Enhancing IS User Empowerment and Problem-Solving Behavior Through Training and Prompting

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Abstract. Information systems (IS) users may learn to use IS through training, but may not be able to solve IS problems that arise. This may be because of limited skills and knowledge of IS problem-solving strategies to resolve these issues. Although previous IS research has studied various aspects of training and trainers as well as the influence on performance outcomes, research has not specifically focused on training problem-solving techniques or behaviors. Considering the potentially negative outcomes from being unable to resolve IS problems, such as inaccuracies or inefficiencies in performance outcomes, this research proposes to address this gap. Research studies have demonstrated that behavioral interventions, such as prompting and transfer of stimulus control, have influenced the use of desired behaviors in specific as well as novel situations. Prompting encourages the desired behavior to be utilized, the desired behavior can then be reinforced for continuous use, and prompting is eventually removed and stimulus control is transferred to a natural stimulus (e.g., IS problem). This research intends to evaluate the effectiveness of prompting and transfer of stimulus control to enhance users' sense of empowerment, efforts to solve IS problems, and performance outcomes. Therefore, this study intends to provide insights on methods of improving IS users abilities to solve IS problems by increasing users' sense of empowerment and problem-solving behaviors when utilizing software applications with the use of specific behavioral interventions (i.e., prompting and transfer of stimulus control).

Keywords: Information systems training · Information systems user · Information systems user empowerment · Problem-solving behavior · Prompting and transfer of stimulus control · Psychological Empowerment Theory · Theory of Trying · Social Cognitive Theory

1 Introduction

Information systems (IS) training is essential for users to learn and apply IS in an effective manner [1]. A conventional IS training entails initial delivery of information regarding the IS as well as demonstrations of its functions. Following this, opportunities for IS users to apply the learned knowledge to develop their own skills are provided. Also, guidance is provided in the form of feedback to help users further refine their newly acquired skills.

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IS training does not typically focus on addressing problems that may arise when using IS. IS training may identify resources that can be utilized, but resource application training to resolve problems may be limited. Hence, individual users learn to use software applications, but do not specifically learn to address or resolve problems that arise when using the application. Their training may identify resources that can be utilized, but they are not specifically taught how to apply them when a problem is encountered. Therefore, utilization of these resources is limited or unproductive.

In addition, the ability to address these problems varies among many users. Some are able to effectively address almost any problem that they encounter, while others struggle. The struggles may result in the individual performing the task without the application (e.g., manually), avoiding the task altogether, or soliciting others to perform the task for them. The impact that these results can have include inefficiencies or inaccuracies in completing tasks, incompletion of tasks, or encumbering individuals who are capable of performing the task because of increased work load. Therefore, problem-solving behavior training is needed to assist IS users in addressing IS problems that they encounter. The research objective for this study is to assess improvements in individual's efforts and abilities to solve problems, as well as individual's sense of empowerment, through problem-solving behavior training interventions.

2 Literature Review

Organizations typically rely on training to develop or improve IS users' proficiency with information systems or software applications [1, 2]. Training has been addressed by several IS researchers [e.g., 1, 3]. For example, Webster and Martocchio [4] assessed the relationship of microcomputer playfulness, or one's unplanned and innovative usage of microcomputers, with training outcomes. Microcomputer playfulness was found to have positive relationships with outcomes such as satisfaction with the instructor and learning outcomes. No measurements, however, were taken of subjects' abilities to resolve subsequent problems encountered with IS usage.

Also, Compeau [5] identified behaviors of effective trainers such as subject-matter knowledge, instructional strategies such as demonstrations of skills being taught and providing opportunities to practice, as well as clear and adaptable explanations. Of the 53 effective training behaviors identified, none involved demonstrating or assisting in problem-solving methods. Compeau and Higgins [2] studied the effects of computer training using a lecture versus behavior-modeling style; Yi and Davis [3] studied observational learning processes effect on self-efficacy, knowledge acquisition, and performance outcomes; and Sharma and Yetton [1] studied the role of technical complexity and task interdependence in the context of training's influence on IS implementation outcomes of user satisfaction. None of these studies, however, focused specifically on problem-solving behavior training.

Therefore, research is lacking in assessing training interventions that specifically target problem-solving abilities of individuals when utilizing software applications. Although trainers may make users aware of various mechanisms that can be employed when a problem occurs, the focus of most training is on utilization of the various

functions of an application or system and not how to deploy various problem-solving techniques when a problem occurs. Therefore, this research looks at behavioral education to develop a training program that will condition users to employ a set of problem-solving behaviors when a problem is encountered. Problem-solving behaviors, in this context, include a variety of alternative actions that can be taken when a problem is encountered to resolve the issue and continue completing the task. The behaviors can include attempting to utilize alternative functions, identifying existing examples and applying similar procedures to the task-at-hand, or conducting effective information searches.

Chase [6] indicates that "Examples of behavioral education have shown repeatedly that when one can identify the target behavior needed by a population and arrange for the population to contact direct training on the behavior, behavioral strategies and tactics will succeed in reliably producing the target behavior" (p. 350). Using behavioral interventions, training can be successful in generating a desired behavior. Training programs such as these have been previously developed and utilized in organizations for managers and employees. One training program utilized to increase the use of desired behaviors at appropriate times, with the behavior eventually occurring without prompts or additional stimuli, is prompting and transfer of stimulus control [7, 8]. The prompts, or stimuli, encourage the desired behaviors to be executed. Upon execution, the behavior can then receive reinforcement so the behavior will be utilized again in the future. Prompts can be, for example, verbal instructions, modeling desired behaviors, providing gestures, or physical guidance.

Eventually, the desired behavior must be executed by the occurrence of a discriminative or natural stimuli versus the prompt [7]. For instance, in the context of problem-solving, the problem itself would be the natural stimuli. Hence, prompts must eventually be removed so that the desired behavior occurs at the appropriate time and because of the presence of the natural stimuli, or transfer of stimulus control. Prompts can be removed by a number of techniques or modified techniques such as delaying successive prompts or gradually reducing the presence of the prompts (e.g., reducing the amount of guidance or instruction).

Prompting and transfer of stimulus control has been demonstrated to positively influence the application of desired behaviors [7]. For example, even though training to implement a positive reinforcement program in a classroom setting had previously occurred in separate instances (i.e., initially and after implementation when it was discovered that the program was not functioning as desired) to encourage usage of the program, desired performance outcomes were not achieved [9]. To improve the usage of the positive reinforcement program, prompts (along with feedback and self-assessment) were utilized to increase the accuracy of the program's techniques usage. Positive outcomes were achieved both with the prompts and after the removal of the prompts.

As another example, prompting and transfer of stimulus control have been successfully utilized to help individuals with mild disabilities acquire functional skill sets [10]. Through the use of prompts and performance feedback, individuals were able to acquire skills and transfer the use of the skills to naturally occurring stimuli (versus the prompts). In addition, some of the acquired skill sets were also applied in novel settings. In summary, these research studies show support for generating desired behaviors with

prompts, and subsequently transferring stimulus control to natural stimuli. Also, textual prompts have been shown to be effective in promoting skill acquisition. Therefore, this research study looks to extend previous research to a software application context in which problem-solving behaviors are occasioned by prompts, with transfer of stimulus control being eventually transferred to the occurrence of a problem situation.

In the context for this research study, the target behavior desired is a set of problem-solving behaviors. Although one may argue that these behaviors may be applied to only a limited set of problems (i.e., those specific problems addressed during training), other researchers indicate that the generalization of these problem-solving behaviors is achievable. Previous suggestions have been made that acquiring a desired skill does not require comprehending all possible variations of the behavior and associated responses [11]. Previous research has also demonstrated that behavior training which focuses on explicit desired behaviors is not necessary to acquire the desired behavior [6]. Instead, some behavior training techniques can result in adaptive behaviors and only categories of these stimulants may be necessary.

In the context of problem solving, previous studies have demonstrated that direct reinforcement of the relationship between desired behaviors and naturally occurring stimuli is not always necessary [6]. Utilizing both stimulus control and response variations, resurgence can facilitate the production of novel behaviors through recognition of an array of contingencies. Resurgence can be created through increased practice. If practice integrates variation in stimuli associated with desired skills, transference as well as extensions of the skills can be facilitated as well.

When a behavior is discontinued due to novel situations, resurgence of previously learned behaviors associated with the stimulus of the novel situation is more likely to occur [6]. After solutions being derived from variations in behaviors has been established, novel situations are more likely to cause future variations in behavior. In essence, this will facilitate efforts to learn. Therefore, training users of software applications sets of problem-solving behaviors can be generalized to various problems that arise (increasing efforts to learn). Also, practice can increase the probability that the behaviors can be extended to problem variations.

In summary, the research proposed for this study looks to extend previous research by utilizing prompts to occasion the use of problem-solving behaviors when a problem occurs, and then transfer stimulus control to the problem itself. This research will employ prompts, similar to previous research studies [e.g., 10], so subjects have a list of problem-solving behaviors that they can refer back to when problems occur. Based on previous researchers' suggestions [e.g., 6], these problem-solving behaviors are expected to generalize to novel problems that are presented to research subjects, and then generalize to novel software applications.

Therefore, this study intends to evaluate the use of prompts and transfer of stimulus control to improve problem-solving with software applications. Applying the principles of prompts and transfer of stimulus control is expected to help increase the probability that an individual will address problems with a set of problem-solving behaviors (with the use of a prompt and after its removal), which should reduce the time needed to complete a task and increase the number of tasks that can be accomplished accurately

in a given time period. Also, this research proposes to assess the generalizability of these problem-solving behaviors and efforts to novel software applications.

3 Theoretical Foundation and Hypotheses Development

3.1 Psychological Empowerment Theory

Empowerment has been defined "as increased intrinsic task motivation manifested in a set of four cognitions reflecting an individual's orientation to his or her work role: meaning, competence, …self-determination, and impact" [12, p. 1443]. Meaning is the relative importance assigned. Competence is conceptualized as self-efficacy or one's belief in their ability to achieve a goal or outcome. Self-determination is one's ability to act with discretion or autonomy. Impact is the level of effect on resulting outcomes. Psychological empowerment has also been conceptualized as "a task motivation reflecting a sense of control in relation to one's work and an active orientation to one's work role… enables people to have a sense of ownership of their work and motivates them to complete their work and improve their performance" [13, p. 657].

Individuals who have empowerment are able to address challenges that arise and find novel methods of addressing these challenges [13]. Empowerment is viewed as a domain-specific variable and one that varies along a continuum [12]. The theory proposes that environmental factors (e.g., work-related) can influence empowerment which influences performance outcomes [13]. Antecedents to empowerment include information availability and access, with information being needed for empowerment in order for individuals to take initiative or comprehend [12]. Consequences of empowerment include proficiency and innovation.

In an IS context, user empowerment has been defined "as an active motivational orientation toward using an information technology (IT) application at work" [13, p. 658]. The dimensions of user empowerment include "competence of user, meaning of system usage, self-determination of user, and impact of system usage" [13, p. 658]. Competence refers to one's belief in their ability to use a system. Meaning of system usage encompasses the value an individual assesses system usage. Self-determination of user is an individual's perception of the discretion and autonomy regarding system usage. Impact of system usage is the level of effect on performance through system usage.

User empowerment has been demonstrated to influence IS usage, including developing connectedness or integration between tasks, using greater or more extended system functions, and identifying novel uses of a system [13]. Although perceived fit, job autonomy, and climate for achievement have been found to influence user empowerment, what has not been explored is the acquisition of information (i.e., problem-solving techniques and prompts) influence on user empowerment and the subsequent influence on trying to solve IS problems. Considering Empowerment Theory proposes, and previous research supports, information being an influential factor on empowerment and an outcome being proficiency, the hypothesis proposed for this study is information obtained from learning-to-try training and prompting will influence user empowerment,

which will subsequently influence task performance with IS as well as system usage (i.e., problem-solving behaviors).

H1: IS users who receive learning-to-try training will have greater user empowerment.
H2: IS users who receive problem-solving prompts will have greater user empowerment.
  H2a: IS users who receive prompts during initial IS usage and subsequently have prompts removed will have greater user empowerment than those who do not receive the prompts.
  H2b: IS users who receive prompts during usage of an initial IS application will have greater user empowerment when utilizing a novel IS application than IS users who do not receive prompts.
H3: IS users with greater user empowerment will utilize more problem-solving behaviors (i.e., trying to solve IS problems, discussed further below).
H4: IS users with greater user empowerment will have better task performance.

3.2 Theory of Trying and Social Cognitive Theory

The Theory of Trying proposes that obstacles encountered when attempting to perform certain actions "influence expectations and attitudes that shape the formation of the intent to try or actual trying" [14, p. 431]. Also, "intention reflects a state of mind that drives one to take action as opposed to trying, which reflects action and even some parts of actual behavior" [14, p. 434]. The Theory of Reasoned Action proposes that an individual's goals, or attempts to carry out an action which may be hindered by impediments, are most likely to predict behaviors if obstacles are present. Trying has been proposed to be "defined as doing all the necessary pre-behaviors and otherwise satisfying all necessary conditions that are within volitional control for the performance of the subjective behavior" [14, p. 435].

Other IS-related constructs acknowledging attempts to use IS have emerged. For instance, the construct trying to innovate with IT has previously been referred to "as an individual's goal of finding novel uses of information technologies" [14, p. 435]. However, this research study proposes to study an individual's attempt *to solve IS-related problems*. Therefore, a new concept of trying to solve IS problems is proposed and conceptualized as an individual's attempt to solve an IS-related problem.

Social Cognitive Theory proposes that individuals learn through three primary learning components – personal/cognitive factors, the environment, and individual behaviors – and the interaction or "reciprocal determinism" of these factors [15, p. 23]. Personal/cognitive factors include individual cognitive abilities, characteristics, and traits. For example, individuals are able to utilize forethought to predict outcomes from their actions. The environment also influences learning through such mechanisms as modeled behaviors. Learning can occur by observing and evaluating the outcomes associated with observed actions. In addition, an individual learns by their own behaviors and evaluating the outcomes of these actions. The knowledge gained from these experiences can be stored as sets of rules in one's memory to be called on to direct future

behaviors and refined in the future. These could be acquired from mechanisms such as training or stimulants such as prompts.

Developing proficiency at a task requires knowledge and cognitive skills, but can also require the actual application of the knowledge and cognitive skills in order to generate proficiency [15]. When individuals enact a given set of behaviors, they are able to obtain feedback which guides future actions. Individuals have pre-existing conceptions that are called upon when deciding upon actions to take. When the actions are enacted, feedback is obtained to inform and modify existing conceptions.

As has been previously noted, skill sets must be applied in a multifarious fashion to address evolving circumstances [15]. Also, "a fixed internal generator of behavior would be more of a hindrance than an aid. Skilled performance requires a generic conception, rather than a specific representation. Situational requirements help to specify how conception is best implemented into specific courses of actions… Subrules specify the enactment adjustments needed in each of these situations" [15, p. 110]. Individuals can selectively process information and learn not only from their own actions, but by observing the behavior of others through mechanisms such as instructional cues, behavioral modeling, and feedback. These observations allow individuals to identify patterns and comprehend underlying behavioral frameworks.

Social cognitive theory proposes that individuals create conceptions through use of symbolizing. Behaviors are derived from these conceptions. "Learning must be generative in nature, because skilled activities are seldom performed in exactly the same way; they must be varied to fit different circumstances… It is because people learn generative conceptions, rather than specific acts, that human skills have remarkable flexibility and utility" [15, p. 111]. Individuals learn by utilizing models, rule sets, and courses of actions that can be applied in varied circumstances.

Social Cognitive Theory suggests that individuals learn through training and instructions which can then influence behavior [15]. In this context, the instructions would be delivered in the form of training and prompts, and the influenced behaviors are trying to solve IS problems. Therefore, the hypotheses propose that information obtained from learning-to-try training (i.e., problem-solving training) and prompts will influence trying to solve IS problems, which will subsequently influence task performance (see the research model in Fig. 1).

H5: IS users who receive learning-to-try training will engage in more problem-solving behaviors (i.e., trying to solve IS problems).

H6: IS users who receive problem-solving prompts will utilize more problem-solving behaviors (i.e., trying to solve IS problems).

- H6a: IS users who receive prompts during initial IS usage and subsequently have prompts removed will utilize more problem-solving behaviors (i.e., trying to solve IS problems) than IS users who do not receive prompts.
- H6b: IS users who receive prompts during usage of an initial IS application will utilize more problem-solving behaviors (i.e., trying to solve IS problems) when utilizing a novel IS application than IS users who do not receive prompts.

H7: IS users who utilize more problem-solving behaviors (i.e., trying to solve IS problems) will have better task performance.

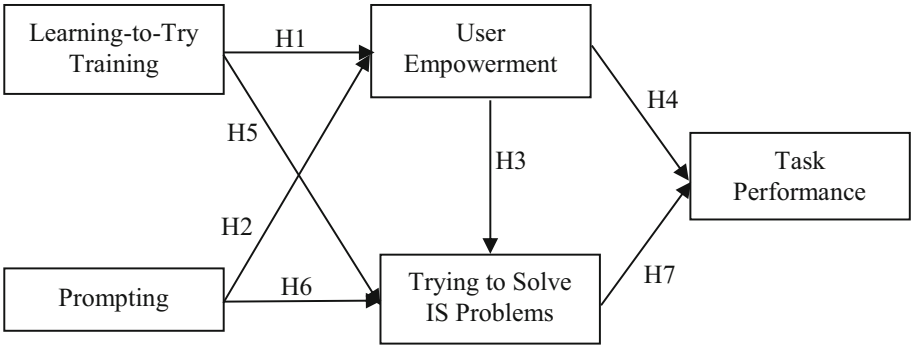

Fig. 1. Research model

4 Research Method

4.1 Overview

To test the research hypotheses, an experiment is proposed that will consist of four conditions in which subjects will/(won't) receive learning to try training (i.e., problem-solving strategies) and will/(won't) receive prompts (i.e., messages regarding strategies). Individuals will receive training for one IS application followed by training for a different IS application (to assess the generalizability of user empowerment and problem-solving behaviors). Transfer of stimulus control will be assessed by removing the prompts after the first IS application's initial use.

More specifically, to apply prompting and transfer of stimulus control, recommendations previously provided will be implemented as follows [7]:

1. Prompting strategy will be selected – prompts will include instructions and strategies for solving IS problems.
2. The learner's attention will be solicited by invoking a pop-up mechanism that the IS exercises are about to begin.
3. The IS exercise will be presented to the research participant.
4. If the research participant has not completed the exercise in a pre-established period of time, then a prompt with the instructions and strategies for solving IS problems will be provided.
5. When the research participant successfully completes the exercise, they will receive reinforcement in the form of a message that says congratulations on completing this exercise.
6. After subsequent exercises have been completed, transfer of stimulus control will occur by delaying the prompts.
7. As exercises are completed correctly, even without the presence of the prompt, congratulatory messages will continue to be displayed after correct completion of an exercise.

Learning-to-try training will consist of demonstrations of various problem-solving strategies that can be utilized when challenges arise using an IS application. The prompts will be messages displayed on the subjects computer screen reminding them of the various problem-solving strategies that they can utilize. The prompts will be provided to the assigned condition during the initial stages of the first IS application's use, but then subsequently removed as additional tasks are assigned to be completed. The proxy for trying to solve IS problems will be use of problem-solving behaviors. The software applications to be explored are Microsoft Excel and Access.

After receiving a series of problem-solving prompts, improvements will be determined by the use of problem-solving behaviors when a problem is encountered, less time to complete a particular task, and a greater number of tasks being accomplished accurately when using Excel before and after the prompts. After training for the second IS application (i.e., Microsoft Access), no additional learning to try training or prompts will be provided to assess the generalizability of problem-solving behaviors. Improvements in generalizability will be also be determined by the use of problem-solving behaviors when a problem is encountered, less time to complete a particular task, and a greater number of tasks being accomplished accurately when using Access.

4.2 Subjects

Undergraduate students will be recruited to participate who have minimal to no Microsoft Excel experience and no Microsoft Access experience. Hence, subjects will be more likely to encounter problems while completing Excel and Access exercises and need to engage in problem-solving behaviors to complete the exercises.

4.3 Procedures and Measures

Subjects will first complete a pre-study questionnaire to capture demographic information, sense of user empowerment, and need for cognition. Subsequently, subjects will receive Microsoft Excel training followed by problem-solving training or learning-to-try training for those in the training condition. Those not in the learning-to-try training condition will be provided information to review regarding the uses of Excel so that time will be equivalent in both conditions.

The subjects will then be asked to complete a set of Excel exercises. For those in the prompting condition, a prompt of various instructions and problem-solving strategies will be displayed for the subjects to use after a set period of time has passed. For subjects not in the prompting condition, no prompts or other messages during exercise completion will be provided. In all conditions, if an exercise is completed correctly, then the subject will receive a congratulatory message.

After a series of Excel exercises have been completed, subjects in the prompting condition will have a greater delay in receiving the prompt. The delayed timing of receiving the prompts will continue until the prompts are no longer displayed for the subjects to use.

Subsequently, all subjects will receive Microsoft Access training. Neither learning-to-try training nor prompts will be provided to any of the subjects to assess the

generalizability of the problem-solving behaviors learned with the previous Excel training. Measurements will be taken of the number of problem-solving behaviors utilized, time to complete each exercise, number of exercises completed accurately before and after the prompts are provided during the Excel session and during the Access session. Subjects will be requested to complete a post-study survey to measure their sense of user empowerment, ability to solve Excel/Access problems, perceptions of the learning-to-try training, effectiveness of the prompts, ability to use problem-solving strategies with future uses of Excel/Access, and ability to use problem-solving strategies with novel applications.

5 Expected Contributions and Conclusion

The research proposed for this study intends to evaluate the use of behavioral training interventions (i.e., prompting and transfer of stimulus control) to improve perceptions of user empowerment and problem solving with software applications. Because abilities to conduct problem solving can vary among individuals, it's important to provide the appropriate resources and training to individuals to address IS problems. Also, considering the negative outcomes that can occur for those individuals who are unable to resolve or address a problem, this study can provide guidance in regards to the appropriate training and mechanisms that can be utilized to improve problem-solving and task performance.

Drawing upon Psychological Empowerment Theory, Theory of Trying, and Social Cognitive Theory, it's hypothesized that training and prompts will enhance users' sense of empowerment and problem-solving efforts, which will contribute to more positive task performance outcomes. This study will provide insight into the probability of increasing problem-solving behaviors when utilizing a software application with the use of specific behavioral training interventions and improvements in performance outcomes. Also, this research can shed light on the effects that specific problem-solving training can have on performance for existing IS and when using novel IS if problem-solving behaviors are generalized to new contexts. This study proposes to improve problem-solving behaviors by using a behavioral template in the form of a prompt, training users to perform problem-solving behaviors, and transfer stimulus control to the problem itself upon removal of the prompt.

Considering the increasing desire for self-directed training and greater proficiency in IS use, the need for IS users to independently solve IS problems continues to grow. This research proposes to evaluate the use of prompting and transfer of stimulus control to improve IS problem solving and task performance. The results may be taken into consideration when designing future IS training. Also, the results may be taken into consideration when designing help functions or learning aids, and the process of providing assistance when IS users encounter problems.

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