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# An Empirical Examination of the Relationship Between Computer Self-Efficacy and Computer Training Outcomes

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## ABSTRACT

This study examines the relationships among computer self-efficacy and two key computer training outcomes, namely trainee reactions and learning performance, as well as the relationship between learning performance and reactions to training. Reactions to training were examined with respect to perceived ease of use and perceived usefulness. Similarly, learning performance was examined in terms of near-transfer and far-transfer learning. The results of a field experiment revealed that computer self-efficacy had significant effects on perceived ease of use and far-transfer learning only. While the results provided no support for the impact of near-transfer learning on training reactions, they provided partial support for the impact of far-transfer learning. Research and practical implications are provided and discussed.

## INTRODUCTION

Computing skills of end users have been correlated with end user performance and the success of information systems [7]. As a result, businesses are striving to provide effective computer training in which end users learn and master the skills necessary to use computer systems effectively [17,20]. Thus, computer training is regarded as an issue of great importance in information systems (IS) research and practice which deserves further investigation and better understanding.

Computer training has attracted extensive research attention [5,10,12,16,18,20]. The objective of most studies has been to understand factors affecting the effectiveness of computer training [7,16,18]. From this line of research, computer self-efficacy (CSE), one's confidence in his/her computing skills, has emerged as a reliable determinant of various outcomes associated with computer training [5,12,20]. However, two important issues have been overlooked in past research. First, while theories of learning identify near-transfer and far-transfer learning as two types of learning through which people learn new skills, most prior studies have not utilized this distinction in evaluating learning performance in computer training [6,10]. Second, although trainees' reactions represent an important criterion for evaluating training effectiveness [15], very few studies have examined reactions as an outcome of computer training.

The present study contributes to the ongoing computer training research by addressing the limitations delineated above. Accordingly, this study tests relationships among the following variables: CSE, perceived ease of use, perceived usefulness, near-transfer learning, and far-transfer learning.

## THEORETICAL BACKGROUND

### Self-Efficacy

Self-efficacy refers to people's confidence in their abilities to organize and execute required skills to perform a behavior [2]. The definition of self-efficacy underscores that self-efficacy is not concerned about the specific skills that individuals may possess, rather it is concerned about whether people have confidence in their abilities to use whatever skills they may have to perform a behavior successfully.

Social cognitive theory (SCT) [2,11] suggests that self-efficacy influences human behavior by influencing: (1) choices of behaviors that people make, (2) the effort and persistence one is willing to expend on a task, (3) emotional reactions to difficult or challenging behaviors, and (4) goal setting. SCT postulates that individuals form their efficacy beliefs based on the information they receive from: (1) past performances, (2) behavioral modeling or observing others perform similar tasks, (3) verbal persuasion and feedback, and (4) the emotional state of an individual such as anxiety or stress.

### Computer Self-Efficacy

Since self-efficacy is a dynamic construct that can vary across domains [6,24], the concept of self-efficacy has been extended to various domains including computing. Thus, computer self-efficacy (CSE) refers to people's perceptions about their abilities to use a computer successfully [5]. The CSE construct has been investigated as an antecedent to many computer-related behaviors [e.g. 5,12,20]. For instance, CSE was found to have a negative effect on computer anxiety and a positive impact on perceived ease of use and computer use [14,19].

In the context of computer training, Compeau and Higgins [5] examined the impact of CSE on learning performance of two computer applications (Lotus and WordPerfect) and found that CSE had a significant effect on learning performance of the two applications. Similarly, subjects who scored higher on a measure of CSE administered before training demonstrated higher learning performance than those who had low CSE scores [12].

### Training Effectiveness

Kirkpatrick [15] suggests that effectiveness of any training program depends on achieving four types of outcomes: (1) reactions, relates to trainees' feelings and attitudes after training, (2) learning, pertains to whether participants learned and mastered the knowledge presented in training, (3) behavior, concerns the extent to which the newly learned knowledge is being applied on the job, and (4) results, involve evaluating the impact of training on organizations in quantitative terms such as reduced costs, improved quality of work, and increased quantity of work.

While Kirkpatrick's framework remains the most widely used model of training effectiveness, very few, if any, studies have utilized this model in evaluating computer-training outcomes. In this study, we focus on examining the first two groups of outcomes: reactions and learning performance. Based on computer training studies [e.g., 12,20], the reactions examined in this study include perceived ease of use and perceived usefulness. Likewise, learning performance was examined in terms of near-transfer and far-transfer learning. In addition, we examine the pattern of relationships among these two types of computer training outcomes.

## RESEARCH HYPOTHESES

### Perceived Ease of Use

Perceived ease of use refers to the degree to which one believes that using or learning a system would be effortless [8]. The ease of use concept was introduced in the technology acceptance model (TAM) [8,9]. According to TAM, perceptions of ease of use of a target system represent one of the two direct determinants of system acceptance and use.

While the relationship between CSE and perceived ease of use has attracted a considerable attention [19], especially in the systems adoption literature, it received little attention as a computer training outcome. For instance, a positive relationship has been found between general CSE and perceived ease before training and after a 4-week training program [13].

**H1:** Computer self-efficacy will have a positive effect on perceptions of ease of use.

### Perceived Usefulness

Perceived usefulness refers to the degree to which a person believes that using a system would enhance one's job performance [8]. It represents the second determinant of IS acceptance as suggested by TAM. With respect to computer training, Yi and Davis [20] examined the impact of retention enhancement intervention on perceived usefulness and other training outcomes. Their results showed that neither immediate nor delayed comprehension had any significant correlation with perceived usefulness. Nevertheless, as pointed out earlier, Compeau and Higgins [5] found mixed results about the relationship between general CSE and performance-related outcome expectations. Accordingly, the relationship between CSE and perceived usefulness remains ambiguous and deserves additional examination. Thus, it is believed that general and software-specific CSE beliefs will impact perceived usefulness.

**H2:** Computer self-efficacy will have a positive effect on perceived usefulness.

### Near-Transfer and Far-Transfer Learning

Transfer of learning refers to how past or current learning is applied or adapted to similar or novel situations [18]. Thus, learning that cannot be transferred or applied to situations that are different from the learning context is known as near-transfer learning. Conversely, learning that can be extended to novel situations that are different from the training environment is known as far-transfer learning. The theoretical basis of near- and far-transfer learning is rooted in the assimilation theory of learning (ATL) [1].

Unlike general learning performance in computer training [5,7,12], near- and far-transfer learning of computer skills attracted little attention in past research. Davis and Bostrom [10] found that the instruction-based training resulted in better performance in the near-transfer tasks than the exploration training. For far-transfer tasks, their results revealed non-significant differences between training approaches. Likewise, Simon et al. [18] found that behavioral modeling training resulted in better performance in near-transfer and far-transfer tasks than other training approaches.

**H3:** Computer self-efficacy will have a positive effect on near-transfer learning.

**H4:** Computer self-efficacy will have a positive effect on far-transfer learning.

In the formulation of TAM, Davis [21] suggested that ease of learning of a system plays a crucial role in influencing perceptions of ease of use toward that system. That is, holding all other factors constant, the more a system is perceived to be easier to use, the more favorable evaluations (in terms of usefulness and ease of use) it will garner from potential users. Accordingly, the following to hypotheses are suggested.

**H5:** Near-transfer learning will have a positive effect on perceptions of usefulness and ease of use.

**H6:** Far-transfer learning will have a positive effect on perceptions of usefulness and ease of use.

## RESEARCH METHOD

### Subjects and Procedure

Data were collected from 78 undergraduate students enrolled in two elective computer information systems courses at a Midwestern university. Sixty-four percent of the subjects (n=50) were males and thirty-four percent were females (n=28). The mean age of the subjects was 23.06 years (SD=2.77). Almost all subjects were either juniors or seniors. Responding to a question about their prior Unix experience, subjects indicated that they had a little experience with it.

The study used a field experiment to test the hypothesized relationships. Prior to training, subjects completed a survey questionnaire containing measures of CSE and some background questions. Then, subjects were given training on the file and directory structures in the Unix environment. Next, subjects took a comprehension test covering the skills and concepts covered in training and completed a questionnaire regarding perceptions of ease of use about Unix. Finally, consistent with prior studies [e.g., 19], perceived ease of use was measured two weeks after the training presentation.

### Measurements

CSE was measured by six items from a widely-used and well-validated instrument [8]. Items on this instrument asked subjects to rate their ability to perform a computing task using unfamiliar software. Responses were recorded on a10-point interval scale with end points of 1 (*not at all confident*) and 10 (*totally confident*). Perceived ease of use was measured by three items from Davis's [9] perceived ease of use instrument. The three items asked respondents to indicate the extent of their agreement or disagreement with statements concerning the usefulness of Unix. Responses were recorded on a seven-point Likert-type scale with end points being 1 (*strongly disagree*) and 7 (*strongly agree*). Similarly, four items from Davis's [9] instrument were used to measure perceived usefulness. Items on this instrument asked respondents to indicate the degree to which they agree or disagree with statements about the ease of use of Unix. Responses to these items were recorded on a seven-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

For near-transfer learning**,** simple or near-transfer tasks are used to measure rote or near-transfer learning [10,18]. Near-transfer tasks are characterized as being standard tasks (similar to the tasks presented in training). Accordingly, a five-item computer learning objective test was used to measure near-transfer learning. The near-transfer skills included in the learning test were: (1) renaming a file, (2) moving to a parent directory, (3) creating a new sub-directory, (4) listing the contents of the current directory, and (5) deleting a file. Each question was worth 3 points. Completely correct answers were given 3 points and completely incorrect answers received 0 points. Partial credit was given for answers that were neither entirely correct nor totally incorrect. As such, possible scores on near-transfer knowledge have a possible range of 0 to 15.

Complex tasks are normally used to measure far-transfer learning [13]. Performing a far-transfer task involves combining two or more near-transfer tasks [18]. Thus, far-transfer learning performance was measured by a four-item learning objective test. The far-transfer tasks included in the tests were similar to the tasks used in other studies [e.g., 10] and included: (1) creating a multi-level directory structure, (2) deleting a non-empty sub-directory, (3) copying a file from one directory to another directory in a different location in the directory structure, and (4) renaming files in a sub-directory. Each question was worth 6 points. The grading procedure used with near-transfer learning test was followed in grading the far-transfer learning test, with different grades awarded to correct, partially correct, and incorrect answers. As such, scores for far-transfer learning have a possible range of 0 to 24.

## RESULTS

Table 1 presents the means, standard deviations, and correlations among the research variables. Most of the correlations were significant except for the correlation between the perceived usefulness and CSE as well as near transfer learning. At the same time, all the significant correlations were well below the 0.8 threshold to suspect the presence of multicollinearity [3].

Regression analysis was used to test the research hypotheses and the results of the regression testing are presented in Table 2. The results provide support for the influence of computer self-efficacy on perceived ease of use (beta = 0.496, $p = 0.000$) and far-transfer learning (beta = 0.537, $p = 0.000$), supporting H1 and H4. Whereas CSE demonstrated non-significant effects on perceived usefulness and near-transfer learning Thus, H2 and H3 were not supported. The results also show that only far-transfer learning had a significant effect on perceived ease of use, providing partial support for H6. H5 which posited that near-transfer learning would positive effects on perceived usefulness and perceived ease of use was not supported.

## DISCUSSION

This study extended previous research by examining the impact of CSE on perceived ease of use, perceived usefulness, near-transfer learning, and far-transfer learning. It also examined the relationship between learning performance and perceptions of usefulness and ease of use. The results provide moderate support for the hypothesized relationships.

Consistent with previous studies [e.g. 13,14,19], the results showed that general CSE has a significant positive effect on perceived ease of use, supporting H1 which suggested that CSE would have a positive effect on perceived ease of use. However, H2, which predicted that CSE would have a positive effect on perceived usefulness, was not supported. However, given that previous studies that CSE had either a small or a non-significant negative [14] effect on perceptions of usefulness, this finding is not surprising. The timeframe in which perceived usefulness was measured in this study offers a plausible explanation for this unexpected finding. Since perceptions of usefulness in this study were measured two weeks after training, it is plausible that a 2-week period was not long enough for subjects to fully explore the system and discover its functionality and potential to improve their course work.

H3 predicted that CSE would have a positive effect on near-transfer learning. The results did not support this hypothesis. However, this finding is consistent with the assimilation theory of learning [1] which indicates near-transfer learning requires recalling concepts from memory and applying these concepts to similar situations and far-transfer learning requires not only recalling concepts from memory but also manipulating these concepts to perform more complex tasks in novel situations.

Consistent with the assimilative learning theory and social cognitive theory, the results did not provide support for H4 which suggested that CSE would have significant effects on far-transfer learning. The assimilative learning theory [1] suggests that meaningful (i.e., far-transfer) learning occurs when the learner understands the new knowledge and is able to recall the new knowledge and apply it in a correct manner to achieve the desired objective. Likewise, social cognitive theory [2] suggests that competent and successful performance requires the presence of not only skills but also high efficacy beliefs to use these skills effectively. Furthermore, these findings provide support for Noe's [17] assertion that trainees are more likely to transfer the learning they acquired in training when they have more confidence in the skills they learned (i.e. high self-efficacy beliefs).

This study provides valuable implications for research and practice. For research, as described earlier, this study attempted to shed light on two issues overlooked in previous research. First, the study took a broader approach to evaluating effectiveness of computer training by employing two key training outcomes (reactions and learning performance) identified in Kirkpatrick's [15] model of training effectiveness. Drawing on past research, reactions were examined with respect to perceived ease of use and perceived usefulness. Second, unlike most past studies, this study evaluated two types of learning (near-transfer and far-transfer) as indicators of learning performance.

From a practice perspective, the study underscored the important role that CSE plays in achieving certain types of training outcomes. Accordingly, any organizational attempts to boost trainees' CSE beliefs prior to training could be useful for achieving desired computer training outcomes and fulfilling training objectives. Past studies have shown that CSE beliefs can be enhanced through behavior modeling [12], organizational support [14], induced conception of ability [16], and prior experience [14].

The study also provides some implications for enhancing specific types of learning performance. Cormier and Hagman [6] suggest a trade-off between training for rapid acquisition of skills and training for transfer of skills. They maintain that training designed for rapid acquisition should involve more time spent on a few and similar examples. In contrast, training for skill transfer should focus on highlighting diverse tasks and situations for which the presented skills can be used. This study demonstrated how the two types of learning are influenced by CSE. Thus these results could be useful for designing training to maximize a specific type of learning.

In the broader context, our results may have implications for enhancing IS acceptance and usage. Perceived ease and perceived usefulness are considered as the primary determinants of IS acceptance. The results revealed that CSE had a strong effect on perceived ease of use. These results appear to indicate that unlike perceived ease of use, perceived usefulness may not be greatly affected by manipulating CSE beliefs. This suggests that other factors may be more influential in influencing

*Table 1. Means, Standard Deviations, and Correlations*

| Variable | Mean | S.D. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| Computer self-efficacy | 40.63 | 11.62 | -- | | | | |
| Perceived ease of use | 15.26 | 4.64 | 0.49** | -- | | | |
| Perceived usefulness | 19.62 | 6.38 | 0.09 | 0.62** | -- | | |
| Near-transfer learning | 10.82 | 2.74 | 0.20 | -0.02 | 0.03 | -- | |
| Far-transfer learning | 15.79 | 5.45 | 0.53** | 0.30** | 0.10 | 0.36** | -- |

*** $p < 0.01$*

*Table 2. Results of Regression and Hypotheses Testing*

| *Hypothesis* | *Indeped. Variable* | *Depend. variable* | *R2* | *Beta* | *T* | *Sig.* | *Result* |
|---|---|---|---|---|---|---|---|
| H1 | CSE | PEOU | 0.246 | 0.496 | 4.809 | 0.000 | Supported |
| H2 | CSE | PU | 0.008 | 0.09 | 0.763 | 0.448 | Not supported |
| H3 | CSE | NTL | 0.040 | 0.199 | 1.710 | 0.092 | Not supported |
| H4 | CSE | FTL | 0.288 | 0.537 | 5.346 | 0.000 | Supported |
| H5 | NTL | PU<br>PEOU | 0.001<br>0.010 | 0.032<br>0.102 | 0.276<br>0.893 | 0.783<br>0.375 | Not supported |
| H6 | FTL | PU<br>PEOU | 0.000<br>0.091 | -<br>0.017<br>0.302 | -<br>0.146<br>2.762 | 0.884<br>0.007 | Partially supported |

*CSE: computer self-efficacy; PEOU: perceived ease of use; PU: perceived usefulness; FTL: far-transfer learning; NTL: near-transfer learning* perceptions of usefulness. Therefore, emphasis on factors other than CSE may prove to be more useful in improving perceptions of usefulness.

## LIMITATIONS AND FUTURE RESEARCH

This study has some limitations that should be recognized when interpreting the results. An obvious limitation involves the use of a student sample to test the research model. Although the use of student samples is widespread in studies of this nature [e.g., 67], it is important for future studies to use more diverse samples in order to enhance the generalizability of the results to other user groups. Moreover, this study used a comprehension test of software learning rather than actual computing tasks to measure learning performance. Thus, to enhance the validity of the results and increase their generalizeability across technologies, future research should consider using actual near-transfer and far-transfer computing tasks and examine other technologies.

The main objective of the current research was to examine the impact of one variable (i.e., CSE) on two key outcomes of computer training. Clearly, other variables such as training method [12], system interface style [10], and labeling of training as work or play [16], and individual learning style [18]) which have been found to have significant effects on computer training outcomes were not examined here. Thus, to enhance current understanding of factors affecting effectiveness of computer training, it is imperative that future research explore how other variables affect learning performance, reactions to training and other training outcomes.

## REFERENCES

References were deleted due to lack of space. The list of the references can be obtained from the author.

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