COMPUTER BASED TRAINING WITH A TWIST: LEVERAGING PEER-TO-PEER LEARNING TO IMPROVE TRAINING EFFECTIVENESS

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A good training program can increase productivity within an organization. This paper explores characteristics associated with a training program that leverages specific learning paradigms that have been shown to increase retention and transfer of information and increase worker efficiency. One of the most widely reported, although rarely measured, method of learning software is through peers. However, little research has been done on this method and most training programs do not incorporate this element into their training. We propose a training program that will incorporate and facilitate learning from peers in the work setting. This will extend the training program beyond the initial training period or session and could lead to better retention and transfer of the material learned. Further, this may lead to the trainees learning about more advanced features of the software subsequent to the training session itself.

BACKGROUND

Training is often viewed as a vital tool for increasing productivity in a corporation. The more effective the training, the more likely employees are to retain information and perform more efficiently (Devaraj & Babu, 2004). To stay abreast of continual advances in technology, corporations are constantly upgrading software, and with these upgrades the need to quickly and thoroughly train employees arises. One of the main challenges for employers is matching training method to the needs and constraints associated with the employees' working environment and training needs. When training needs are not met, employers may notice a lack in retention of learned materials and a decrease in enthusiasm. Some of the issues associated with accommodating trainees' working environments and needs include: Costs—both for developing the training and for employees to take time away from work to attend the training; scheduling—particularly with the increased need to work around employees' travel schedules; and training effectiveness—the training should be designed in a manner that results in improved performance for the employee (LeRouge & Webb, 2003).

A variety of training methods have been designed to address and resolve issues such as those listed above. Some of these methods include; computer based training (CBT: McConnel, Wiedenbeck, & Zila, 1995; Gist & Rosen, 1989; Simon & Werner, 1996), application-based training, construct-based training (Olfman & Bostrom, 1988), and training involving active and passive learning (Cohan & Newsome, 1988). Many of these training categories have met with limited success. A possible remediation for this is to leverage the training method that is currently occurring in many (if not most) business environments—learning from colleagues or "peer-to-peer learning".

Although peer-to-peer learning of software has been documented in the literature since the mid 1980's (Carroll & Rosson, 1987), there has been little work done to specifically study this process. However, recent studies have indicated that people who utilize more efficient methods of using software are more likely to know or work with someone who uses those efficient methods (Peres, Tamborello, Fleetwood, Chung, & Paige-Smith, 2004; Chadwick-Dias, Tedesco, & Tullis, 2004). Furthermore, research suggests that in office settings, people are more likely to learn new features of software from a peer than from any other source, e.g., a manual or online (Peres, 2005). Collectively, these findings suggest that if people are trained in a manner that leverages or facilitates peer-to-peer learning, the efficacy and efficiency of the training may improve.

This paper describes the development process and design of a training program for Microsoft Vista and SharePoint. The proposed training will incorporate peer-to-peer learning in the initial training and is designed to facilitate this type of learning after the training is over. We submit that by facilitating the peer-to-peer learning that currently occurs in many office settings, employees will better retain and transfer the knowledge they acquire during the initial training session.

Training Requirements

This training program is being implemented on a pilot basis at a large petroleum company in Houston, Texas. The needs of the company are to have an effective training program that people would be likely to attend (typically only a small proportion of those who are eligible or appropriate attend face to face training

sessions in this company). This is an international company of +50,000 employees and the technical abilities and physical location of these employees are quite varied. Thus it was determined that a CBT would be the most beneficial delivery method for the training as it could be widely distributed throughout the company and could be scaled to meet the specific needs of an employee or group of employees.

Training Paradigm

With personal computers playing such a large role in most corporations, it is not uncommon for people to assume that CBT would be the most appropriate training delivery method because of its delivery of training through the target technology itself. However, CBT only refers to the delivery of the training, not the content or design of the training material. Thus, we conducted a review of the literature on different training paradigms to determine which would most closely match the needs of this company and could be incorporated into a peer-to-peer learning environment. Some of the training methods we investigated were modeling, tutorial training, and hands-on practice.

In a field study, Simon and Werner (1996) compared the effectiveness of three different training methods: self-paced exploration, classroom instruction, and behavior-modeling. The behavior-modeling training was similar to an "on the job" training program in which the participant learned the program while working with someone who already knew the program. The behavior-modeling group outperformed the other two groups on all measures and most dramatically on the measures of procedural knowledge. This suggests that it is important to incorporate observation of a "model" in training programs.

Gist and Rosen (1989) investigated two different methods of incorporating modeling into training: video modeling and tutorial training. Video modeling consisted of trainees watching a model on the computer screen demonstrate a series of steps that the trainee would have to follow in order to complete a specific task on the computer. After a specific step was illustrated, the trainee was given time to practice that step. During this time, the computer also provided feedback on the performance of the trainee. Tutorial training was similar to video modeling in that trainees were still viewing the training on the computer screen, however in this type of training, the trainees had to wait until a series of steps were completed before being allowed to practice. Gist and Rosen (1989) found that video modeling, which incorporated behavioral modeling strategies, resulted in better performance along with reports of higher satisfaction with the overall training. The results of this study suggest that effective training programs should have frequent opportunities for trainees to practice what they have just learned or seen.

In 1995, Wiedenbeck, Zila, & McConnel evaluated three methods for providing hands-on practice that can be included in training programs; exercise, exploration, and guided-exploration. The exercise method of training consisted of the trainee deciding on a strategy and method to accomplish a task. The trainee had to practice the strategies they had just learned. They could determine in which order they would like to practice the strategies, but they had to practice. Exploration on the other hand, did not mandate practicing strategies and methods, but rather allowed the trainee to set their own goals, and decide a method for implementation. Thus, with exploration, the participant had the choice to practice strategies, or just read through text without practice. Similar to exploration, guided-exploration allowed the trainee to set their own goals. However the computer provided suggestions and questions to help guide the participant as they navigate through the software. Wiedenbeck et al (1995) hypothesized that when people were allowed to set their own goals, not only would they be more motivated, but also their exploration would facilitate learning that was more meaningful in regards to making a connection between new information and prior knowledge. However, contrary to expectations, the exercise method resulted in both better performance and faster training. The exercise method was also beneficial because the exercises focused on the most important functions in software, i.e., the ones that the user would be able to directly apply to their work.

In contrast to Wiedenbeck et al's findings (1995), Carrol, Mack, Lewis, Grischkowsky, & Robertson (1985), reported that users who participated in guided-exploration were able to create a better product in a decreased time period than the people in a self-paced group. However, it is important to note that the training methods compared in this study are different than those compared in the Wiedenbeck et al. study. Guided-exploration in the Wiedenbeck et al. study was more similar to the self-paced training in the Carrol et al. study in that for both of these conditions, people were not given any time constraints in regards to learning the new software. Conversely, the exercise condition in the Wiedenbeck et al. study was more similar to the guided-exploration condition in the Carrol et al. study. Trainees in both of these conditions were given guided practice on how to accomplish tasks in a certain time frame.

When comparing the results of the Wiedenbeck et al. (1995) and Carol et al. (1985) studies, it seems clear that methods that provide the trainee with direct guidance resulted in the best performance in the shortest period of

time. This suggests that it is important that training protocols not rely exclusively on the trainees' exploration of the software.

In addition to the design of the training, there has been some research on what is the most effictive *focus* of the training. Olfman & Bostrom (1988) investigated construct-based training and application-based training. The researchers described construct-based training as a method where the trainers discussed some of the software package's features and did a demonstration of those features. Participants were not guided through solutions, but instead were provided with a manual that describes how to perform tasks. Applications-based training used the same overview to describe the software as construct-based training (i.e. they are given a manual to help with problem solving), however the participants brought questions regarding difficulties they were having with the software, and the solutions were worked out in the training. Results from Olfman & Bostrom (1988) showed that those who participated in the applications-based training spent twice as many hours using the software than those in the construct-based training, indicating a link between the type of training and use of software on the job.

This review illustrates that certain methods of training tend to work better than others for training people how to use software in terms of user proficiency and technology adoption. When training people on a new software program, computer based trainings seem to be very effective when there is a "model" for the trainee to observe and there are opportunities for the trainee to do exercises frequently through out the training. Another important element of a successful training program is structure for the trainee to follow. Training programs with a sense of guidance throughout the training resulted in better performance likely because they not only provided support for the trainee, but also provided a foundation for navigating through the new system.

Peer-to-Peer Learning

Recent research has found strong evidence that most people learn software almost exclusively by exploring the interface on their own (Lane et al, 2005; Peres, 2005). This method of learning does not expose the user to all of the possible functions or features available in the software and typically results in users learning one method for performing a task in software, and that method is usually the one that is most available on the user interface. Furthermore, once this most available method has been learned, users typically do not bother to learn methods that may be more efficient; a phenomenon termed the "paradox of the active user" (Carroll & Rosson, 1987). Unfortunately, the most available method learned maybe inefficient, as for example the architect described by Bhavnani and John (1996), who would close and re-open the entire program when he wanted to close one file and open another.

Another way that people can (and do) learn more advanced methods with software on the job is by working with others who use those techniques (Peres, Tamborello, Fleetwood, Chung, & Paige-Smith, 2004; Tamborello, Peres & Fleetwood, 2006; Chadwick-Dias, Tedesco, & Tullis, 2004). Indeed, in our lab we have been able to experimentally manipulate this effect and have found that people increased their utilization of more efficient methods of using the software after watching a peer use the efficient method than if they observed a peer using another method. Chadwick-Dias et al. (2004) found that older Internet users who had someone in their home who also used the Internet, knew more about using the internet than those who did not. Chadwick-Dias suggested that this difference was due to the Internet users in household gaining knowledge from each other. In fact, Chadwick-Dias et al (2004) reported that performance was more related to the opportunities people had for learning through collaboration than the number of hours or years of experience they had.

Working around others who use the same software may impact the environment of learning as well as the learning itself. Law and Charron conducted a series of studies that examined the impact of the environment on learning (2005). They found that an environment where opportunities for learning were present was a valuable motivator and that social factors were one of the most crucial aspects in creating that environment of learning. The authors discussed that daily knowledge sharing amongst employees occurred primarily with employees who worked in an environment where they had quick and convenient access to each other, i.e., they were co-located.

Given the benefits of peer-to-peer learning, we submit that effective training programs should be designed to leverage the peer-learning activities that are currently occurring in offices. If employees who work closely together are trained together, all of the employees in the group will know what the other employees in their group know, and thus they will serve as an important memory reference for the content of the training. For instance, if "Bob" is trying to remember how to use the "Save As" feature in MSWord, he can ask "Sue" if she remembers how to do this from the training. Because they are located close to each other, this knowledge request comes at little time or effort cost to Bob, particularly if Sue knows the answer. If she does not know the answer, there will be others to ask as well. Although these requests of peers take time away from

the tasks at hand, the time cost is likely less than the time required to look up the answer through the help files, Internet, or on notes. This may be why people are so much more likely to refer to each other than to these other sources of information.

Further, if the PTP training overtly instructs the employee group to share new techniques with each other, this may facilitate the diffusion of knowledge of more advanced techniques through the group. This process may serve to both transmit knowledge and motivate learners.

PROPOSED PEER-TO-PEER TRAINING

The basis of the peer-to-peer training (PTP) model is for employees to be trained with other employees that work in close proximity to each other or in a team. Having the employees trained together on Vista or Sharepoint may facilitate this PTP learning that can and often does occur spontaneously in office settings. For this particular training, employees in both the control group and the PTP group for both Vista and Sharepoint will complete a CBT training module that utilizes modeling and exercises. The Vista PTP group will train in a co-located group of 5 – 10 employees. The Sharepoint PTP group will be trained together remotely via teleconferencing technology such as Netmeeting. Employees in the control group for both software packages will complete all training by themselves. Upon the completion of the CBT training, all employee groups will then participate in their own focus group sessions where they will discuss what they learned from training, beneficial features of Vista and Sharepoint, and potential drawbacks of Vista and Sharepoint. The PTP groups will additionally discuss how to learn from and teach their peers.

EVALUATION

Olfman and Bolstrom (1988) stated that an effective training program is one in which the user will gain an accurate initial understanding of the software and motivation to continue use of the software post-training. To evaluate the training program's effectiveness both the PTP and control groups will complete a set of web surveys and short interviews at immediate, 3-, 6-, and 12-month intervals after training. The surveys and interviews will measure the comparative efficacy of the two training methods. These surveys will include measures on the amount of training material remembered, how much the employees utilize the material they learned in the training, what sources of information employees used for questions or issues they had regarding the material covered in the training, and employees' self-efficacy with the material in the training.

Additional measures will be collected to test the effects of PTP training on goal orientation, knowledge structures, and decisional balance as these measures will give us insight into the theoretical underpinnings of the PTP training paradigm.

DISCUSSION

As mentioned previously, training can increase productivity and efficiency within a corporation, and it is therefore vital for a company to adopt a training method that will be effective, have a short duration, and be cost efficient in order to maximize all efforts. Along with meeting these criteria, employers should utilize training methods that will capitalize on retention and transfer of training materials. Based on research discussed in this paper, it is evident that a CBT that incorporates modeling, guidance, and frequent exercises can be beneficial for a corporation to adopt into their current training methods. The research presented here also suggests that formal training programs may benefit from the utilization of peer-to-peer learning amongst employees.

We therefore propose a training program that delivers training using CBT; has the CBT training incorporate modeling and frequent exercises; and facilitates peer-to-peer learning upon completion of the CBT. This combination of training "elements" may lead to increased productivity, enhanced staff collaboration, and increased retention of information, particularly when compared to training that does not facilitate peer-to-peer training.

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REFERENCES

Bhavnani, S. K., & John, B. E. (1996). Exploring the unrealized potential of computer aided drafting. Proceedings of SIGCHI conference on Human Factors in Computing Systems, Vancouver, British Columbia Canada, pp. 332-339, ACM Press.

Carroll, J. M., Mack, R. L., Lewis, C. H., Grischkowsky, N. L., & Robertson, S. (1985). Exploring a word processor. *Human-computer interaction*, *1*, 283-307.

Carroll, J. M., & Rosson, M. B. (1987). Paradox of the active user. In J. M. Carroll (Ed.), Interface thought: Cognitive aspects of human-computer interaction (pp. 80-111). Cambridge: Bradley Books.

Chadwick-Dias, A., Tedesco, D., & Tullis, T. (2004). Older adults and web usability: Is web experience the same as web expertise? Proceedings of SIGCHI extended abstracts on Human Factors and Computing Systems, Vienna, Austria, pp. 1391-1394, ACM Press.

Cohan, L.A., Newsome, S.L. (1988). Navigational aids and learning styles: Structural Optimal Training for Computer User. *SIG CHI Bulletin*, 20(1), 30-32

Devaraj, S., & Babu, R. (2004). How to measure the relationship between training and job performance. *Communications of the AMC, 47(5), 63-67*

Gist, M.E., Schwoerer, C., & Rosen, B. (1989). Effects of alternative Training Methods on Self- Efficacy and Performance in Computer software training. *Journal of Applied psychology,* 74(6), 884-891

Lane, D. M., Napier, H. A., Peres, S. C., & Sándor, A. (2005). The hidden costs of graphical user interfaces: The failure to make the transition from menus and icons tool bars to keyboard shortcuts. *International Journal of Human Computer Interaction, 18*(2), 133-144.

Law, A. & Charron, R. (2005). Effects of Agile Practices on Social Factors. *Human and Social Factors of Software Engineering*, 30, 1-5.

LeRouge, C., & Webb, H. (2003). Managing Training in a Technology Context. Proceedings of *SIGMIS* conference on computer personnel research: Freedom in Philadelphia--leveraging differences and diversity in the IT workforce, Philadelphia, Pennsylvania, 98-103, ACM Press.

Olfman, L.& Bostrom, R. (1988): The Influence of Training on Use of End-User Software. In: Allen, Robert (ed.) *Proceedings of the Conference on Office Information Systems*, Palo Alto, California, USA. pp. 110-117.

Peres, S. C. (2005). *Software use in the workplace: A study of efficiency.* Unpublished Dissertation, Rice University, Houston, Texas USA.

Peres, S. C., Tamborello, F. P., II, Fleetwood, M. D., Chung, P., & Paige-Smith, D. L. (2004). Keyboard shortcut usage: The roles of social factors and computer experience. *Human Factors and Ergonomics Society 48th Annual Meeting, 48*, 803-807.

Simon, S. J., & Werner, J. M. J. (1996). Computer training through behavior modeling, self-paced, and instructional approaches: A field experiment. *Journal of applied psychology*, *81*(6), 648-659.

Tamborello II, F. P., Peres, S. C., & Fleetwood, M. D. (2006). A peer mediated leap to efficiency: A theory of cost-benefit analysis in the selection of efficient strategies. *Human Factors and Ergonomics Society 50th Annual Meeting*, 349-353.

Wiedenbeck, S., Zila, P.L. & McConnel, D.S. (1995). End-User training: an empirical study comparing On-*line practice methods.* Proceedings of SIGCHI conference on Human Factors in Computing Systems. *74-81.*