The Effects of Training for Computer Skills on Outcome Expectations, Ease of Use, Self-Efficacy and Perceived Behavioral Control

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ABSTRACT

Previous studies on user training have largely focused on assessing models which describe the determinants of information technology usage or examined the effects of training on user satisfaction, productivity, performance, and so on. Scant research efforts have been made, however, to examine those effects of training by using theoretical models. This study presented a conceptual model to predict intention to use information technology and conducted an experiment to understand how training for computer skill acquisition affects primary variables of the model. The data were obtained from 32 student subjects of an experimental group and 31 students of a control group, and the information technology employed for this study was a universitys electronic mail system. The study results revealed that attitude toward usage and perceived behavioral control helped to predict user intentions; outcome expectations were positively related to attitude toward usage; and self-efficacy was positively related to perceived behavioral control. The hands-on training for the experimental group led to increases in perceived ease of use, self-efficacy and perceived behavioral control. The changes in those variables suggest more causal effects of user training than other survey studies.

1. Introduction

User training plays a significant role in accepting and using a new information

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technology (IT). In order to assimilate new IT into an organization effectively, training potential users is an essential managerial practice to be established (Lenard-Barton, 1987). Studies of IT implementation and end-user computing have shown that training is an essential contributor to systems success (e.g., Benson, 1983; Fuerst and Cheney, 1982; Igbaria, et al., 1989; Leonard-Barton and Deschamps, 1988). In other words, user training has positive effects on their IT usage, productivity, information satisfaction, and decision making process.

Cronan and Douglas (1990) reported that a training program for end users resulted in an increase in their productivity and satisfaction with the systems. Yaverbaum and Nosek (1992) reported that education and training lead to an increase in user information satisfaction, which refers to the sum of ones feelings and attitudes towards a variety of factors (components) related to the delivery of information products and services (Doll, et al. 1995, p. 178). Mykytyn (1988) found that training decision support systems (DSS) users is positively correlated with the use of a DSS to improve decision making. Green and Hughes (1986) found that there is an interaction between training and cognitive style, which affects decision process attributes such as number of alternatives considered and amount of data considered. Igbarias (1993) field survey revealed that training as an individual characteristic influences computer anxiety and perceived usefulness, which ultimately affect user acceptance of microcomputer technology. The results of Nelson and Cheneys (1987) field study showed that computer-related training is positively associated with computer-related ability, which is, in turn, positively related to use of IT. While the results of these studies present why user training is required for effective utilization of IT, less research efforts have been made for understanding how training influences user acceptance from theoretical standpoints.

A variety of theoretical models have recently been proposed and assessed to explain the determinants of IT usage (Adams, et al., 1992; Davis, et al., 1989; Mathieson, 1991; Taylor and Todd, 1995). Intention-based models, such as the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the Theory Planned Behavior (Ajzen, 1985, 1991) from social psychology, use behavioral intention to predict individual behavior. The Theory of Planned Behavior is an extension of the Theory of Reasoned Action in that it contains perceived behavioral control in addition to attitude toward behavior and social norm. The Technology Acceptance Model, which is an adaptation of the Theory of Reasoned Action, suggests two belief-based factors affecting system usage: perceived ease of use and perceived usefulness (Davis, et al., 1989). The Social Cognitive Theory proposes outcome expectations and self-efficacy as its cognitive determinants of individual behavior (Bandura, 1986).

The purpose of this research is to assess the effects of user training on major variables of these theoretical models to explain individual behavior. Particularly, this

research suggests a conceptual model to understand how training for computer skills influences such variables as outcome expectations, perceived ease of use, self-efficacy and perceived behavioral control. Since these variables are considered as the determinants of user acceptance, it will help to understand the role of user training in predicting user intentions to examine those effects of user training by conducting an experiment. This experimental study will have an implication on how effectiveness of an IT training program can be evaluated and what benefits could be obtained from user training.

The paper proceeds as follows. In the next section, relevant theories in which the conceptual model in this study is ground are explained. The conceptual models are, then, introduced and research hypotheses are generated, followed by a discussion about research methodology in the study. The results of data analysis are presented and hypotheses are tested. Finally, the final section provides concluding comments and discusses limitations of the study and future research issues.

2. Theoretical Background

2.1. Social Cognitive Theory

The Social Cognitive Theory, a widely accepted, empirically validated model of individual behavior, posits a triadic reciprocal causation model in which human behavior, personal factors, and environmental events all influence each other in a dynamic fashion (Bandura, 1986). Exponents of environmental determinism theorize about how behavior is controlled by situational influences, whereas exponents of personal determinism seek the causes of human behavior in dispositional sources in the form of instincts, traits and other motivational forces within the individual. In the social cognitive view, human behavior is neither determined by inner forces nor automatically controlled by external environments. Unlike the theorists favoring one-sided interactionism which views human behavior as a product of personal and situational influences, the Social Cognitive Theory favors a conception of interaction based on triadic reciprocality. According to the Social Cognitive Theory, individuals choose their environments, which also influence them; human behavior in a given situation is affected by environmental factors, which are in turn affected by behavior; and cognitive and personal factors influence behavior, which also influences the personal factors.

This research is particularly concerned with two specific cognitive determinants of individual behavior in the Social Cognitive Theory: outcome expectations and

self-efficacy. Outcome expectations refer to the beliefs about the consequences of undertaking a particular behavior. Individuals are more likely to undertake behaviors which they believe will result in valued outcomes than those which will not result in favorable consequences. Expected positive outcomes of using a computer would increase the persons feeling of its usefulness. If one believes that using a spreadsheet software will lead to increased work productivity, for example, the software is considered as a useful tool for the individual.

Self-efficacy, another cognitive factor influencing individual behavior and performance, is defined as peoples judgments of their capabilities to organize and execute courses of action required to attain designated types of performances (Bandura 1986, p. 391). Self-efficacy is not concerned with the component skills necessary to undertake a particular behavior, but concerned with the beliefs about ones ability to perform the behavior. Computer self-efficacy, thus, represents ones perceived ability to use computers in performing a task, rather than specific computer skill components such as saving files and uploading files. Gist and Mitchell (1992) differentiate self-efficacy from other related concepts such as self-esteem and effort-performance expectancy. Self-esteem is an individuals affective evaluation of the self, but self-efficacy is a judgment about task capability that is not inherently evaluative (Gist and Mitchell 1992, p. 185). Compared with the effort-performance expectancy, self-efficacy is a more comprehensive concept incorporating the rationale underlying the expectancy theory construct, and it has generative capability of influencing thought patterns, emotional reactions and performance.

Both outcome expectations and self-efficacy will influence individual behaviors. Using Harvard graphics software, for example, will be affected by the individuals expectations about the outcomes which may be attained by using the software and the potential users perceptions of his or her ability to use the software in the accomplishment of a task. Whereas the concept of outcome expectations has been used by many information systems researchers (e.g., Davis et al., 1989; Desanctis, 1983, Lucas, 1978), self-efficacy has recently been considered by information systems researchers. Compeau and Higgins (1995) found that computer self-efficacy influences outcome expectations, affect, anxiety, and actual computer use. Igbaria and Iivari (1995) reported that self-efficacy has a significant effect on computer anxiety and perceived ease of use, and is influenced by computer experience and organizational support. Continued research is required to clarify the determinants of self-efficacy and its influences on information systems user behavior and performance.

2.2. Theory of Planned Behavior

The Theory of Planned Behavior (Ajzen 1985, 1991), an extension of the Theory of

Reasoned Action (Fishbein and Ajzen, 1975), has been proposed to deal with situations where individuals have only limited control over the factors influencing their behavior. The predictive accuracy of Theory of Reasoned Action diminishes when individuals have not complete volitional control over their behavior because they lack requisite information, skills, and other resources. The additional block of perceived behavioral control of the Theory of Planned Behavior reflects such incomplete control situations.

According to the Theory of Planned Behavior, a persons behavior (B) is predicted by behavioral intention (BI) and perceived behavioral control (PBC), and behavioral intention is predicted by attitude toward the behavior (A), subjective norm (SN), and perceived behavioral control (PBC). Attitude toward a behavior is a persons general feeling of favorableness or unfavorableness for performing the behavior (Ajzen and Fishbein, 1980). Subjective norm reflects perceptions that significant referents desire the individual to perform or not perform the behavior in question. Perceived behavioral control reflects perceptions of the internal interferences (e.g., skills, abilities, knowledge, adequate planning) and external interferences (e.g., time, opportunity, cooperation of other people) with control over intended behavior. The model can be formally expressed by a weighted function of the variables:

$$B = w_1BI + w_2PBC$$
$$BI = w_3A + w_4SN + w_5PBC.$$

Attitude toward a behavior, subjective norm, and perceived behavioral control are determined by their corresponding belief structures: behavioral beliefs (bb), normative beliefs (nb), and control beliefs (cb). Attitude toward a behavior (A) is a function of behavioral belief strength and outcome evaluations. A behavioral belief (bb) strength is the subjective probability that the behavior will lead to a salient outcome of the behavior. An outcome evaluation (oe) reflects desirability of the outcome of the behavior. One may believe, for example, that using E-mail will lead to improved communication with his/her coworker, and that it is very desirable to improve communication with coworker. Attitude toward a behavior can be shown as:

$$A = \sum bb_i\ oe_i.$$

Subjective norm (SN) is a function of normative belief concerning a particular referent and motivation to comply with the referent. A normative belief (nb) is the individuals perception of the opinion of a person or group whose beliefs about the behavior may be important to him/her. Motivation to comply (mc) refers to how much the individual generally wants to comply with the wishes of social referents. One may believe, for example, that his/her coworkers think that he/she should use

voice-mail, and that complying with the wishes of the coworkers is relatively unimportant. Subjective norm can be expressed as:

$$SN = \sum nb_j \; mc_j$$

Perceived behavioral control (PBC) is a function of control belief and perceived facilitation. A control belief (cb) is the persons perception of the availability of skills, knowledge, resources, time, and opportunities. Perceived facilitation (pf) is the persons assessment of the importance of those resources to performing the behavior. For example, one may feel that it is hard for him/her to find a computer to use a spreadsheet package, but availability of a computer is important for using it. Perceived behavioral control can be expressed as:

$$PBC = \sum cb_k \; pf_k$$

Compared to the Theory of Reasoned Action, which has a longer history, the Theory of Planned Behavior has been received relatively few empirical tests. Schifter and Ajzen (1985) applied the Theory of Planned Behavior to the prediction of weight loss behavior. Ajzen and Madden (1986) applied the theory to investigate students behaviors such as class attendance and getting a good grade, and found that perceived behavioral control was a significant predictor of intention. In the information systems context, researchers have recently started to pay their attention to applying the theory for explaining IT usage behavior. Mathiesons (1991) experimental study showed that perceived behavioral control had a significant effect on behavioral intention. Taylor and Todds (1995) research, based on student data collected from potential users of a computer resource center, revealed that the decomposed Theory of Planned Behavior provides a fuller understanding of behavioral intention, when compared with the Technology Acceptance Model and the original model of Theory of Planned Behavior.

2.3. Technology Acceptance Model

The Technology Acceptance Model (Davis 1989, 1993; Davis et al., 1989), based on the Theory of Reasoned Action (Fishbein and Ajzen, 1975), has been developed to help to explain and predict user acceptance of end-user computing technologies. The Technology Acceptance Model posits that two beliefs, perceived usefulness and perceived ease of use, determine IT acceptance and usage. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance, and perceived ease of use is defined as the degree to which a person believes that using a particular system would be free of

effort (Davis 1989, p. 320).

In the Technology Acceptance Model, IT usage behavior (B) is predicted by behavioral intention to use the IT (BI), which is, in turn, jointly determined by the persons attitude toward using the IT (A) and perceived usefulness (U), with relative weights estimated by regression. Attitude (A), which reflects positive or negative feelings about using the IT, is a weighted function of perceived usefulness and perceived ease of use (E). Finally, perceived usefulness is influenced by perceived ease of use. These relationships can be stated formally as below:

$$BI = w_1 A + w_2 U$$
$$A = w_3 U + w_4 E$$
$$U = w_5 E.$$

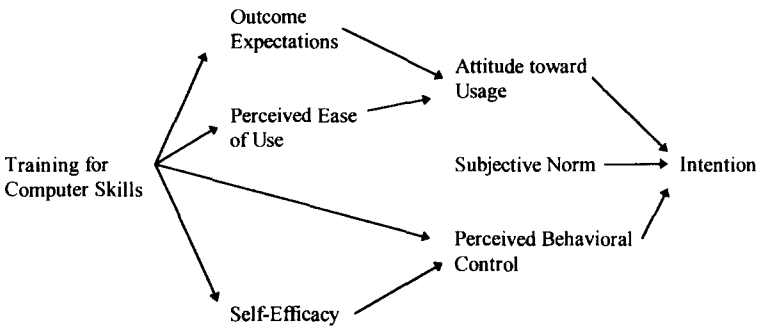
There has been empirical studies which supported the Technology Acceptance Model in the information systems area. Davis et al. (1989) found that perceived usefulness strongly influenced intention to use software, and attitudes only partially mediated the effects of these beliefs on intentions. Other studies also showed that the model has reasonable explanatory power (Davis, 1989; Davis, 1993; Mathieson, 1991). The model is relatively simple and specific, but is less comprehensive than the Theory of Planned Behavior.

3. Conceptual Model and Research Hypotheses

3.1. Conceptual Model

This research employs the Theory of Planned Behavior as a basic model to predict intention to use IT, and combines the model with the concepts of self-efficacy, outcome expectations, and perceived ease of use, which are assumed to be affected by training for computer skills (Figure 1). The Theory of Planned Behavior suggests that attitude toward using IT, subjective norm, and perceived behavioral control determine behavioral intention. These determinants of intention are not independent of outcome expectations and self-efficacy, which are also predictors of human behavior in the Social Cognitive Theory. Outcome expectations, which are similar to perceived usefulness, should be associated with attitude toward using IT, and self-efficacy determines perceived behavioral control. As the Technology Acceptance Model explains, perceived ease of use should be related to attitude toward using IT.

<Figure 1> Conceptual Model



Consistent with the Decomposed Theory of Planned Behavior (Taylor and Todd, 1995), the conceptual model does not include behavioral beliefs, normative beliefs and control beliefs which are often elicited by a sample of group, but incorporates the theoretical concepts of outcome expectations, self-efficacy, and perceived ease of use. This makes the model more generally applicable to various situations. Although the theoretical concepts are not a complete set of variables associated with the determinants of intention in the Theory of Planned Behavior, incorporation of such concepts helps to understand how external variables, such as training for computer skills, can be related to the Theory of Planned Behavior, without eliciting salient beliefs which are situation specific. Instead of assessing the effects of user training on the belief-based measures of attitude and perceived behavioral control, it is possible to examine those effects on self-efficacy, outcome expectations and perceived ease of use. Since a training program is often designed so that users can acquire computer-related skills, training is also directly associated with perceived behavioral control in the model. As the Technology Acceptance Model does not contain a direct relationship between external variables such as user training and attitude toward IT usage, such a relationship is not shown in the model in Figure 1.

3.2. Research Hypotheses

As the Theory of Planned Behavior postulates, there are three conceptually independent variables influencing intention to use an IT: attitude toward the behavior, subjective norm, and perceived behavioral control. In general, the more favorable

attitude toward using an IT a person has, the stronger intention to use the IT. The more favorable subjective norm with respect to using an IT a person has, the stronger the persons intention to use the IT. Finally, the greater the perceived behavioral control over using an IT, the stronger intention to use the IT. Previous empirical tests of the Theory of Reasoned Action and the Theory of Planned Behavior showed that, though the effect of subjective norm was not consistent, attitude and perceived behavioral control were positively correlated with behavioral intention (e.g., Ajzen and Madden, 1986; Schifter and Ajzen, 1985). Accordingly, it is hypothesized that:

Hypothesis 1: *Attitude toward using an IT is positively related to intention to use the IT.*

Hypothesis 2: *Subjective norm with respect to using an IT is positively related to intention to use the IT.*

Hypothesis 3: *Perceived behavioral control over using an IT is positively related to intention to use the IT.*

Since outcome expectations are behavioral beliefs that a particular behavior will result in favorable or unfavorable outcomes, they should be positively correlated with attitude toward the behavior. Outcome expectations about using an IT are analogous to perceived usefulness in the Technology Acceptance Model (Davis, 1989; Igbaria and Iivari, 1995). A person who believes that using a particular IT leads to mostly positive outcomes will possess a favorable attitude toward using the IT. One the other hand, if a person believes that mostly negative outcomes will result from using the IT, he/she will have a negative attitude toward it. Thus, we hypothesize that:

Hypothesis 4: *Outcome expectations about using an IT are positively related to attitude toward using the IT.*

The Technology Acceptance Model suggests that perceived ease of use influences attitude toward the behavior (Davis et al., 1989). If an IT can be used with less efforts, in general, people will have more favorable attitude toward using the IT. A set of belief dimensions related to attitude can be derived from perceived characteristics of innovation (Hoffer and Alexander, 1992; Moore and Benbasat, 1991). Perceived complexity, one such characteristic of an innovation, represents the degree to which an innovation is perceived to be difficult to understand, learn, and operate (Rogers, 1983). As perceived complexity decreases, attitude toward IT usage becomes more favorable (Tornatzky and Klein, 1982). Perceived ease of use, as a belief

dimension analogous to perceived complexity, should also be correlated positively with attitude toward using the IT (Taylor and Todd, 1995). Thus, we hypothesize that:

> Hypothesis 5: *Perceived ease of use is positively related to attitude toward using the IT.*

Control beliefs, which determine perceived behavioral control, reflect facilitating conditions and self-efficacy. Taylor and Todd (1995) decomposed control beliefs into self-efficacy, resource facilitating conditions and technology facilitating conditions. Resource conditions refer to time and money, and technology conditions refer to technology compatibility issues that may constrain IT usage. Ajzen and Madden (1986) point out that self-efficacy beliefs are very similar to perceived behavioral control. Individuals, with higher computer self-efficacy, i.e., greater ability to use computers, will perceive that they have greater control over using computers. Users with greater confidence in their ability to use an IT will anticipate fewer obstacles or impediments to using the IT. Thus, we hypothesize that:

> Hypothesis 6: *Self-efficacy is positively related to perceived behavioral control over using the IT.*

In the Technology Acceptance Model, perceived ease of use and perceived usefulness are influenced by external variables such as system features (e.g., menus, icons, touch screens), training, documentation, and user support consultants (Davis et al., 1989). An examination of the effects of these external factors on perceived ease of use and usefulness may clarify the reason why a particular system is accepted or unaccepted by potential users. Outcome expectations are analogous to the perceived usefulness construct (Davis, 1989). Training for computer skills is considered, thus, as an external variable influencing perceived ease of use and outcome expectations. People who understand how to use a particular system will find it easier to use it, because less efforts are required for the trained people. And they also understand how the system can be utilized to improve task performance. Thus, we hypothesize that:

> Hypothesis 7: *Training for computer skills will increase perceived ease of use of the trainees.*

> Hypothesis 8: *Training for computer skills will increase perceived outcome expectations of the trainees.*

Self-efficacy may change over time, because the efficacy judgment changes as new information and experiences are acquired (Gist and Mitchell, 1992). Increased training programs may strengthen confidence in one ability to use computers in his/her work (Gist, et al., 1989). Compeau and Higgins (1995) found that people who received behavior modeling training had higher self-efficacy than people who received traditional, lecture-based training in Lotus 1-2-3. By the same token, people who participate in an effective IT training program will have higher self-efficacy after the training. Hence, it is hypothesized that:

Hypothesis 9: *Training for computer skills will increase self-efficacy of the trainees.*

Training for computer skills is considered as an external variable influencing perceived behavioral control in the Theory of Planned Behavior. People may not be willing to use an IT, because they lack requisite skills, facilities, opportunities or funds. An IT training program may be designed to eliminate a portion of potential users barriers to using the IT by changing their skills and knowledge. Potential users may increase their ability to use an IT by learning how to operate the system (Nelson and Cheney, 1987). People who acquire computer skills required to operate a system by participating in a training program, therefore, will perceive higher control over using it after the training. Thus, it is hypothesized that:

Hypothesis 10: *Training for computer skills will increase perceived behavioral control over using the IT.*

4. Research Methodology

4.1. Subjects and Experimental Procedures

A laboratory experiment was conducted using 63 student subjects from undergraduate classes including data communications, systems analysis and design, and management information systems at a university in Korea. The IT used for this study was the universitys electronic mail (E-mail) system, and all variables in this study should be interpreted by presuming use of the system. Thirty-two students were randomly selected to receive a high degree of training as an experimental group, and the other 31 subjects received a low degree of training as a control group. The two groups were not significantly different in terms of possession of facilities for using E-mail, such as personal computer, modem and telephone ($t = -0.51$, $p = 0.611$)

and number of computer-related courses taken ($t = 0.42$, $p = 0.673$). And they had no opportunities for using the universitys E-mail system before.

In order to measure the effects of training for computer skills, a pretest-posttest design was employed as below:

Time	:	1st week	2nd & 3rd week	4th week
Experimental group	:	O_1	X	O_2
Control group	:	O_1		

The experiment lasted for a period of four weeks during which the subjects were not told about the hypotheses being tested. Both the control group and the experimental group initially received a minimal level of E-mail training for the first week, i.e., a five minute lecture about how to use the universitys E-mail system. After this short explanation about how to read and send E-mail messages, the subjects of both groups completed a questionnaire (O1) prepared to measure the variables of the study. Since the subjects had an average of six computer-related course experiences, there is every reason for them to understand how E-mail can be used in organizations.

Only the experimental group received an additional training (X), and responded to a post training questionnaire (O2) containing the same items as the initial questionnaire. The subjects were required to write their identification numbers to compare O2 with O1. The questionnaire was not distributed to the subjects of the control group during the fourth week. No opportunities were available, except for the training in this study, for students to learn and use the universitys E-mail system on campus. The high level of training (X) consisted of a half-hour demonstration of E-mail use in classes and an individualized hands-on practice on the E-mail system. It was a course requirement to the students of the experimental group to participate in this hands-on training and an E-mail practice test, but it was not to respond to the questionnaires. It took about two weeks for the subjects of the experimental group to finish the hands-on E-mail practice. During each subject was using the E-mail system for about 25 minutes, a two-page E-mail manual and an assistant were available to help his/her practice. The tasks the subjects practiced include connecting to a host computer by modem, reading new and old messages, mailing a message, transferring a file prepared by a word processor in a personal computer to the host computer, downloading a file in the host computer to a personal computer and reading the file, and so on. Since the host computer is running the UNIX operating system, the subjects also had to comprehend basic UNIX commands concerning saving, listing, and deleting files. While a subject is working on the E-mail system, a few other

subjects had opportunities for watching what the subject is doing. When each subject finished the practice, he/she took an E-mail practice test, which included downloading a message from a host computer, and preparing a return message using a word processor and uploading to the host computer to send it to the destination. It took about 3 to 5 minutes for each subject to complete the assignment. During the fourth week, the subjects in the experimental group responded to the second questionnaire.

4.2. Variables and Measurement

Based on a review of the relevant literature, the questionnaire items were prepared and translated into Korean. Previously used items were adapted to reflect the situations of the present study, and a few students with the same academic background as the subjects checked if they could understand the questionnaire. The values of -3 to 3 were assigned to the scales (bipolar scoring) for intention, attitude, subjective norm, perceived behavioral control, outcome expectations, and ease of use. Each of the measures used in the study is described in detail below.

Development of the scales to measure behavioral intention, attitude, subjective norm and perceived behavioral control were based on the suggestions provided by Ajzen and Fishbein (1980), Ajzen (1985, 1991), and Trice and Treacy (1988). Intention to use E-mail this year, particularly the universitys E-mail system, was measured by summing over three items: willingness to be a frequent user, an active user, and a user rather than a nonuser. Attitude toward using E-mail was obtained by summing over a set of four evaluative scales: useful-useless, wise-foolish, like-dislike, and helpful-not helpful. Subjective norm was measured by summing over two items: the people who influence me would think that I should use E-mail; the people who are important to me would think that I should use E-mail. Perceived behavioral control over using E-mail was obtained by summing over three questions concerning the degree to which subjects have any problem with using the universitys E-mail system, can use the system easily, and feel in complete control over using the system.

A four-item measure of outcome expectations was developed based on the measures of Davis (1989) usefulness and Compeau and Higgins (1995) outcome expectations about using a computer. The expected consequences that might be associated with using E-mail include easier communication with professors, easier communication with classmates, asking questions to a professor more conveniently, and improved course performance. Respondents were asked to indicate how likely they thought it was that each of these outcomes would result from using E-mail.

The construct of ease of use was operationalized based on the work of Taylor and Todd (1995). The items for this construct were concerned with difficulty of learning the system because of complexity; difficulty of using computers, modem and software

related to the system; and level of knowledge required to use the system. The first two items were reverse scales.

For the self-efficacy construct, the measure developed by Compeau and Higgins (1995) was used. The respondents were asked to indicate whether they could use the universitys E-mail system under a variety of conditions. For each condition that the subjects answered that they could use the system (yes response), they rated their confidence by circling a number from 1 to 10, where 1 indicates Not at all confident, 5 indicates Moderately confident, and 10 indicates Totally confident, The conditions include: if there was no one around to tell me what to do as I go; if I had only the system manuals for reference; if I had seen someone else using it before trying it myself; if I could call someone for help if I got struck; if someone else had helped me get started; if I had a lot of time for using the system; if I had just the built-in help facility for assistance; and if someone showed me how to do it first. The responses on the confidence scale were scored by counting 0 for not being able to use the system (No response) and 10 for Totally confident, thus encompassing both self-efficacy magnitude and strength.

Training for computer skills was operationalized by the nature of experimental treatment. A minimal level of training was provided to inform the subjects of the procedures for using the system. A high level of hands-on training to teach the subjects of the experimental group how to use the E-mail system involved watching E-mail demonstration and hands-on practice, and user training for computer skills in the present study refers to this additional high level of training (X), which was hypothesized to affect self-efficacy, outcome expectations, perceived ease of use and perceived behavioral control.

5. Results

5.1. Descriptive Statistics

A profile of the subjects participated in the study is shown in Table 1. More than half of the subjects were female and under the age of 24. Most of the subjects were juniors and seniors majoring in management information systems or business administration. Eighty-four percents of the subjects reported that they had no prior experience with E-mail, and 46 percents reported that they did not have facilities necessary for using E-mail at home.

Means and standard deviations of the variables are summarized in Table 2. The variables seem to have positive means and have sufficient variations for examining

their relationships. The positive means of outcome expectations and attitudes indicate that students appear to believe that using E-mail is beneficial, and they have

<Table 1> Profile of the Subjects

	Frequency	Percent
(a) Sex		
Male	27	42.9
Female	36	57.1
(b) Age		
20-21	5	7.9
22-23	29	6.0
24-25	7	11.1
26-28	22	35.0
(c) Department		
MIS	47	74.6
Business Admn.	14	22.2
Other	2	3.2
(d) Year		
Sophomore	5	7.9
Junior	22	34.9
Senior	36	57.1
(e) Prior E-mail Experience		
Yes	10	15.9
No	53	84.1
(f) Possession of Facilities for E-mail At Home		
Yes	34	54.0
No	29	46.0

favorable attitudes toward using E-mail. Similarly, they generally think that people who are important to them expect them to use E-mail, and tend to have a certain degree of self-efficacy and perceived behavioral control.

5.2. Reliability and Validity of the Measures

The reliability of the measures are shown in Table 3. A magnitude of 0.5 to 0.6

for the alpha coefficients is sufficient in the early stages of basic research, but a value greater than 0.8 is more desirable (Nunnally, 1978). Each item in Table 3, except for an item for ease of use, is highly correlated with its corresponding total,

<Table 2> Descriptive Statistics (n=63)

Variable	Possible Range	Mean	Standard Deviation
Outcome Expectations	(-12, 12)	6.27	3.87
Ease of Use	(-6, 6)	0.74	2.95
Self-Efficacy	(0, 80)	58.20	15.31
Attitude	(-12, 12)	7.47	3.71
Subjective Norm	(-6, 6)	1.66	2.68
Perceived Behavioral Control	(-9, 9)	3.17	4.24
Intention	(-9, 9)	4.73	3.23

and all variables possess sufficient reliability measured by Cronbachs alpha. An item for ease of use with a low item-to-total correlation of 0.07 was eliminated, resulting in an alpha coefficient of 0.74.

A factor analysis for all items was conducted to assess the construct validity of the variables in the study (Table 4). To decide the number of factors to extract, the Kaiser criterion, which suggests retention of factors with eigenvalues greater than one, was used. Six factors emerged from the varimax rotation explained 80.28% of the total variance. For a factor loading to be significant, it should exceed 0.5 (Hair, et al., 1992). Each item in Table 4 loaded very significantly on only a single factor it was supposed to measure.

5.3. Hypothesis Testing

Multiple regression models were formulated to test hypothesis 1 to 6. The regression, reliability and factor analyses were done by using a total of 63 questionnaire responses which consist of 32 responses obtained after hands-on training for the experimental group and 31 responses obtained after a lower level of training for the control group. Hypothesis 7 to 10 were tested by the t-test for a paired sample for the experimental group.

Table 5 presents the estimated coefficients and related statistics for the multiple regression model for predicting intention to use E-mail. The coefficient of multiple determination (R-square) for the model is 0.600, which means that 60.0% of total

variations of intention is explained by attitude, subjective norm and perceived behavioral control. The data analysis supported Hypothesis 1 which proposed a positive relationship between attitude toward using E-mail and intention to use it (t =

<Table 3> Cronbach's Alpha

Constructs	Items	Item-to-total correlation	Alpha Coefficient
Outcome Expectations	OE1	0.6708	0.8278
	OE2	0.6752	
	OE3	0.6503	
	OE4	0.6463	
Ease of Use	EU1	0.4549	0.7464
	EU2	0.5028	
	EU3	(0.0727)	
Self-Efficacy	SE1	0.7960	0.9446
	SE2	0.8466	
	SE3	0.8677	
	SE4	0.8937	
	SE5	0.8374	
	SE6	0.7781	
	SE7	0.6436	
	SE8	0.8141	
Attitude	A1	0.8273	0.9205
	A2	0.8118	
	A3	0.7992	
	A4	0.8493	
Subjective Norm	SN1	0.8963	0.9448
	SN2	0.8963	
Perceived Behavioral Control	PBC1	0.8559	0.9096
	PBC2	0.8298	
	PBC3	0.7819	
Intention	I1	0.9070	0.9450
	I2	0.9216	
	I3	0.8418	

3.48, p = 0.001) and Hypothesis 3 which posited that a positive relationship between perceived behavioral control and intention (t = 5.43, p < 0.001). On the other hand, the results did not support Hypothesis 2 concerning the relationship between

subjective norm with respect to using E-mail and intention to use it (t = 0.23, p = 0.812). There is a statistical basis for concluding that attitude toward using E-mail

<Table 4> Factor Loadings for Items

Items \ Factors	SE	A	OE	PBC	SN	EU
SE1: No one around to tell me	**0.73**	0.16	0.22	0.30	0.06	0.06
SE2: Manuals for reference	**0.77**	0.19	0.19	0.24	0.18	0.12
SE3: See someone else using it	**0.87**	0.12	0.10	0.16	0.11	0.15
SE4: Call someone for help	**0.86**	0.10	0.21	0.17	0.16	0.20
SE5: Help me get started	**0.88**	0.03	0.23	0.04	0.09	0.13
SE6: A lot of time to use	**0.75**	0.16	0.28	0.24	0.10	-0.01
SE7: Built-in help facility	**0.65**	0.24	-0.08	0.40	0.02	-0.22
SE8: Someone show me how	**0.85**	0.21	0.08	0.09	0.08	0.01
A1: Useful-Useless	0.15	**0.78**	0.33	0.23	0.16	0.08
A2: Wise-Foolish	0.15	**0.84**	0.34	0.06	0.02	0.06
A3: Like-Dislike	0.25	**0.78**	0.19	0.20	0.24	0.03
A4: Helpful-Not Helpful	0.21	**0.82**	0.12	0.15	0.35	-0.02
OE1: Communication - Prof.	0.32	0.30	**0.70**	0.14	0.07	0.16
OE2: Comm. - classmates.	0.25	0.18	**0.68**	0.11	0.40	-0.06
OE3: Asking questions to Prof.	0.15	0.24	**0.79**	0.10	-0.08	0.12
OE4: Improved Performance	0.20	0.29	**0.65**	0.17	0.31	-0.29
PBC1:Use without problems	0.28	0.18	0.17	**0.85**	0.06	0.12
PBC2:Use without difficulty	0.32	0.20	0.25	**0.76**	0.14	0.21
PBC3:Feel in control	0.29	0.15	0.08	**0.80**	0.16	0.17
SN1:People influencing me	0.17	0.22	0.20	0.18	**0.88**	0.08
SN2:People important to me	0.23	0.39	0.13	0.10	**0.84**	0.11
EU1:Hard to learn	0.22	0.11	0.07	0.13	0.00	**0.85**
EU2:Difficult to use	0.05	-0.01	-0.03	0.18	0.13	**0.83**
Eigenvalues	10.46	2.67	1.81	1.25	1.23	1.01
Cumulative % of explained variance	45.52	57.14	5.01	70.47	75.86	80.28

Note: SE = Self-Efficacy
A = Attitude toward usage
PBC = Perceived Behavioral Control
OE = Outcome Expectations
SN = Subjective Norm
EU = Ease of Use

<Table 5> Multiple Regression Model for Predicting Intention

Variable	Parameter Estimate	Standard Error	Standardized Estimate	t	*p*-value
Intercept	1.087	0.625	0.000		
Attitude	0.312	0.093	0.358	3.48	0.001
Subjective Norm	0.029	0.124	0.024	0.23	0.812
Perceived Behavioral Control	0.396	0.072	0.519	5.43	0.000
R-square = 0.6000					

and perceived behavioral control over using it significantly help to estimate the mean of intention to use it. We cannot say, however, that subjective norm make a significant contribution to the prediction of intentions.

Table 6 expresses the prediction of attitude toward using E-mail by a regression model containing outcome expectations and ease of use. Hypothesis 4, which posited a positive relationship between outcome expectations and attitude toward using E-mail, was supported ($t = 6.27$, $p < 0.001$), but Hypothesis 5, which proposed a positive relationship between ease of use and attitude toward using E-mail, was not supported ($t = 0.96$, $p = 0.338$). We can say that the more positive outcome expectations people have, the more favorable attitude toward using E-mail. There is insufficient information, however, to say that the easier to use the universitys E-mail system, the more favorable attitudes people are likely to have.

<Table 6> Multiple Regression Model for Predicting Attitude

Variable	Parameter Estimate	Standard Error	Standardize Estimate	t	*p*-value
Intercept	3.634	0.697	0.000		
Outcome Expectations	0.598	0.095	0.624	6.27	0.000
Ease of Use	0.120	0.125	0.095	0.96	0.338
R-square = 0.4133					

The results of multiple regression in Table 7 also supported Hypothesis 6, which posited a positive relationship between self-efficacy and perceived behavioral control ($t = 4.83$, $p < 0.001$). The variable of training in Table 7 represents the difference between a high degree of hands-on training for the experimental group and a low

degree of training for the control group. There is a statistical basis to say that the higher self-efficacy for using the universitys E-mail system, the higher perceived behavioral control over using it.

<Table 7> Multiple Regression Model for Predicting Perceived Behavioral Control

Variable	Parameter Estimate	Standard Error	Standardized Estimate	t	*p*-value
Intercept	-6.138	1.652	0.000		
Self-Efficacy	0.141	0.029	0.509	4.83	0.000
Training	2.144	0.887	0.254	2.41	0.018
R-square = 0.4154					

The results of testing hypothesis 7 to 10 are shown in Table 8. The dependent variables were measured before training for computer skills (i.e., E-mail demonstration and hands-on practice) and after the training, and the t-test was performed to assess if there were significant differences in the paired values of the variables. Hypothesis 7, which proposed that ease of use will increase as a result of training for computer skill acquisition, was supported by p-value of 0.022 (t = 2.09). Subjects tend to believe that it is easier to use the universitys E-mail system when they had a chance to receive hands-on training for using the system. Hypothesis 8 was not supported by the results of data analysis (t = 1.61, p = 0.058). Training the subjects did not result in a significantly higher degree of outcome expectations.

Hypothesis 9, which posited that training for computer skills will increase self-efficacy, was supported by the results of the t-test in Table 8 (t = 5.72, p < 0.001). Self-efficacy with respect to using the universitys E-mail system significantly increased as a result of the hands-on E-mail training. The results of the t-test also supported Hypothesis 10, which stated that training for computer skills will increase perceived behavioral control (t = 3.84, p < 0.001). It can be concluded that the hands-on training to teach how to use the universitys E-mail system has increased perceived behavioral control over using it. The results in Table 8 also showed that significant changes were not made for attitude toward using E-mail (t = 0.85, p = 0.198), subjective norm (t = 1.02, p = 0.167), and intention (t = 1.25, p = 0.110).

The results of testing hypothesis 7, 9 and 10 were consistent with those of the t-tests to compare the experimental group with the control group in terms of ease of use, self-efficacy and perceived behavioral control in Table 9. There were no

<Table 8> The Effects of Training for Computer Skill Acquisition

Variables	Types of Groups	Means	Difference	t	*p*-value (one-tailed)
Ease of Use	Before	0.53	1.06	2.09	0.022
	After	1.59			
Outcome Expectations	Before	6.34	0.84	1.61	0.058
	After	7.18			
Self-Efficacy	Before	47.46	15.96	5.72	0.000
	After	63.43			
Perceived Behavioral Control	Before	2.00	2.96	3.84	0.000
	After	4.96			
Attitude toward usage	Before	7.25	0.62	0.85	0.198
	After	7.87			
Subjective Norm	Before	1.50	0.50	1.02	0.167
	After	2.00			
Intention	Before	4.62	0.87	1.25	0.110
	After	5.50			
Test Score	Before	2.40	6.46	14.55	0.000
	After	8.87			

Note: Before = Before Hands-on Training
After = After Hands-on Training

significant differences in the values of ease of use ($t = -0.97$, $p = 0.168$), self-efficacy ($t = 1.33$, $p = 0.09$) and perceived behavioral control ($t = -0.59$, $p = 0.278$) between two groups when they were measured before the hands-on training. However, the value of self-efficacy for the experimental group, when measured after hands-on training, was greater than that of the control group ($t = -2.91$, $p = 0.002$), and the results were the same for perceived behavioral control ($t = -3.75$, $p < 0.001$) and ease of use ($t = -2.39$, $p = 0.009$). For outcome expectations associated with hypothesis 8, the results were not consistent. Though the training did not increase significantly the outcome expectations of experimental group, the subjects of the

<Table 9> Comparison Between Control Group and Experimental Group

		Means		t		*p*-value (one-tailed)	
Variables	Types of Groups	Before	After	Before	After	Before	After
Ease of Use	Control	-0.12	-0.12	-0.97	-2.39	0.168	0.009
	Experimental	0.53	1.59				
Outcome Expectations	Control	5.32	5.32	-1.02	-1.95	0.155	0.027
	Experimental	6.34	7.18				
Self-Efficacy	Control	52.80	52.80	1.33		0.094	0.002
	Experimental	47.46	63.43		-2.91		
Perceived Behavioral Control	Control	1.32	1.32	-0.59		0.278	0.000
	Experimental	2.00	4.96		-3.75		
Test Score	Control	1.77	1.77	-1.11		0.135	0.000
	Experimental	2.40	8.87		-15.37		
Number of Computer-Related Courses	Control	6.45	6.45	0.42		0.337	0.337
	Experimental	6.06	6.06		0.42		

experimental group had higher outcome expectations than those of the control group after training ($t = -1.95$, $p = 0.027$).

Performance is an important training outcome (Galletta, et al., 1995). Two types of training performance were measured to check the effectiveness of the hands-on training. The performance of a practice test after the hands-on training was measured by the time taken to finish the given assignment. Eighty-four percents of the subjects could finish the practice test in 4 minutes. And a test consisting of 10 questions about the specific commands for using the E-mail system was administered before the hands-on training and after the training. Examples of the multiple choice test items include What is the command for listing new messages arrived? and Select the command for uploading a file. The hands-on training in this study significantly increased the test score from 2.40 to 8.87 in Table 8 ($t = 14.55$, $p < 0.001$). After

training, the subjects of the experimental group understood an average of 88.7% of the questions. These results of performance tests indicate that the type and amount of hands-on training in the study were sufficient for the subjects to understand how to use the universitys E-mail system.

6. Discussion and Conclusion

The results of the present study should be interpreted with the understanding that the IT examined was a universitys E-mail system. The computer skills in the present study, thus, refer to the skills necessary for using the E-mail system. This research supports that attitude toward IT usage and perceived behavioral control help to predict user intentions. The more favorable attitudes toward IT usage people have, the greater their intentions to use it. The greater perceived behavioral control over using an IT people have, the greater their intentions. Although subjective norm was not a significant factor, the Theory of Planned Behavior appeared as a useful model for explaining user acceptance of IT. These results are similar to Taylor and Todd (1995) and Mathieson (1991).

Outcome expectations were significantly related to attitude toward IT usage. People who expect positive outcomes from using an IT tend to have more favorable attitude toward it. Unlike the previous studies (e.g., Davis, 1989; Kleintop, et al., 1996) focused on the Technology Acceptance Model, the study results did not support that perceived ease of use was related to attitude toward usage. Self-efficacy was positively related to perceived behavioral control. People who believe that they have greater ability to use an IT are more likely to think that there are no interferences with their control over using the IT.

Training for computer skills led to increases in perceived ease of use, self-efficacy and perceived behavioral control. After hands-on training, the subjects perceived that it would be easier to use the universitys E-mail system, believed that they had greater ability to use the system, and felt less impediments to using the system. Consistent with Igbaria, et al.s (1995) field survey, user training was positively related to perceived ease of use. Compeua and Higgins (1995) found that behavioral modeling training , which provided the subjects with an opportunity for observing someone else operating a software package, developed higher perceptions of computer self-efficacy than subjects who receive nonmodeling training. The results of this experimental study, on the other hand, showed that the hands-on training for potential users increased their perceived behavioral control and self-efficacy. This implies that user training for computer skills may directly change perceptions about their abilities to use

an IT and control over using it, which, in turn, help to predict their intentions.

A possible explanation for the reason why user training did not lead to changes in outcome expectations in this study is that the user training was not directed toward changing attitudes or outcome expectations, but it focused on only computer skill acquisition, i.e., teaching how to use the system to read and send E-mail messages. Perhaps, another reason is that, after training, the subjects thought that the universitys E-mail system was not useful as they expected, because it was not convenient to send messages in Korean and the professors and students in other classes were not using E-mail.

Although training for computer skills did not appear to be associated with outcome expectations, it influenced indirectly user intentions in the sense that it led to increases in self-efficacy, perceived behavioral control and perceived ease of use. The increases in those factors are the benefits of user training for computer skills, and reflects the success of a training program. No other factors than training seemed to cause those changes in this study. Before the hands-on training, there were no statistically significant differences in ease of use, outcome expectations, self-efficacy, perceived behavioral control, test score and number of computer-related courses between the two groups. Perceived behavioral control, along with attitude toward usage, contributed to predicting user intentions. Hence, it is valuable to invest in user training, particularly a type of hands-on training for computer skill acquisition employed in this study, to improve user acceptance of an IT.

Although the results of this experiment might not be generalizable to other groups of people and settings, it is possible to make more causal inferences on the effects of user training than other field survey studies (Igbaria, et al., 1995). Future studies may plan a different experimental design and compare the effects of different training methods on the variables of interest. Furthermore, an alternative research model based on a particular theory may be developed to test the direct and indirect effects of training and other external variables such as organizational support and individual differences. In addition to studies comparing different theoretical models to predict IT usage and field studies to test proposed research models, much research is still needed to clarify causal effects of different types of user training.

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