks such as the Internet, computer chatting, video education programs, voice communications mechanism and e-mail, e debate rooms and bulletin boards that enable 24-hour non-simultaneous interaction.

Fifth, online training is more economical than other media learning in terms of cost-efficiency. It enables not only sharing of digital data in various e-libraries and learning resources centers' databases but also utilization of public communications lines including fixed phone lines and Internet access lines without additional costs for facilities establishment. So it is economical to use vast and useful data at inexpensive costs.

Finally, online training is more useful than other media-driven learning especially in that it uses the WWW. It is because of the dynamism and interactiveness of data delivered in the learning process, the vast data source of the WWW and the conveniences of revising and complementing data such as editing the contents into a word processor file.

2.2 Designing factors of training programs

On the factors affecting the efficacy of online training, this research highlights 5 dimensions of trainee, contents of training, trainer, user friendliness of the website and organizational environment factors.

2.2.1 Trainee

Or the quality contents of the training do not achieve learning performance. At times, trainees fail to clearly recognize the cause, backgrounds and purposes of the training before it starts. For those who don't understand the importance of the training to get learning effects if not easy at all even the greatest trainer delivers the greatest quality contents.

In order for a training to be successful, the trainees' attitudes towards and motivation for the training about the usefulness of the contents are most important (Rossett, 1997). Recently, these researches on training moti-

vation are drawing more attention than the ability or characteristics of trainees (Mckellin, 1994).

At training scenes, motivation can be 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 "special desire of participants to learn the contents of the training program" (Noe and Schimitt, 1986).

Hicks and Klimoski (1987) pointed out that trainees need to be given a free hand to choose a specific training program as a motivational strategy. They argued that given the choice, if trainees got realistic information on effects from their participation in the program, the degree of learning would be higher. These arguments of theirs also mean that if trainees are allowed to participate in choosing their training program and their intention of choice is reflected, it is important to heightening their motivation for learning (Baldwin, Magjuka, and Loher, 1991).

One of the factors behind the training is to select and let able trainee's part in it. In other words, it is to select and let those with train ability participate in proper training programs. Trainability is determined by the trainees' level of abilities of and motivation for learning (DeSimone and Harris, 1998). In the research by Mathieu et al (1992) trainees showed more positive emotional responses when they had higher motivation, which was in proportional relationship to improvement of work performance after the training. The importance of learning motivation shown above is expected to be the same in online education situations as well.

One characteristic of trainees that is dealt with in most e-training situations is computer self efficacy. Self-efficacy means one's subjective judgment about his or her own work abilities. This doesn't mean one's specific skills but one's subjective judgment on whether to be able to achieve required results (Bandura, 1977).

Compeau and Higgins (1995) said one's self-efficacy about computer significantly affects the user's expectations and performance. Hill, Smith and Mann (1987) got a result that college students' computer self-efficacy affects their decision to use computer. Other researches related to training effectiveness and self-efficacy in traditional training scenes have already been done on various training programs. These have dealt with how self- efficacy affects training effectiveness under various circumstances such as computer soft ware learning (Gist, Schwoerer, and Rosen, 1989), interpersonal skills training (Gist, Stevens and Bavetta, 1991) and military training program (Eden and Ravid, 1982).

Based on precedent researches above, this research intends to prove the relations between trainees' personal characteristics such as learning motivation and computer self0efficacy and learning effectiveness under e-learning circumstances using empirical data,

with hypotheses for analysis as follows.

H1 : The higher the motivation of the trainees' for online training, learning effectiveness will improve.

H1-1 : The higher the motivation of the trainees' for online training, their learning performance will improve.

H1-2 : The higher the motivation of the trainees' for online training, their transfer performance will improve.

H2 : The higher the computer self-efficacy of the trainees' about online training, learning effectiveness will improve.

H2 1 : The higher the computer self-efficacy of the trainees' about online training, their learning performance will improve.

H2-2 : The higher the computer self-efficacy of the trainees' about online training, their transfer performance will improve.

2.2.2 Contents of Training

According to the research on contents of corporate training in the US by training type, most were about management function and knowledge on skills and functions with a dramatic surge in computer education (Milkovich and Boudreau, 1997). According to a research on contents of corporate training in Korea, about 40% were about general knowledge related to work and 27% about spiritual education of their company whereas training on expertise related to work was only 25% (Pilkyu, Beak and Dongwook, Um, 1998).

In this research, the contents of training among other constituting factors of a training program are dealt with in relation to work relatedness of the contents. Ford and Wroten (1984) suggested utilizing the evaluation of work relatedness of a training program through analyzing the validity of the contents of training and then using the evaluation results in redesigning the training program. Using this method, they argued, organizations could enhance the trainees' level of motivation to improve learning performance.

Bramley (1991) said for its success a training program is desirable to be done in similar environments to the real work scenes and with more common factors between the training and work, job performance after training further enhances. He argued that during training giving trainees questions on how to apply the contents of the ongoing training to their real work was effective. Alliger and his colleagues (1997) also argued that when trainees recognized that the contents were practical, they applied knowledge and skills from the training to their real work.

The researches under traditional convocation training circumstances above proposed that the contents of training affect the effectiveness of a training program, whose results could be applied to online training situations.

H3 : The more related are the contents of on-

line training to work, the effectiveness of online training will improve.

H3-1 : The more related are the contents of online training to work, the trainees learning performance will improve.

H3-2 : The more related are the contents of online training to work, the trainees' transfer performance will improve.

2.2.3 Education Trainer

It is mot farfetched to say that the success of a training program depends on the qualification and attitude of a trainer. Therefore a trainer has to fully understand not only the basic direction of an education program but also various knowledge and skills required providing training. Leuduchwicz (1982) insisted that besides trainer's ability, trainer's duty, influencing power and characteristic of the organization are systemically affecting trainer effectiveness.

Previous researches of trainer has lacked efforts on explaining the direct relationship between the characteristic of a trainer and training effectiveness while focusing on trainer's role in terms of designing and implementing of a training program.

Trainer's qualification recommended by Bartlett (1982) and Randall (1978) in mobilization-style training includes ability to provide an overall outline, emphasize the conceptual understanding, effectively convey the message, prepare training material in advance, treat trainees in an appropriate way, clearly respond to trainees' questions and encourage trainees to achieve their goal.

The more interaction occurs between the trainer and trainees, the better training effectiveness will be gained, which is not exception under all the other training environment (Dillon and Gunawardena, 1995) including multimedia remote training (Collins, 1995 ; Borberly, 1994 ; Latchem et al., 1994). E-mail or physical meeting between the trainer and trainees are the example. Trainees to receive feedback from their trainer usually use E-mail and it is considered a very useful method when the numbers of trainees are about over 30 (Leidner and Jarvenpaa, 1995). Powley (1994) found a research result suggesting 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.

Stone (1992) studied the relationship between the trainer and trainees. A tested group received a call from the trainer every week while the other group was just given the minimum feedback from the trainer. According to the study result, trainees showed a faster completion of the course when they received a regular call and feedback from their trainer.

Therefore, such interaction as e-mail and physical contact between a trainer and trainees greatly affect the effectiveness of online training, which can be hypothesized as follows:

H4 : The more interactions between the trainer of online training and trainees occur, the better learning effectiveness will be achieved.

H5 : The more e-mail is exchanged between trainer and trainees, the better learning effectiveness will be achieved.

2.2.4 Convenience of Online Site

The space for online training need to be designed to facilitate communications between separated trainer and trainees, share training material and generate debates among participants. The interaction process requires technical design format including chat room and multimedia function that enables trainees to easily use the website.

Leidner and Jarvenpaa (1995) suggested simulation, three-dimension virtual reality and debate room as a website design method. Well and Kick (996) argued that trainees' interest and motive can be intrigued when they can use quality graphic and multimedia system providing an appropriate music and sound system. Another hypothesis can be drawn from the assumption that it should be convenient for users to use these websites.

H6 : The easier access to a training website will improve the learning effectiveness.

2.2.5 Environment of an Organization

Though the success of training primarily relies on a program design itself, maximum training effectiveness can never be found without organization support. Noe (1986) in particular argued that working environment 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 working place if there are not enough support or the surroundings are not favorable for trainees.

Baldwin and Ford (1988) insisted that seniors' support and organization atmosphere have direct impact on training effectiveness and application rate of the trainee. According to their argument, training effectiveness affects application rate and seniors' support and working atmosphere are directly linked with application rate.

Based on previous research on 'continuous learning culture', Tracey (1995) came up with a new concept of the learning culture. According to him, the continuous learning culture means drawing up challenging work responsibility schedule to develop employees' potential, fully compensating for self-developing effort and emphasizing the improvement and renovation of working environment (Tracey et al., 1995). They obtained a research result that shows continuous learning culture has

significant impact on training and application rate. The argument that organization environment affects training effectiveness has been proved in the country as well (Lee Do-hyung 1995; Kim Jong-in 1977).

The assumption that the importance of relationship between the organization environment and training effectiveness under the traditional training atmosphere applies in the same way to the online training environment leads to the following hypothesis.

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

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

H7-2 : The more support trainees receive from their seniors, better application effectiveness 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 effectiveness.

H8-2 : More reliable learning culture will lead to better application effectiveness.

2.3 Training Effectiveness

Many scholars who studied traditional convocation training point out the difficulty of evaluation, emphasizing the importance of training effectiveness evaluation (Carnevale and Schulz, 1990, Alliger et al., 1997).

According to evaluations of training, most companies failed to evaluate their training systematically or if they DID, mostly on trainees' responses. Only about 10% were thou ght to try to evaluate changes in trainees' behavior, showing how inadequate evaluations were done on corporate training (Saari, 1988). According to Saari (1988), in the case of the most costly MBA programs (about $14,000 per head), 42% companies were surveyed not to conduct an evaluation ; for external short-term courses, 32%; and for college programs, 23% were surveyed not to evaluate.

Most researches related to training evalua tion are focused on measuring the trainees' reaction to the training program and the degree of learning from the program (Tracey, Tannenaburn, and Kavanagh, 1995). Reaction to the training program means the trainees' measurement of their attitudes towards the contents, methods and trainers and the degree of learning means the amount of learning which is the degree of their improvement in abilities including knowledge, skills and attitudes.

Reaction and learning are studied as major indicators of training but these evaluation and measurement variables are not the ultimate goals of training programs. That is because an evaluation about training is made by mea-

suring transfer as to the achievements of learning goals result in expansion of job performance as well as learning issues such as whether learning goals were achieved (Kreiger, Ford, and Salas, 1993).

Implementation of a training program is supposed to contribute to performance of the corporate organization. But if the trainees don't have the will to apply the skills or knowledge they learned from the training to their work or organizational factors that hinder the application of their skills or knowledge, the implementation of training can be said to fail. Therefore, trainers in charge must identify the effectiveness of training through evaluating the learning performance, the primal goal of training ; and transfer performance, the ultimate goal.

Baldwin and Ford (1988) presented an integrated model on the process that learning, the outcome of training; and transfer, the achievement of work application is generated. According to them, the trainees' personal characteristics and organizational environments affect both learning performance and transfer performance while learning designing methods of the composition of training materials and learning theories affect only on learning performance, which affects transfer performance. Based on precedent researches above, the relations between learning and transfer could be hypothesized as follows.

H9 : The higher the trainees' learning performance, the transfer performance will improve.

This research is based on the cause and effect relations shown in the transfer model by Badlwin and Ford (1988) and drew proper variables in online training to presume a model. <Table 1> In this model, learning motivation, contents of training, support of su-

〈표 1〉 Reliability of Research Model

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
◦ Direct contact	4	.9076
Easy to use / access the site	2	.8897
Organization environment		
◦ support from the supervisors	3	.9301
◦ consistent learning environment	4	.8991

pervisors and consistent learning culture are variables drawn from existing traditional training environments and self-efficacy, direct meeting, e-mail exchanges and user-friendliness are ones included because of the online factor.

3. Research Methodology

3.1 Subject

In an attempt to acquire tried and-true data to verify above hypothesis, questionnaire has been made to employees (working for S Inc., H Inc., L Inc.). The subject had already taken on-line training one or six months prior to July of 2000, when the questionnaire was performed. The reason of choosing the subject above is that a certain period of working at the field after the training enables the effectiveness of educational training-transfer affect those trainees. The total of one hundred seventy out of two hundred twenty copies of questionnaires has been collected and one hundred fifty-one has turned out to be valid with the valid rate of sixty-eighty point six percent. The subject with the valid questionnaires shows following :

- The proportion of males to females is 82.2 percent to 17.2 percent.
- Sixty-eight point two has been continuously working for their company for more than five years, twenty-three point eight working for from six ro ten years. More than ninety percent of subject seem to work for the current company for less than ten years.
- As for they job category, about forty-three is working for business management, twenty-seven for manufacturing, thirteen point two for R & D.
- As for job position, more than ninety percent of workers are still among the rank and file at their company.
- As for their educational background, about eight four point eight percent had completed college or university degree, seven point nine with graduate degree.
- As for the experience of the on-line training, about thirty three percent has never attended an on-line training, forty eight doing the second time.

3.2 Definition for variables and item measure

3.2.1 Learning Motivation

Learning motivation of trainees means the desire or aspiration to acquire the knowledge from the on-line training program that they take. In order to take motivation measure, five question items out of the questionnaire that Hick and Klimski invented (1987) were adopted scaling 5 points. Such questions as "Do you think if this was the good chance for you to improve your task ability?" and " Did you try hard to learn as much as you want during

the training?" were included.

3.2.2 Computer self-efficacy

Five question items, with the scale of 5 points, out of questionnaire that Compeau and Higgins developed (1995) were adopted to measure trainees' ability. Self-efficacy measure based on their own judgement regarding to their ability to carry out a series of task for the use of computer and to cope with any kind of troubles regarding to computer use. Those questions are such as "Are you confident to use computer?" and " Are you sure to use computer with its instruction of manual?"

3.2.3 The contents of training

The contents of training indicate that what is taught to trainees during the program. In this paper, the contents are to measure as the job- related task and is based on the actual work in the field assisting to improve the achievement.

In this paper, four question items, scaling with five points, were adopted out of the questionnaire that Grove and Ostroff developed (1991) for the content measure. Those questionnaire items are " if the contents of the on-line contain the most recent one" and "if helpful guideline were provided through on-line for the better job task achievement.

3.2.4 Face-to-face meeting(direct contact)

The face-to-face meeting was to check if the actual face-to-face meeting had happened between the trainers or instructors and trainees and been encouraged. And also it was to measure how helpful the face-to-face to meeting to trainees taking question items out of questionnaire that Liedner suggested (1995). The measure also takes five point of scale. Some of the questions are "Were they encouraged to have a face-to-face meeting instructors?" and "Were trainees able to have meeting with instructors during the program?"

3.2.5 e-mail communication

E-mail communication was to measure, with the scale of 5 points, based on the questionnaire that Liedner et al suggested (1995). The foci of measure were to check if e mail communication were encouraged between the instructors and trainees and if it actually had happened. And also e mail communication were helpful to the trainees was checked. Some of those questions are "if the instructors have performed the e-mail communication with trainees" and "Were trainees encouraged to interact with instructors in order to solve any questions they have regarding to the class?"

3.2.6 easy to use

The easy-to use measure is to check how easy to use for trainees to access to the on-line site. Three question items are from Liedner's questionnaire (1995) scaling of 5 points. Questions were included such as "Was the

response speed of the educational training system fast enough to carry out the class?" and "Was the training site designed user-friendly enough to carry out the class?"

3.2.7 Support from the supervisors

The support of the organization or supervisors of the trainees was to measure if the supervisors of the organization had offered the chance to adapt what the trainees had learned to the job field, and if they had guided how to adapt. The support of the organization measure is also to enhance the degree of being adapted with feedback to trainees. Some of the question items were based on Tracey's questionnaire (1995) scaling of five points. For examples, "Did supervisors help or intend to help his work fellows to improve their ability by giving chances to attend educational training program?" were asked.

3.2.8 Encouraging learning environment

Continuous encouraging learning environment Tracey et al. (1995) means that members of the organization believed learning or training plays a crucial role in their job tasks. Learning environment measure is to check task allotment, and incentive for self-development. Four of Tracy's questionnaire items were adopted I this research. For example, "Is the organization evaluating high on employees' self-development and progressive innovation" and "Is the organization providing me with the appropriate job and role?" were included to the questionnaire.

3.2.9 Learning achievement

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 the scale of five points. Learning achievement measure was to check based on trainees' achievement they recognized. Questions such as "I've learned new stuff through this program" and "I believe that I've learned better than the others."

3.2.10 Achievement of transfer

Trainees' achievement of transfer refers to what degree the trainees have transferred what they had trained to their job tasks. The questionnaire items were adopted from Ruiller and Goldstein's research model (1993) for the transfer degree with the knowledge and skills from the program. Two of five items scaling of five points are such as "Are you using what you'd learned from the training at your job tasks?" and "Has your job performance improved after the training program?."

3.3 Assessment of measurement

3.3.1 Assessment of measure items on the basis of one-dimension

The questionnaire items of the components for the research model have been performed

〈Table 2〉 confirmatory factor analysis of external variance

variance	item	Learning motiva-tion	Self effi-cacy	Contents of Training	Direct meet-ing	e-mail commun-ication	Easy to use	Support from super-visors	Consistent learning environ-ment	t value
Learing Motiva-tion	Mot 1	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	eft 1	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	Con 1	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
Direct Meeting	Mee 1	0	0	0	0.84	0	0	0	0	18.28
	Mee 2	0	0	0	0.46	0	0	0	0	17.44
	Mee 3	0	0	0	0.59	0	0	0	0	16.09
	Mee 4	0	0	0	0.60	0	0	0	0	15.96
e-mail	Ema 1	0	0	0	0	0.94	0	0	0	17.65
	Ema 2	0	0	0	0	0.93	0	0	0	18.61
	Ema 3	0	0	0	0	1.03	0	0	0	17.84
	Ema 4	0	0	0	0	0.93	0	0	0	18.44
Easy to Use	Use 1	0	0	0	0	0	0.98	0	0	19.48
	Use 2	0	0	0	0	0	0.85	0	0	16.83
support	Sup 1	0	0	0	0	0	0	0.87	0	21.84
	Sup 2	0	0	0	0	0	0	0.88	0	23.04
	Sup 3	0	0	0	0	0	0	0.75	0	17.21
Learning mood	Cul 1	0	0	0	0	0	0	0	0.78	17.81
	Cul 2	0	0	0	0	0	0	0	0.64	46.54
	Cul 3	0	0	0	0	0	0	0	0.61	18.22
	Cul 4	0	0	0	0	0	0	0	0.67	16.80
fitness		χ = 416.28, df = 48, p = 0.00, GFI = 0.83, NFI = 0.87, CFI = 0.88, IFI = 0.89								

on the basis of Chruchill's research approach (1979). Firstly, responses to each item measuring research model were sum up then low related item was dropped on the basis of relative relation with the total items. In other words, one-dimension to each measure has been assessed based on exploratory factor analysis and item-to-total correlation, which analyze individual items to total items. Those items showing less than .30 on the basis of the correlation between individual item and the total items were dropped. And as for the

exploratory factor analysis through the major construct analysis, items showing less than ± .30 and other redundant items were excluded. According to the one-dimension analysis, one item from learning motivation, one from training contents, one from user-friendly use (easy to use), and one from support were dropped. And according to an analysis that spilt up into external and internal factors dropped all items showing .50 high rate of loading.

3.3.2 Reliability analysis

In this research, reliability was examined on all the remaining items from one-dimension assessment. As the test of reliability, Cronbach α was adopted to represent internal consistency. < Table 1> shows the result of credibility test implying that measures in our research represent higher than that of Nunnally's (1978) as his suggestion of .60 were applied to our research.

3.3.3 Validity analysis

Variance models are composed of mainly two models such as measurement model and structural model. Validity analysis refers to measurement model. For the assessment of validity analysis confirmatory factor analysis in addition to exploratory analysis has performed on each concepts based on LISREL's measurement model.

The result of confirmatory factor analysis toward external variances is shown at <Table 2>. Factor loading appears higher than 0.04. Although P value in accordance to χ value doesn't satisfy the standard (χ = 416.28, df = 48, p - 0.00), and other fitness index has no problem with the fitness for the measurement model. Also the t value of the factor loading of the measurement appears more than ± 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 at <Table 3>. Factor loading of measurement items toward construct concept is significant and has discriminative validity for the measures.

〈Table 3〉 confirmatory factor analysis toward internal variances

Variance	Items	Learning achievement	Transfer achievement	T value
Learning achievement	LEA 1	0.84	0	19.91
	LEA 2	0.90	0	231.56
	LEA 3	0.76	0	18.33
	LEA 4	0.72	0	17.65
Transfer achievement	TRA 1	0	0.84	22.11
	TRA 2	0	0.73	21.37
	TRA 3	0	0.79	20.73
fitness	χ = 229.35, df = 13, p = 0.00, GFI = 0.80, NFI = 0.9., CFI = 0.91, IFI = 0.91			

3.4 Result of Hypothesis Verification

In this research, for the purpose of hypothesis cause and effect relation verification among construct concepts suggested in the research model, correlation among the above concept have been verified and assessed in the use of variance structural analysis. According to the analysis result in the use of LISREL 8.12a, the fitness of research model has been assessed leading to χ = 33.73 (p = 0.00009944), fitness index GFI 0.9789, NFI 0.9670, CFI 0.9747, IFI 0.9756. Despite p value in accordance to χ have not satisfied, most of previous researches haven't assessed the fitness of model toward the p value only. Instead it has been examined its fitness with other fitness indexes. Since when model is correct with its conditions likely incorrect, χ value is likely to appear larger and then there is some pitfall: the more the number of sample, the lower its value.

From this respect, it is advisable to put them into consideration with other fitness indexes (Lee, 1990). In this research the fitness of the whole model assumes appropriate on the ground of high fitness indexes including GFI.

As shown in <Table 4>, each item of cause and effect relation suggested in hypothesis has been verified by measuring t-value of standard path, being assessed on the basis of statistical significance of t value.

As shown at <Table 4>, some of factors influencing trainees' learning achievement are such as learning motivation, computer self-efficacy, contents of training program, fact - to-face meeting (direct meeting) between instructors and trainees, how easy 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 very thin.

On other the hand, some factors influencing to trainees' transfer achievement are such as learning motivation, contents 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 thin and invalid.

4. Conclusion

4.1 Discussion

The goal of this study is to identify program designing factors that affect to improve the trainees' learning performance and transfer performance as effectiveness of a training program. To this end, research hypotheses were drawn through reviewing precedent researches, trainees who participated in an online work-related training program at large companies in Korea were surveyed and pos-

〈Table 4〉 Inferred value of research model

Hypothesis	From → to	Name of path	Standard path	T value	Signifi-cance	Adopted or denied
H1-1	Motivation → learning achievement	γ 11	0.5098	7.5276	P < .01	adopted
H1-2	Motivation → transfer achievement	γ 21	0.4279	8.4914	P < .01	adopted
H2-1	self-efficacy → learning achievement	γ 12	0.1894	3.8988	P < .01	adopted
H2-2	self-efficacy → transfer achievement	γ 22	0.0401	1.1588	n.s.	denied
H3-1	training contents → learning achievement	γ 13	0.2578	3.1655	P <.05	adopted
H3-2	training contents → transfer achievement	γ 23	0.2869	5.1026	n.s.	adopted
H4	Direct meeting → learning achievement	γ 14	0.1616	2.3550	P < .05	adopted
H5	e mail → learning achievement	γ 15	0.0850	1.9029	n.s.	denied
H6	Easy to use → learning achievement	γ 26	0.2407	2.4360	P < .01	adopted
H7-1	Support → learning achievement	γ 17	0.1318	1.9503	n.s.	denied
H7-2	Support → transfer achievement	γ 27	0.2898	602883	P < .01	adopted
H8-1	Learning environment → learning achievement	γ 18	0.1988	3.3709	P < .01	adopted
H8-2	Learning environment → transfer achievement	γ 28	0.0355	0.8725	n.s.	denied
H9	Learning achievement → transfer achievement	β 21	0.2446	6.1150	P < .01	adopted
χ = 33.7388, df = 9, p = 0.00, GFI = 0.9789, NFI = 0.9670, CFI = 0.9747, IFI = 0.9756						

itive analysis was conducted on collected empirical data. The summarization and interpretation of the results from this research is as follows.

First, according to this study, the higher the trainees' motivation for learning is, the better their learning and transfer performance is. In particular, as shown in the analyzed results, the trainees' motivation for learning can be interpreted as of the greatest relative importance among other variables that affect the training effectiveness. Since it is not exactly in line with the goal of this study, no analysis about the relative differences among variables

was made. But given the value of the path coefficient (motivation for learning + learning performance : γ 11 = 0.5098, motivation for learning + transfer performance : γ 12 = 0.4279), learning motivation is an important factor that influences the effectiveness of the training. This means the trainees' motivation is the most important factor in online training as much as in traditional convocation training.

Second, the higher the trainees' computer self-efficacy is, the higher their learning performance is. This result is in line with the research done by Compeau and Higgins (1995). In that in order to learn through online training the trainees' should have computer skills to some degree, their attitudes and confidence about computer can be said to affect success of online training. But according to the results of this study, no direct relations between the trainees' self-efficacy and transfer performance were proven. Im and Park (1999) said that in traditional convocation training, the trainees' self-efficacy about the training have affected their transfer performance. But in this study, under the online training circumstances, the trainees' computer self-efficacy was shown to directly affect their learning performance and indirectly affect their transfer performance through the causal relationship that computer self-efficacy affects learning performance, which in turn affects transfer performance.

Third, the higher the work relatedness of the contents of the online training, the higher the effectiveness of training can be. Already, Alliger and his colleagues (1998) argued that work-relatedness of the contents influenced transfer performance. This study is not only in accordance with their research but also shows that work-relatedness of the contents directly affects the trainees' learning performance. In that the ultimate goal for a company to introduce a training program is to improve the trainees' work capabilities by enhancing their knowledge, skills and attitudes, work-relatedness of the contents of training can be said to be a factor that must be taken into account. And this research also supports the importance of development of contents of online training.

Fourth, as factors that should be considered in designing an online training web site, direct contact between and among trainers and trainees and user-friendliness of the web-site can be quoted. There is no reason why direct contact between trainers and trainees should be excluded only because the training is done online. One previous study (Powley, 1994 and Stone, 1992) showed that regular meetings or regular feedback such as a phone-call improved learning performance and this research supports it. Exchange of e-mail also was presented as a factor that influences the effectiveness of training in that it helps increase interaction between trainers and trainees in previous studies. But in this study its influence was not proven, so further study is needed. And results show that when the

trainees perceive that the web-site they are trained is convenient to use their learning performance is high. Therefore designers or operators of online training need to improve their system to secure its user-friendliness and by extension make a easier and more interesting web-site using multimedia functions (voice delivery, moving images, etc.) Based on previous studies, this study hypothesized that direct meetings, exchange of e-mail and user-friendliness of the web-site affect only learning performance. But researches on online training have yet to be accumulated, researchers of this study made additional analysis on whether these variables unique in online training and transfer performance have direct relations for reference. According to the analysis of the full model, the path coefficient between variables unique in online training (ex. direct meeting) and transfer performance was shown not to be significant, which supports the results of this study that these variables influence transfer performance through learning performance.

Fifth, the hypothesis verification of the influence of an organizational environment on the learning effectiveness was partially supported. First of all, the support of supervisors was shown not to affect the learning effectiveness, but significantly affect transfer performance. This result is different from the argument by Baldwin and Ford (1988) that support of supervisors to training has direct relationship with the trainees' learning performance. But the direct relationship can be said to be mainly because this study measured the variable of supervisors' support by the degree that they support their subordinates to apply what they learned to real work. Therefore future studies need to make an operational definition of the support of supervisors as their interest in the training program itself. Consistent learning culture was shown to affect learning performance, but no transfer performance. Therefore, it can be said that the more the organizational environment emphasizes on innovation and properly rewards its employees' efforts to develop themselves, the higher the trainees' learning effectiveness is.

Sixth, the higher the trainees' learning performance in online training, the higher their transfer performance is. This result is generally accepted in previous studies related to transfer performance (Badlwin and Ford, 1988). This causal relationship is the ground for many companies to focus on enhancement of learning performance at the initial stage of designing a training program with the purpose of improving their employees' work capabilities.

Finally, if variables are divided into two categories of online environmental variables and traditional environmental variables, according to this study traditional variables are still important in the online environment. Considering only variables related to the online environment, self-efficacy, direct meeting and user-friendliness have a direct influence

on learning performance and an indirect influence on transfer performance. In other words, online training programs such as virtual education or e-learning recently experimented at schools and companies have a positive effect on improving the effectiveness of training and in order to enhance of the effect of online education these significant variables have possibilities to be designed effectively.

4.2 the limitations of this research and further research recommendations

This research was conducted in a situation that empirical researches related to the effectiveness of online training had yet to be accumulated enough. Therefore, it was done mainly on previous researches under traditional convocation circumstances. Since studies on online training are not enough, there were difficulties in theory building and plenty of limitations in theory testing as well. The limitations are as follows.

First, this study measured the effectiveness of training by learning performance and transfer performance. Warr & Bunce (1995) and Alliger (1998) suggested that through emotional reaction of the trainees' about the train ing program the effectiveness of training can be measured. Therefore, it is thought that further study is required considering this.

Second, this research failed to deal with the technical aspect of the design of the system that affects the effectiveness of online training. But the reason why this research didn't cover various multimedia functions including audio and video effects is the contents and facilities of online training have yet to fully support those functions. Therefore, as in the suggestion by Leidner and Jarvenpaa (1995), further study needs to be conducted on the effects of the technical design of an online training system including various multimedia, key response pads, hypermedia, simulation and 3 dimensional virtual reality.

Third, in order to measure the degree that the trainees' apply what they learned to real work after the online training, this study was conducted to employees who finished the tra ining 1 6 months ago. So, it is questionable about the reliance of their responses because they depend on their memory of past events. In particular, measurement of the trainees' motivation for online training is desirable to be done before the training starts. Therefore, further vertical studies are needed on the effectiveness of virtual training.

Fourth, the trainees' responses can be subjective because this study let them themselves respond measure the effectiveness of online training. Therefore, when the measurement of the trainees' learning performance and transfer performance is commissioned to their trainers and their own supervisors, more objective data could be secured.

Finally, this research has done to various job task improvement-training programs, used

in 3 major companies in Korea. In order to secure internal validity, studies on a single online training program are needed.

Reference

[1] Kim, J. I., "The Influence of job environments toward the transfer of educational training," Human Resource Paper, 1997, pp. 87-108.

[2] Moon, S. Y., "Cyber Training from Samsung SCU," Human Resource Management, Vol. 119, 1999, pp. 31-33.

[3] Park, J. W., "e-Campus, the place for employees' ability development," Human Resource Management, Vol. 139, 2001, pp. 62-64.

[4] Baek, P. K. and Eum, D. W., Human Resource Development in limitless competitive Era, Samsung Reseach Center, 1998.

[5] Lee, D. H., Learning and Transfer effect in the Organizational training program, Doctoral Dissertation, 1995.

[6] Lee, M. S., Variance Structural Analysis, Seongwon Publishing Co, 1990.

[7] Im, J. H., Reaearch on effects on teachers-students activities in virtual class based on Internet, Education Technology, Vol. 14, 1998, pp. 103-136.

[8] Im, H. C. and Park, B. K., "Curricular Contents of Training Program and its effect on transfer : Support from Supervisors and Peer Group," HR Research, Vol. 23, No. 2, 1999, pp. 107-138.

[9] Ahmad, R. and Ives, B., Effectiveness of Virtual Learning Environments in Basic Skills Business Education : A Field Study in Progress, International Conference in IS, Vol. 12, 1998, pp. 352-357.

[10] Alliger, G. M. and Janak, E. A., "Kirkpatrick's Levels of Training Criteria : Thirty Years Later," Personnel Psychology, Vol. 42, 1989, pp. 331-342.

[11] Alliger, G. M., Tannenbaum, S. I., Bennett, W. Jr., Traver, H., and Shotland, A., "Analysis of the Relations Among Training Criteria," Personnel Psychology, Vol. 50, 1997, pp. 341-358.

[12] Baldwin, T. T. and Ford, J. K., "Transfer of training : A Review and Directions for Future Research," Personnel Psychology, Vol. 41, 1988, pp. 63-105.

[13] Baldwin, T. T., Magjuka, R. J., and Loher, B. T., "The Perils of Participation : Effects of Choice of Training on Trainee Motivation and Learning," Personnel Psychology, Vol. 44, 1991, pp. 51-66.

[14] Bandura, A., "Self-efficacy Mechanism in Human Agency," American Psychology, Vol. 37, 1977, pp. 122-127.

[15] Borbely, E., "Challenges and Opportu-

nities in Extending the Classroom and the Campus via Digital Compressed Video," In R. Mason and R. Bacsich (eds.), ISDN : Applications in Education and Training, 1994, pp. 65-82.

[16] Bramley, P., Evaluating Training Effectiveness-Translating Theory into Practice, London : McGraw-Hill Book company, 1991.

[17] Carnevale, A. P. and Schulz, E. R., "Evaluation Practices," Training and Development Journal, Vol. 44, 1990, pp. 23-29.

[18] Chung, Factors that Affect the Use of Instructional Electronic Message Systems, Doctorial Dissertation, Champaign, IL: University of Illinois, 1991.

[19] Churchill, G. A., Jr., "A Paradigm for Developing Better Measures of Marketing Constructs," Journal of Marketing Research, Vol. 16, 1979, pp. 64-73.

[20] Collis, B., "Anticipating the Impact of Multimedia in Education: Lessons from the Literature," Computers in Adult Education and Training, Vol. 2, 1995, pp. 136-149.

[21] Compeau, D. R. and Higgins, C. A., "Computer Self-efficacy : Development of a Measure and Initial Test," MIS Quarterly, Vol. 19, 1995, pp. 189-211.

[22] DeSimone, R. D. and Harris, D. M., Human Resource Development (2nd.), Dryden, 1998.

[23] Dillon, W. R. and Gunawardena, C. N., "A Framework for the Evaluation of Telecommunications-Based Distance Education," In D. Sewart(ed.), Selected Papers from the 17th World Congress of the International Council for Distance Education, Vol. 2, 1995, pp. 348-351.

[24] Dubin, S. S., "Maintaining Competence through Updating," In S. L. Willis and S. S. Dubin(eds.), Maintaining Professional Competence, San Francisco: Jossey-Bass, 1990, pp. 9-43.

[25] Eden, W. B. and Ravid, G., "Pygmalion versus Self-expectancy : Effects of Instructor and Self-expectancy on Trainee Performance," Organizational Behavior and Human Performance, Vol. 30, 1982, pp. 351-364.

[26] Gist, M. E., Shwoerer, C., and Rosen, B., "Effects of Alternative Training Methods on Self-efficacy and Performance in Computer Software Training," Journal of Applied Psychology, Vol. 74, 1989, pp. 884-891.

[27] Gist, M., Stevens, C. K., and Bavetta, A. G., "Effects of Self-Efficacy and Post Training Intervention on the Acquisition and Maintenance of Complex Interpersonal Skills," Personnel Psychology, Vol. 44, 1991, pp. 837-861.

[28] Goldstein, I. L., "Training in Work Organizations, In M. D. Dunnet, and L. M. Hough(eds.)," Handbook of Industrial and Organizational Psychology, CA : Consulting Psychologyists Press, 1993.

[29] Grove D. A. and Ostroff, C., "Program Evaluation," In K. N. Wexley(ed.), Developing Human Resourses, Washington, DC. BNA Books, 1991.

[30] Harasim, "Online Education : the Future," in T. M. Harrison and T. Stephen(eds.), Computer Networking, Scholarly Communication in the Twenty-first Century University, New York, SUNY Press, 1996.

[31] Hicks, W. D. and Klimoski, R. J., "Entry into Training Outcomes : A Field Experiment," Academy of Management Journal, Vol. 30, 1987, pp. 542-552.

[32] Hill, T., Smith, N., and Mann, M., "Role of Efficacy Expectations in Predicting the Decision to Use Advanced Technologies : The Case of Computers," Journal of Applied Psychology, Vol. 72, 1987, pp. 307-313.

[33] Kreiger, K., Ford, J. K., and Salas, E., "Application of Cognitive, Skill-Based, and Affective Theories of Learning Outcomes to New Methods of Training Evaluation," Journal of Applied Psychology, Vol. 78, 1993, pp. 311-328.

[34] Latchem, C., Mitchell, J., and Atkinson, R., "ISDN-based Videoconferencing in Australian Tertiary Education," In R. Mason and P. Bacsich (eds.), ISDN : Applicaitons in Education and Training, London : Institution of Electrical Engineers, 1994, pp. 99-113.

[35] Leduchwicz, T., "Trainer Role and Effectiveness : A Review of the Literature," International Journal of Manpower, Vol. 3, 1982, pp. 2-9.

[36] Leidner, D. E. and Jarvenpaa, S. L., "The Use of Information Technology to Enhance Management School Education: A Theoretical View," MIS Quarterly, Sep. 1995, pp. 265-291.

[37] Mathieu, J. E., Tannenbaum, S. I., and Salas, D., "Influences of Individual and Situational Characteristics on Measures of Training Effectiveness," Academy of Management Journal, Vol. 35, 1992, pp. 828-847.

[38] McKellin, D. B., A Control Theory Perspective on Training Motivation, Unpublished Dissertation, Michigan State Univ., 1994.

[39] Milheim, W. D., "A Comprehensive Model for the Transfer of Training," Performance Improvement Quarterly, Vol. 7, No. 2, 1994, pp. 95-104.

[40] Milkovich J. W., Boudrear, Human Resource Management(8th), Irwin Chicago, 1997. Mosel, J. N., "Why Training Programs Fail to Carry Over," Personnel, 1957, pp. 56-64.

[41] Noe, R. A. and Ford, J. K., "Emerging Issues and New Directions for Training Research," In G. R. Ferris, and K. M. Rowland(eds.), Research in Personnel and Human Resource Management, Vol. 10, JAI press, 1992, pp. 345-384.

[42] Noe, R. A. and Schmitt, N., "The Influence of Trainee Attitudes on Trai-

ning Effectiveness : thst of a Model," Personnel Psychology, Vol. 39, 1986, pp. 497-523.

[43] Noe, Raymond A., "Trainees' Attributes and Attitudes : Neglected Influences on Training Effectiveness," Academy of Management Review, Vol. 11, 1986, pp. 736-749.

[44] Nunnally, J. C. Psychometric Theory (2nd), New York : McGraw-Hill, 1978.

[45] Powley, R. L., The Effectiveness of Electronic and Telecommunications Tutoring on Distance Education Students' Completion Rates Learning Outcomes, Time to Complete and Their Motivation to Participate in Future Distance Education Programs (electronic tutoring), The Florida State University, 1994.

[46] Robinson, K. A., Handbook of Training Management, London, Kogan Page, 1985.

[47] Romiszowski, A. J. and Mason, R, "Computer-mediated Communication," in D. H. Jonassen(ed.), Handbook of Research for Educational Communications and Technology, NY : Prentice Hall International, 1996, pp. 438-456.

[48] Rossett, A., "That Was a Great Class, But," Training and Development, 1997, pp. 19-24.

[49] Rouiller, J. Z. and Godstein, I. L., "The Relationship between Organizational Transfer Climate and Positive Transfer of Training," Human Resource Development Quarterly, Vol. 4, 1993, pp. 377-390.

[50] Saari, L. M., Johnson, T. R., McLaughlin, S. D., and Zimmerle, D. M., "A Survey of Management Training and Education Practices in U. S. Companies," Personnel Psychology, Vol. 41, 1988, pp. 731-743.

[51] Sevilla, C. and Wells, T. D., "Contracting to Ensure Training Transfer," Training & Development, June 1988, pp. 10-11.

[52] Stone, E. F. and Lance E. Anderson, "Relative Power of Moderated Multiple Regression and the Comparison of Subgroup Correlation Coefficients for Detecting Moderating Effects," Journal of Applied Psychology, Vol. 79, No. 3, 1994, pp. 354-359.

[53] Tracey, J. B., Tannenbaum, S. I., and Kavanagh, M. J., "Applying Trained Skills on the Job : The Importance of the Work Environment," Journal of Applied Psychology, Vol. 80, 1995, pp. 239-252.

[54] Walsh J. and Reese, B., "Distance Learning's Growing Reach," Technological Horizons in Education Journal, Vol. 22, 1995, pp. 58-62.

[55] Warr, P. and Bunce, D., "Trainee Characteristics and the Outcomes of Open Learning," Personnel Psychology, Vol. 48, 1995, pp. 347-375.

[56] Wells, F. S. and Kick, R. C., Enhancing Teaching and Learning in Higher Education with a Total Multimedia Approach, 1996.

저 자 소 개

김정욱	(E-mail : jukim@sejong.ac.kr)
1980년	서강대학교 전자공학과 (학사)
1982년	한국과학기술원 경영과학 (석사)
1982년 ~ 1984년	한국개발연구원 연구원
1984년 ~ 1996년	한국통신 부장
1996년 ~ 2000년	동양공업전문대학 경영정보과 조교수
2000년 ~ 현재	세종대학교 경영학과 부교수
관심분야	정보자원관리, ITA, 전자상거래

남기찬	(E-mail : jknam@sogang.ac.kr)
1987년	서강대학교 영문학과 (학사)
1987년 ~ 1989년	University of Mississippi 경영학 (석사)
1989년 ~ 1995년	State University of New York at Buffalo (박사)
1995년 ~ 1997년	동국대학교 정보관리학과 전임강사
1997년 ~ 현재	서강대학교 경영학과 교수
관심분야	아웃소싱, E-business, 소프트웨어 품질보증