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Original Article

A framework of hybrid self-regulated and collaborative learning method for End-User Training in the public sector of Thailand

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Abstract

End-User Training (EUT) is a method used to learn and improve IT/IS skills. In order to provide effective EUT programs for organizations, several issues in the design of EUT need to be considered. Thus, this paper proposes a framework of hybrid self-regulated and collaborative learning for EUT which aims to support effective software learning. The framework consists of three phases: pre-training, training and learning process, and post-training. The pre-training phase is composed of five steps: training needs assessment, learning goal setting, analysis (i.e., learner, software, task/job, organizational, and technology characteristics), design, and development. The training and learning process phase is composed of learning methods which involves organizing teams and IT appropriately for training. The post-training phase consists of learning assessment and evaluation from the EUT implementation. The results revealed that the training team's satisfaction towards the proposed framework was perceived as useful and easy to use guidelines for effective EUT.

Keywords: End-User Training, self-regulated learning, collaborative learning, technology acceptance model

1. Introduction

Nowadays the use of Information Technology (IT) and Information System (IS) in organizations is growing rapidly. Training is one of the most common method that organizations employ to enhance the productivity of individuals and aid communication of the organizations' goals to new personnel. In terms of software, End-User Training (EUT) is used to train and learn IS. EUT is one of the most effective way to increase end-users effectiveness in computing. Moreover, IT using Technology-Mediated Learning (TML) (Bostrom, 2009) based on Socio-Technical Theory (STT) (Bostrom & Heinen, 1977) can support training and learning in many fields. Thus, EUT is crucial to the success of IT/IS (Hardin *et al*., 2013). Different training and learning processes are developed for specific training methods that involve Technology-Supported Learning (LeRouge & Webb, 2003). Training and learning strategies are an important part of the training methods which are composed of different types of IT tools and trainees (Coulson *et al*., 2003). In addition, they are very important to the EUT process, especially Self-Regulated Learning Strategies (SRLS) and Collaborative Learning (CL). SRLS has a better outcome when learning to use IS (Gravill & Compeau, 2008). The comparative analysis of EUT methods show that all training methods are significantly different (Kaplan-Mor *et al*., 2011). Several learning techniques can be applied to EUT, e.g., behavior-modeling methods (Chen *et al*., 2004) and enactive learning (Gupta & Bostrom, 2009). This research intends to focus on Computer Support Collaborative Learning (CSCL) using TML (Bostrom, 2009; Gupta, Bostrom, & Huber, 2010). Many studies have focused on learning processes, training and learning strategies, and various training methods. However, only a few studies include self-regulated and collaborative learning

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strategies, and the comparative analysis of EUT methods. More research is required focusing on the integration of learning and training strategies, the components of the framework, and knowledge of influential factors to achieve training effectiveness. Thus, this study proposes a framework of hybrid self-regulated and collaborative learning for EUT which aims to support effective software learning by self-regulation and collaboration.

A case study protocol was defined to provide a 4-step plan to evaluate the developed framework. First, four research questions were defined as follows: What are the processes or steps of EUT? What are the problems during training? How do participants in EUT need to be changed? And did they accept the proposed framework and why do they use it? Second, two public sector organizations for EUT implementation in Thailand were selected. Third, qualitative analysis was then performed through observations and interviews, while quantitative analysis was derived using questionnaires. Lastly, the importance of the proposed EUT framework was considered and threats to validity identified.

2. Factors Influencing EUT

There are many factors that positively and negatively affect EUT. They can be grouped into seven categories: organizational, individual differences, training methods, learning techniques, learning processes and interactions, immediate learning outcomes, and long-term learning outcomes. For example, organizations hold their EUT programs based on the effectiveness of IT/IS applications, and their impact on the work of personnel within an organization (Azadeh & Songhori, 2006). Task Technology Fit (TTF) (Goodhue & Thompson, 1995) which consisted of task characteristics, technology characteristics, performance impacts, and utilization to improve both learning and teaching styles, which align with the intention to use technology (Lin *et al*., 2013).

The virtual team based on Adaptive Structuration Theory (AST) (DeSanctis & Poole, 1994) and process support also contribute to the success of EUT (De Waal & Batenburg, 2012). Training methods assist end-users to achieve better learning performance, higher levels of Computer Self-Efficacy (CSE) based on Social Cognitive Theory (Bandura, 19 86), satisfaction, and learning climate (Chou & Liu, 2005). In the practice of using computer-based training, there are a number of factors related to groups of individual differences (Palvia & Palvia, 2007). In addition, individual factors impact on computer-mediated environments (Choi *et al*., 2007). The impact of individual differences on training processes involves structures of appropriate EUT methods, which has a direct impact on learning outcomes. The learning outcomes, in turn, have a positive impact on perceived usefulness and perceived ease of use of the end-user technology, which leads to behavioral intention to use the system in the future and actual usage (Gupta, Bostrom, & Anson, 2010).

EUT literature has identified five levels of evaluation: technology (usefulness of technology), reaction (the satisfaction toward training), skill acquisition (acquisition of knowledge or skills), skill transfer (the ability to apply skill learned at work for improved job performance), and organizational effect are conducted (Mahapatra & Lai, 2005). These five levels assist in explicitly distinguishing between skill acquisition and skill transfer (Sein & Simonsen, 2006).

Key success factors of EUT were scrutinized and identified in (Krompho *et al*., 2013) and (Krompho & Porrawatpreyakorn, 2013) which consisted of needs assessment, application software-computer self-efficacy, self-regulated learning strategies, learning-goal orientation, and pre-training self-efficacy.

3. The Proposed Framework

The proposed framework of hybrid self-regulated and collaborative learning for EUT consists of three phases: pre-training, training and learning process, and post-training as shown in Figure 1.

The three phases of the framework are elaborately described as follows.

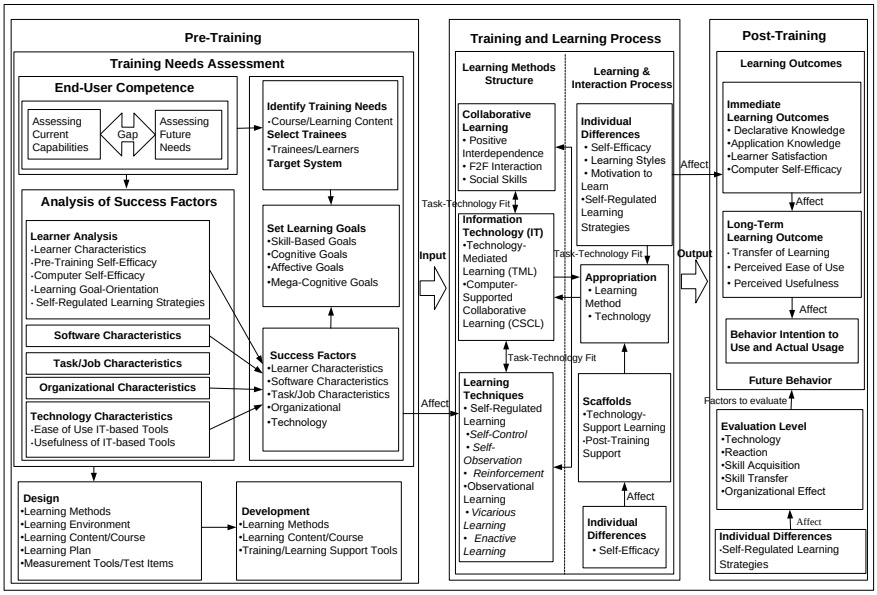

Figure 1. Proposed framework; extend from Gupta *et al*. (2010).

Pre-training phase: This phase consists of five steps: training needs assessment, learning goals setting based on goal setting theory (Locke & Latham, 1990), analysis, design, and development.

Step 1: Training needs assessment. This is the process of identifying training needs for end-users (O'Brien & Hall, 2004), and specifying course priorities, which are desirable for the training program. The needs assessment would focus on the knowledge, skills, abilities, motivations, and attitudes of the individual (Nelson *et al*., 1995). The results of a needs assessment are then used for the learning goal setting, develop learning strategies, design learning content, and evaluate EUT (Cekada, 2010). Therefore, the training needs assessment plays a key role to understand training needs and conduct training programs effectively (Iqbal & Khan, 2011). This step consists of two sub-steps: assessment and gap analysis. A self-assessment of end-user competence begins by identifying the knowledge, skills and capabilities of IT applications, the individual's need to learn for effective performance, and assessing the ability of IT to achieve the desired future (Gravill *et al*., 2006). A questionnaire can be used as a tool for self-assessment.

Step 2: Analysis – This step is applied from the content-level framework for training needs assessment by Nelson, Whitener, and Philcox (Nelson *et al*., 1995) and the forethought phase of self-regulated learning of Zimmerman model (Zimmerman, 1989) which contains a process related to task analysis and self-motivational beliefs. The key success factors can be categorized into five groups: learner, software, task/ job, organizational, and technology characteristics. The results of this step are used to compose training groups, design and develop training courses, and provide EUT method suitable to learner characteristics.

Step 3: Learning goals setting - Learning goals are defined as desired learning outcome and learning process according to data from the assessment of end-user competence (Sein *et al*., 2001). Learning goals are classified into four categories :Skill-Based Goals, Cognitive Goals, Affective Goals, and Mega-Cognitive Goals (Olfman *et al*., 2006). The learning goals focus on improving knowledge and skills individually and enhancing the learning experience for the future. Moreover, this step assists the training provider to design and develop learning methods which becomes learning outcomes as defined in the learning objectives.

Step 4: Design - This process includes the design of the learning environment, learning plan, learning strategies in order to set course design and learning content, and evaluation of EUT. The design and plan of the training contribute to the setting of learning goals and the use of programs leads to improvement of design.

Step 5: Development - Development is a process of results derived from the design step for the training and learning process. This step consists of the development of learning strategies, learning methods, and learning contents.

Training and learning process phase: This phase includes the process of conducting training.

Step 6: Implementation - The process consists of implementing a training tracking system, and preparing training program guidelines. In addition, the training content is developed to a group of trainees according to the developed EUT methods. The learning method involves organizing teams and suitable IT for the training.

Post-training phase: This phase involves an evaluation process of learning assessment, post-training support, and learning transfer. This process should be evaluated immediately after general training and long-term effects training in order to cultivate the ability to transfer knowledge after the EUT has ended.

Step 7: Evaluation - This step includes guidelines and tools to evaluate EUT programs for the individual, group/ team, and organization. For example, factors to evaluate include learning environment, satisfaction to the training program, learning outcomes, learning process and interaction, and organizational effect (Mahapatra & Lai, 2005).

The proposed framework will be beneficial to the development of training and learning methods in order to develop personnel in an organization. For example, organizations that use IS for end-users could develop abilities in self-managed learning and collaborative knowledge sharing with TML. In addition, the proposed framework focuses on ease of use and usefulness of the technology, which will result in the adoption of IS.

4. Case Study Design

This case study research was conducted to evaluate the developed framework using the guidelines of Runeson and Höst (2009). The unit of analysis is organization level. Participants were 72 stakeholders and participants in EUT (4 trainers, 4 designers, 4 developers, and 60 end-users) agreed to participate at two public sector organizations in Thailand.

For participant-observations, a form to explain participant's behavior in EUT and learning process was designed. The observations were recorded as a result of issues, recommendations, and conclusions to confirm the consistency of the answers from the participants and the actual situation.

Subsequently, the stakeholders in the EUT setting were interviewed, including the trainers and web designers responsible for the learning environments and use of the training support tool. Basic skills were also used in practice, e.g., introducing the case study, explaining the purpose of the interviews, interviewing with a training team, and providing EUT. Each individual interview took 30-60 minutes. The interviews were recorded for accurate analysis.

Finally, the questionnaires were developed, which consisted of five constructs (i.e., computer self-efficacy , perceived usefulness, perceived ease of use, attitude toward, and behavior intention to use) based on TAM of Davis (1989) using the Likert-type scale of 1-5 (1 means strongly disagree and 5 means strongly agree). Table 1 presents the reliability analysis of Cronbach alpha coefficients; the scale total of 0.91 was used to evaluate this framework.

Table 1. Coefficient alpha reliability for all scales.

Variables	Number of Items	Alpha
Computer Self-Efficacy	4	0.81
Perceived Usefulness	4	0.86
Perceived Ease of Use	4	0.88
Attitudes toward the framework	5	0.87
Behavioral intention to use a framework	3	0.85
Total	19	0.91

In this research, the independent variables consist of external and psychological factors. The external factors include prior experience, skill levels in using the software, computer usage, and usage of earlier versions of the software. The psychological factors are computer self-efficacy, perceived usefulness, perceived ease of use, and attitude toward the framework. The dependent variables are behavioral intentions when using the framework. Control parameters are associated with demographic factors such as sex, age, education, and jobs that affect behavior intention when using the framework.

During the observations, interviews and questionnaires, the researchers collected data related to conducting EUT, processes or steps, problems during training, changes in training, and satisfaction to the framework. The data were analyzed by content analysis from multiple researchers to compare the similarities and differences in two case studies, and Within-case and Cross-case analyses was conducted to determine whether the data had been analyzed correctly to ensure accuracy.

5. Results

The case study results are divided into three parts: pre-training phase, training and learning process phase, and post-training phase as follows.

Pre-training phase: This phase included steps of training needs assessment which included analysis, design, and development. As observed, the training teams were surveyed on their training needs, developing training course for new end-users based on their organization's policies, conducting training courses, and evaluating user's satisfaction. However, the established training was not associated with end-user competency assessment, training needs, and key success factors of EUT.

Initially, the researchers introduced this EUT framework and the process of training needs assessment. Then, the training team identified training needs for an organization based on basic IT/IS skills (e.g., word-processing, spreadsheet, and presentation) of the organization's personnel. The process of training needs assessment was related to setting training courses priorities and learning goals, and forming a group of trainees. They then used the results of self-assessment to identify training needs. This emphasized that training needs can be identified by Application-Specific Computer Self-Efficacy. Thus, the training team should also consider the competency of end-users and the appropriateness of learning and training methods for end-users.

Secondly, the researchers introduced ways to analyze and considered the key success factors that may have an impact on EUT. As observed, the training team built a tool to analyze the key success factors. The findings revealed that learner, software, task/job, organizational, and technology characteristics were important factors to implement before designing and developing effective EUT programs.

Thirdly, the researchers suggested examples of learning contents for a training course, a tool for learning assessment, and a demonstration to show how to use the training support tool. Then, a web designer participated in designing learning contents and learning environments. In this case, they designed a Microsoft Excel course to use with a training support tool which required teamwork. The trainer later designed and developed learning contents. They used the Learning Management System as a support tool. They felt that they were able to perform the framework's steps and use tools successfully.

Fourthly, the researchers introduced a guideline to develop learning contents that could help designers or developers to transfer knowledge to end-users. Problems that might arise during the implementation of EUT were also described. In these cases, much time was needed to identify training needs, collect related data, and create learning contents. As observed, the training team felt that they had more workload as designing and developing learning contents need to be changed frequently. If the training team had urgent work, the schedule of developing learning content would be delayed. During the training and learning process, it was found that collaborative knowledge sharing was not enough for training and learning effectiveness due to the many problems encountered. For example, there were network problems while end-users attended the online video-based learning. The training team always had urgent tasks to carry out. Therefore, they took a long time to solve problems. This result is consistent with the interview results as the trainer said: "Course designing has a limitation as technology changes rapidly. Software-based training courses for end-users may have to be changed frequently. It is quite a major limitation."

Lastly, in term of the need for change, it was found that the participants were required to change learning contents, the process of training needs assessment, and user manuals for learners. The demo applications to show the creation of assessment tools should also be easy to use. As observed, at the starting point of developing a training curriculum, the training team frequently updated the course content. This is consistent with the interview results, as a trainer said: "We must change the contents and courses before creating the learning contents using technology." One of trainers also said: "We must change the learning contents in text file format to video file format." Thus, the training team had to follow the guideline to change them to align with their formats. This is consistent with another trainer's feedback as he said: "We must change learning contents in case that the version of programs and format of learning contents are changed in order to suit learners." Therefore, stakeholders or participants in EUT need to change the method to create learning contents, learners' manuals to use IS, and EUT implementation. One problem found was that end-users lack motivation or learning needs. One of the trainers also said that "End-users must change their behaviors to create motivation or learning needs." This is in line with one of the developers' feedback as he said: "We must change the method to create the learning content and prepare a web-based learning system manual for end-users."

Training and learning process phase: In this phase, grouping end-users and implementing LMS to conduct training and learning by trainers are introduced. Trainers used a support tool for self-learning and collaborative learning in order that end-users could access the training system by themselves. Several problems were encountered such as the inability of end-users in learning media, knowledge sharing problems, and network problems. This is consistent with the interview results as a web designer said: "The network can be unstable and caused many problems, such as inconsistent

online video stream." He also said that: "The training courses should be designed and developed to show all steps used in the program, otherwise many problems might occur. For example, sentences must be kept short in case of learning without loud speakers. In collaborative learning, learners can use internet technology such as chat applications to communicate among learners and between learners and instructtors. Moreover, in the case of self-learning learners should be motivated to learn, e.g., via learning support systems and up-to-date contents." In addition, there were problems when using LMS as trainers, a web designer, and developers said: "There are problems for personnel who have never used LMS; thus the personnel should be trained before using LMS." This is also consistent with another trainer's feedback: "When there are some problems about network and LMS, learners will most likely not be willing to use the system, unless they are forced to."

Consequently, organizations should train trainers before using a system. This is consistent with the interview results as developers said: "Several problems will be encountered when instructors and learners are unavailable or not able to use the EUT support tool." Hence, it's important that "Instructors and learners should be trained how to use LMS before self-learning and collaborative knowledge sharing."

After the training, researchers found that the learners gained lots of knowledge transfer and demonstration to use the programs. These help learners keep being interested in and gain greater understanding, all of which met the needs of the learners. This is consistent with the interview results as designers and developers said: "The organization that already used LMS can easily apply the LMS to the framework for knowledge sharing by using a web board and a chat room."

Post-training phase: In this phase, researchers introduced the guideline for learning assessment and participating in designing and developing a tool (i.e., pre-/post-test, a measurement tool for CSE), and a tool to evaluate EUT programs in the reaction level (i.e., satisfaction, and intention of learning). The training teams felt that they could additionally develop tools to evaluate training programs. Trainers would validate a tool before developing a training system. They had experience in using a training support tool. The results of evaluation in using the training support tool, shows that they were able to use the EUT processes or steps easily. Almost all the training team agreed to using TML adoption to design learning environments, and that end-users had higher confidence in using the programs after training and gained post-test scores which are higher than pre-test scores.

Many training members said: "EUT processes or steps are valuable for training new personnel. Nowadays, training courses are mostly stored or performed in document forms; thus, applying the framework or support tool for a training plan can help determine training data, e.g., training schedules and trainee names." This is in line with a system developer's feedback: "The framework can be applied for preparing and prioritizing training courses. We can apply the training process to training, self-managed learning, assessment, knowledge documentation in organizations. This is to facilitate the self-learning of users." Another system developer said: "The framework has benefits when developing EUT training courses; because it provides steps before training, e.g., analyzing individuals, tasks, and organizations". Moreover, a web designer added: "The framework helps learners to understand what they should learn."

Another observation, found that after using the proposed framework, the training teams accepted the framework. For instance, the training team applied the framework according to the organization's policy to support learning by using technology. To encourage learning, learners did not need to learn in classrooms, but were able to learn anywhere and anytime. As a result, they can follow the steps of EUT and apply the framework's tools easily as a trainer said "The training process can be used when end-users have problems with using systems. Hence, there is no need to answer the same question repeatedly since they know how to solve problems using the guideline." This is consistent with a learning content developer's feedback who said: "We can apply the framework to collect data of training needs and test in the pre-training phase which can measure knowledge and skill of different end-users. We can accept this framework since it helps considerably to solve users' problems."

To conclude, the training teams accepted the proposed framework since it provided a guideline for training needs assessment, setting learning goals, designing learning environments, and developing training contents. Furthermore, it helped end-users to solve problems by themselves.

From the comparison of observations and interviews, the findings revealed that the training teams understood the processes and steps of the framework which could be used in EUT, training needs assessment, and determine the course topics suitable for end-users. They can use tools in pre-training, training and learning process, and post-training phase as well. The observation results are also consistent with the interview and TAM-based questionnaire results. This proves that the process or steps of the EUT framework are easy to learn. Table 2 summarizes this analysis and Table 3 shows the results of one-sample t test.

From Table 2, the training team's satisfaction towards the proposed framework was perceived as useful, easy to use, and beneficial to work in the future. It also allowed for self-managed learning and collaborative knowledge sharing for end-users. Table 3 shows the mean = 4.22, S.D. = .24, t = 10.32 ($t>0$), df = 11, Sig. (2-tailed) =.000 which is less than .05 (Sig. < .05). This indicates that the mean difference is positive. Consequently, the mean level of satisfaction scores was higher than 3.50 at significance level of 0.05. In summary, all the training teams strongly accepted the framework which can improve their training and learning process as well as performance.

6. Conclusions

The proposed framework was developed for facilitating self-learning and collaborative knowledge sharing. It was perceived as easy to implement effectively, and useful to enhance skills for both new and existing IS in organizations. The limitations in this study were the amount of steps to be followed when training end-users and the cost-effectiveness was ambiguous. These both limited the practical use of the framework.

Table 2. Summary statistics.

Items	Mean	S.D.	Meaning
Computer Self-Efficacy			
1. Using the framework can be done without any guidance from others	3.64	0.51	Agree
2. Using the framework can be done by studying the manual	4.36	0.67	Agree
3. Using the framework can be done if someone helps me get started	4.09	0.30	Agree
4. Using the framework can be done if a process is similar to previous work	4.09	0.30	Agree
Perceived Usefulness			
5. Using the framework helps work successfully faster	4.36	0.51	Agree
6. Using the framework helps make better performance	4.27	0.47	Agree
7. Using the framework helps make work more easier	4.55	0.52	Strongly Agree
8. The framework will be beneficial to my work in the future	4.45	0.52	Agree
Perceived Ease of Use			
9. The framework are clear and easy to understand	4.09	0.54	Agree
10. The framework does not require high effort to use	4.27	0.47	Agree
11. The framework is easy to use	4.09	0.30	Agree
12. The framework has steps that can learn to use in practice by myself easily	4.27	0.47	Agree
Attitudes toward the framework			
13. I am satisfied to use the framework in work	4.36	0.51	Agree
14. The framework helps make work more attractive	4.18	0.41	Agree
15. The framework allows end-users to collaboratively learn and share knowledge	4.45	0.52	Agree
Behavioral intention to use a framework			
16. I certainly intend to use the framework within the next month or other month	4.18	0.41	Agree
17. I predict that I would use the framework within the next month or next month	4.36	0.51	Agree
18. I plan to use the framework within the next month, or next month	4.18	0.41	Agree

Table 3. One-Sample T Test.

Variables	Mean	S.D.	t	Sig.
Computer Self-Efficacy	4.04	0.28	6.73	.000
Perceived Usefulness	4.40	0.34	9.00	.000
Perceived Ease of Use	4.17	0.25	9.38	.000
Attitudes toward the framework	4.31	0.39	7.19	.000
Behavioral intention to use a framework	4.33	0.35	8.29	.000
Total	4.24	0.25	10.36	.000

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