

COMPARING EFFECTIVENESS E- LEARNING TRAINING AND TRADITIONAL TRAINING IN INDUSTRIAL SAFETY AND HEALTH

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ABSTRACT

To respond to a changing work environment that is demanding 'just-in-time training' for employees, most of company organization not only depend on traditional training, they have already mobile to e-learning and emphasizing it in safety and health since they were trust of the benefits of e-learning training to the company cost effective. Nevertheless, accidents still happen at the workplace. This has become an issue to be discussed/studied, especially on the effectiveness of e-learning training with compared to traditional training. In this study, a framework to measure comparative effectiveness between these two learning environment was develop based on Kirkpatrick's four-level evaluation model and then a case study was

applied to test all the levels of the framework. These four levels include participant reaction, learning, achievements, behavior of employees, and results.

In this study, using comparative on two groups of the two training methods. The groups are traditional training and e-learning training. The comparative is based on the quantitative data collection through closed ended questionnaire. All the questions are approach to the four levels of the Kirkpatrick's Model. To complement the quantitative data, in this study also approach the qualitative collection data using depth interview and open ended questions to use for more closely describe the views of the respondents. For both methods All the questions are approach to the four levels of the Kirkpatrick's Model. The respondents are from all levels of employees is about 60 employees in one of the chemicals Industry located in Kuantan, Pahang. However, in this study have split out to another respondents to support the results of employees, the respondent is from managers and supervisors, they will give answer from the same questions to support the truth on the results quantitative data collection from the employees. The collection results indicated that there is no difference in the rating of the effectiveness of the two training methods based on Kirkpatrick's model. But from the interview result, the participants demonstrated a preference for traditional training over e-learning training.

The convenience of e-learning training with on-demand availability, user controlled training pace and chunked segments were identified as elements that enhanced the e-learning training method. Manager with the ability to implement e-learning training as a cost savings measure should continue to pursue online training while monitoring the acceptance of the training method change and carefully selecting programs that translate into an e-learning format.

Keywords: E-learning training, traditional training, Kirkpatrick's four level model.

1. INTRODUCTION

Our case study is a one of the chemicals multinational industry located in Malaysia. As we know chemicals industry is a one of the hazardous trades as far as work safety is concerned. The company has moved in the direction of safety and health management in attempt to improve what are poor safety statistics. However, some of areas of the company found that the improvement in employees' performance reaches a plateau (level-off) and is difficult to improve further. They begin to ask how to make further improvement on safety and health? The answer to this continuous improvement lies on the creation of a positive safety and health culture by providing training in safety and health at work.

Therefore, The company are reconsidering their investment in training for employee development performance, such as training as they begin to recognize that the knowledge, skills and competencies of their employees give them an advantage that is difficult for competitors to imitate. The business organization have devoted considerable expense in training , whether provided by in-house personnel or out-of-house experts.

Even though, training in itself is expensive and adding more components to it may not be a good idea in terms of financial capacity. For instance, "the company has spent about RM300,000.00 per year for training". (*HRD, 2009*). In the case, The company has quite distance among each branches around the world and all instructions coming from the head quarters at Brussels, due to the case the company having costly in delivery of training to their employee's. The company has realized they have spent a lot in training cost and at the same

time, business success requires companies to lower the cost. Therefore, the company have to be particulars all the cost involved in training besides to give priorities on trainee competence, i.e- related to acquisition of desired knowledge and skills and provide a foundation for the retention of knowledge and skill to the employee's. The initiative that, the company looking in increasing of the e-learning training for reducing the amount of time and money spent on training, besides traditional training still remaining to use for certain training.

Consequently, the company has frequent in using the e-learning training to deliver most of in-house training or across training via web from the other side or corporate.

Through online, all information's related with training were gathered to in one of the one place. Every employee can access it even long distance " just in time" in order to maximize its effectiveness and subsequent return on investment to the organization and minimization of organizational resources invested in the training process. But how far the effectiveness of e-learning training in the organization influence to employee's skills and knowledge. The company organizations are also facing a number challenges that it brings to. employees' and instructors may have gaps in using their computer when they start e-learning training. Besides, technical difficulties or operator error may hamper employees' and instructors, etc.

It happened at the company was owned by a case study that is the name of a confidential nature has been requested by the company, there is unclear whether the employees in the company really understand about the contains or the information of the training program or not because for some training can access it without supervise or not dependent on the availability and skills of an instructor and just only their self to going through the web to explore and learn the information has given and even conducted by someone. All information

related with the training has placed to in one place such as by CD ROM, Internet Web browser or email forwarded or etc. The training will be delivered and controlled via computer using a variety of methods, including text, sound, graphics, still photography and motion video. Whether the courses provide the necessary information to learn and retain information covered it is not guarantee. The employee just only depending on the sources has ready provided in the system or in the software of the computer. Any further enquiry of the information is not respond by any instruments provided or by the respective person in-charge immediately. The situation has shown information given is unguaranteed met to the training need or the training objective or whether the information has provided to them sufficient or not. Even though they can come back to their supervisor to clarify or direct to the corporate who's provided the info, but how many employee's can effort to do that and they only depend on the information has given to the system in their software. Sometimes, found the information's are not enough to get better understand to comply it or to practice it to the workplace or to their routine job. There found some employee's need additional training for the same area.

In an entirely online training environment trainees are primarily responsible for motivating themselves and guiding themselves through the training. While, in classroom training the instructor generally takes care of these task during training. Thus, there were found training program in an online is more likely to be compromised when trainees are unable to navigate through the training. Found some of employee's won't give positive feedback during discussion after the training program. This happened for those employee's are lazy, careless, passive listening and not focus on the training program or do not know how or when to self motivate to give more focus on their attention and have more effort on the training task. It is would be not motivated among trainee's to learn and get attention during training. There was

related with their method of instructional on the training to get trainee attention (*Human Resources Manager 2010*).

Lack of education or experience with the computer and language may cause some of employee's to experience anxiety that negative impacts their ability to learn. In the company has found some of employees' especially from technical background, have less knowledge to use the computer and they were feel quite tough to practice the web to go in the training. "It would be constrained to them to practice it and follow the training and it would influence in staffs participation to training program" (*Human Resources Manager 2010*). As a human being, many people are not ready to accept such a drastic change in instruction, from a human instructor to a computer that serves as an instructor even though the instructional technologist knows that behind the computer screen and the graphics and the sounds.

Back to the focus of research in occupational safety and health training, there are several obstacles to achieving its goal of training courses through online method. There were probably affected in increasing of an accident number of frequency especially at production area in the company.

Consequently, how the effectiveness of e-learning training to increase or to contribute employees' with good skill and knowledge or talented employees' still questionable. Therefore, this study intended to determining whether e-learning training represents a viable training method choice based on comparing perceived effectiveness of e-learning and traditional training in the safety and health.

2. LITERATURE REVIEW

Davis (1998) defined the purpose of training as developing skills for participants to become more effective and efficient in their work. Davis offered a comprehensive view of training including focused philosophies of learning, best practices for implementation, and appropriate and thorough assessment of learning. Davis stated that training helps the organization fulfill its purpose and goals while at the same time developing its workers. *Alexander(2001)* “echoed this definition by stating that educational initiatives-training used in this study- occur when the student learns”.

“Training is a growth in industry” (*Dennis, 2006*) and is noted as playing a strategic role in many companies and organizations. Dennis stated that research has shown double-digit growth in selecting training areas over the past few years. Organizational managers have an interest in enhancing the company’s strategic position through educating employees. In addition, executives have a strong interest in expanding their skills through training. “Training trends at the individual level indicate that workers today are interested in flexibility that accommodates family life” (*Amour, 2005*). “While Amour specifically results at the organizational level are seen as a direct consequence of change in individual performance” (*Holton, 1996*).

Understanding the varied factors that promote or inhibit learning is an important key when designing and developing training programs. “With traditional training, the instructors themselves are an important factor in the learning environment” (*Zerr, 2007*). The instructor’s preparation and knowledge are central to his or her ability to teach. “However, the instructor’s personality, enthusiasm, and interpersonal skills are also critical elements” (*Zerr, 2007*). The research of *Davis (1998)* “indicated that the effectiveness of training was a

critical component to the success of any business as knowledge capital becomes the most competitive asset of any organization". Acknowledging the importance of an instructor in training raises questions and concerns about the potential effectiveness of e-learning training, which by definition, does not have the influence of the instructor's personality, enthusiasm, and interpersonal skills.

For this study, "effective online training" will refer to the learners' outcome and how it is reflected by things such as knowledge gains, training applied to the job, and returns on training investment. Performance measures are crucial to corporate training. According to *Berk (2003)*, "if you don't know which programs had the greatest impact on the job and the company's business objectives then your measurement system has some significant shortcomings" (p. 2).

Determining what to measure and why creates the foundation for moving forward with the selection of a methodology. *Cover stone (2003)* states that evaluation in the corporate world is most likely linked to the bottom line. Without evaluation it is not possible to know whether one's objectives are being met.

Some companies integrate built-in training measurements into online training implementation to measure knowledge transfer by providing pre-assessments, periodic assessments, and post-assessments. "The pre-assessment is used to identify the participant's level of skill before training; periodic assessments are used to measure learner progress; and a post-assessment is used to quantify overall gains in skill development" (*Berk, 2003; Brodsky, n.d.; Peretti, 2008*). This particular type of training is impractical for many companies due to the amount of money it takes to successfully achieve.

Companies do not want to spend more on measurement than the training itself (*Berk, 2003*). According to *Tai (2005)*, “effectiveness of a program ultimately means the benefits of online training are outweighing the costs of resources required for implementing it” (p.6). Despite the different ways companies choose to evaluate online training programs, current return on investment (ROI) models of evaluation are rarely used to assess online training due to the time and money it requires. “Since evaluation of online training is necessary to demonstrate its worth, the need for better and more widely used evaluation models is critical to the future of e-learning” (*Moller et al., 2008, p. 71*).

Companies want research data that training courses are of high quality and value so that their employees are able to transfer what they have learned in training to their job. In order to help businesses measure the value of their employees and their knowledge, proxy metrics need to be created and implemented for ROI analysis (*Duggan & Barich, 2001*) “addressed the demands of workers with regard to work life, his comments are equally as applicable to the workers’ training requirements through that work”. Workers do not want demands, including training demands, which require them to leave their families to go to a convenient location for the trainers at an inconvenience to themselves. “Just as today’s workers indicated a preference for the potential of telecommuting” (*Amour, 2005*), they may likewise prefer the convenience of online learning rather than traditional training.

Even though, Costs becomes a challenge in e-learning whether it is measure in terms of an expenditure or as a cost savings to the company. According to *Webb (2003)*, “analysts, vendors and customers agree that the biggest obstacle to implementing large-scale e-learning initiative is cost”. According, *Filho(2005)* quotes a Gartner survey that found the budgeting

process is often fragmented and results in needless costs. *Cross (2004)* “contends that executives assume training has little or no impact on revenue”, so they measure training benefits in terms of cost savings. This works against e-learning in which increase in top-line revenue generally exceed reduced expenses by a wide margin.

However, *Bersin (2002)* states that it is important to remember that the ultimate purpose of e-learning is not to reduce the cost of training, but to improve the way an organization does business. Overall, training professionals often do not like to acknowledge the historically low stature and importance that training and learning occupy within the corporate hierarchy because of the perceived difficulty of determining ROI for training activities (*Galloway, 2005*).

Many authors who have addressed training effectiveness relied on the four levels of training effectiveness identified by *Kirkpatrick (1983)*. Those level are reaction of trainees, learning results, job behavior, and returns for the organization. Measurement on the four levels begins at the most basic level by ascertaining the effect on the trainee. The measurement at level 1 is to determine if the participants liked and understood the training. The design of the study described herein was to investigate effectiveness based on the levels, to determine the training effectiveness of e-learning training in comparison with traditional training surveys and interview with learning participants as well as their managers.

There are many potential barriers to the effective use of e-learning training mentioned in the literature. “These are categorized into three main areas (a) the lack of face to face interaction with an instructor and peers;(b) technological barriers, including hardware deficiencies and software navigation problems; and (c) learners’ lack of self-efficacy in their computer skills.

Self-efficacy refers to the learner's belief in his or her own ability to demonstrate a skill" (*Christoph, Schoenfeld, & Tansky, 1998*). Specifically, for this completed study. Self-efficacy referred to the learner's confidence in his or her own ability to use the computer in navigating and using the e-learning program.

Models for Evaluation of Training

There are currently many different methods used to measure the effectiveness of online training, but not one overall "best system." *Bassi, Ludwig, McMurrer, and Van Buren (2000)* state that there is a lack of a standard system for measuring and valuing training investments.

In this section, different methods of training evaluation will be presented although it is important to note that this study will utilize the Kirkpatrick on the methodology.

2.1.1 Objectives-oriented evaluation

According to *Bonk and Dennen (2002)*, "Objectives-oriented evaluation is to compare learning results to online learning objectives". From this approach, we can determine whether the objectives are being met or not. In addition, it can help determine whether objectives are appropriate or not. Moreover, the objectives can be used as a comparative benchmark between online learning and other learning methods. Objectives-oriented evaluation is sometimes called goal-driven evaluation. An objectives-oriented approach can exist in two levels of objectives. The first level is instructional objectives for learners. That means the question "What did the learners learn?" determines these objectives. The second level is systemic objectives for learning. In this case, the question "What did the learning solve the problem?" determines the systemic objectives.

Major weaknesses of this approach include the difficulty of evaluators to operate in a program environment with ill-defined objectives, to identify unintended program outcomes, and to measure learning. Grades used to determine learning, can have little relationship to what students learned when they have already known the material. Also according to *Bonk and Dennen (2002)*, “grades may not be a reliable measure of learning, performance tests in particular, as different teachers will not likely assign grades in a consistent manner”. Therefore, using grades to measure learning can be problematic.

2.1.2 CIPP model

The CIPP is sometimes called a management-oriented model. It examines the online learning within its larger system or context. The CIPP model is considered as a comprehensive framework using both formative and summative evaluations. CIPP stands for evaluations of context, inputs, processes, and products. This model was presented by *Stufflebeam (2003)* as follows:

“Context evaluations assess needs, problems, assets, and opportunities to help decision makers define goals and priorities and help the broader group of users judge goals, priorities, and outcomes” (*Stufflebeam, 2003*). Applying for online learning, context addresses the environment in which online learning takes place. It compares the real environment of online learning to the ideal. However, it uncovers systemic problems that may dampen online learning success, including technology breakdowns and inadequate computer systems.

“Input evaluations assess alternative approaches, competing action plans, staffing plans, and budgets for their feasibility and potential cost-effectiveness to meet targeted needs and achieve goals” (*Stufflebeam, 2003*). Applying for online learning, input examines which resources are put into online learning. It also examines whether the content is correct or not,

and whether combination of media has used or not. However, input uncovers instructional design issues.

“Process evaluations assess the implementation of plans to help staff carry out activities and later help the broad group of users judge program performance and interpret outcomes” (*Stufflebeam, 2003*). In online learning, it examines how well the implementation works. However, it also uncovers implementation issues.

“Product evaluations identify and assess outcomes - intended and unintended, short term and long term - both to help a staff keep an enterprise focused on achieving important outcomes and ultimately to help the broader group of users gauge the effort’s success in meeting targeted needs” (*Stufflebeam, 2003*). With respect to online learning, product addresses outcomes of the learning through the questions such as “Did the learners learn? How do we know? Does the online learning have an effect on workflow or productivity?” It also uncovers systemic problems.

Kirkpatrick Four-Level Approach

The most commonly used methodology for evaluating corporate training programs is the Learning Levels model by Dr. Donald Kirkpatrick. Kirkpatrick’s classic model for measuring traditional learning is applicable for e-learning as well (*Kramer, 2007; Moller et al., 2008; Ruiz et al., 2006; Strother, 2002*). The four levels of Kirkpatrick's evaluation model essentially measure:

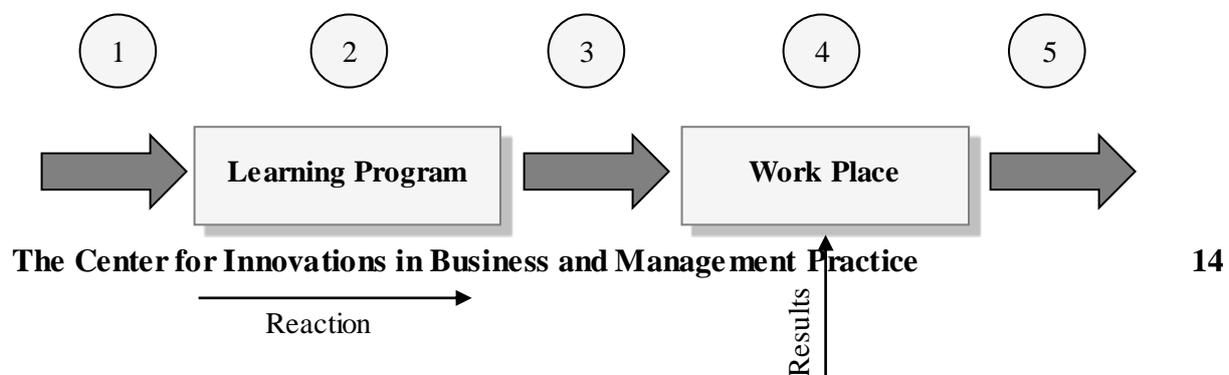


Figure 1: Training evaluation problem based on Kirkpatrick model (Nickols, 2000).

- (1) reaction of the students as to what they learned,
- (2) learning or gaining knowledge,
- (3) transfer as a measure of changes in behavior upon returning to work, and
- (4) results of the trainee's performance in business (Kirkpatrick, 1979).

3. METHODOLOGY

Even though, currently there are several evaluation approaches of online training. In this study, based an effective evaluation framework of online training environment comparing with traditional learning environment based on Kirkpatrick's four-levels evaluation model (see **Figure1**). A new point of this measurement is that, based a framework on Kirkpatrick's four-levels evaluation model to comparatively evaluate effectiveness between online training and traditional training.

This measurement for the hold framework is represented as Figure 2. First, to determine the objectives of evaluation. In this study, the overall objective is to determine the effectiveness of an online training program comparing with traditional training program. Next, Kirkpatrick's four-levels evaluation model is applied. From the framework, had shown four levels of Kirkpatrick's evaluation model that there are three proposed types of evaluation: process evaluation that is mainly focused on participants' satisfaction for the course, impact evaluation that is focused on immediate effects, and outcome evaluation which is focused on

long-term outcome of training program including traditional training and online training. In this study, just only highlighted on two of the three proposed types of evaluation: participants' satisfaction for the course and immediate effects.

Four levels of evaluation criteria of Kirkpatrick's model are briefly specified in four questions as follows: Level 1 - Reaction: Were the learners pleased with the program? Level 2 - Learning: What did the learners learn in the program? Level 3 - Behaviour: Did the learners change their behaviour based on what was learned? Level 4 - Results: Did the change in behaviour positively affect the organization?. Level 1 and Level 2 were used in this study of the evaluation process.

The methodology followed the Kirkpatrick Model, specifically Level 3. Many corporations, such as NCR, IBM and GE, use the Kirkpatrick framework to measure the success of online training (*Beamish, Armistead, Watkinson, et al., 2002*). NCR (*Goldwasser, 2001*) used post monthly training status reports to indicate that Kirkpatrick Level 3 was achieved. This level evaluation measures behavioral change on the job. It may include specific application of the special knowledge or skills learned in the training. It is measured after the training has been implemented in the work setting and may provide data that indicate the frequency and effectiveness of the on-the-job application (*Phillips & Stone, 2003*). Impact evaluation and outcome evaluation are sometimes referred to evaluation of outcomes. (*Tran Thanh Dien 2006*).

“The research methodology is the set of processes used to collect and analyze data” (*Leedy & Omrod, 2001*). This chapter discusses the processes that were used for instrument development, sample selection, and collection and analysis of data. The goal was to produce a valid and reliable instrument to measure the online training effectiveness in the company.

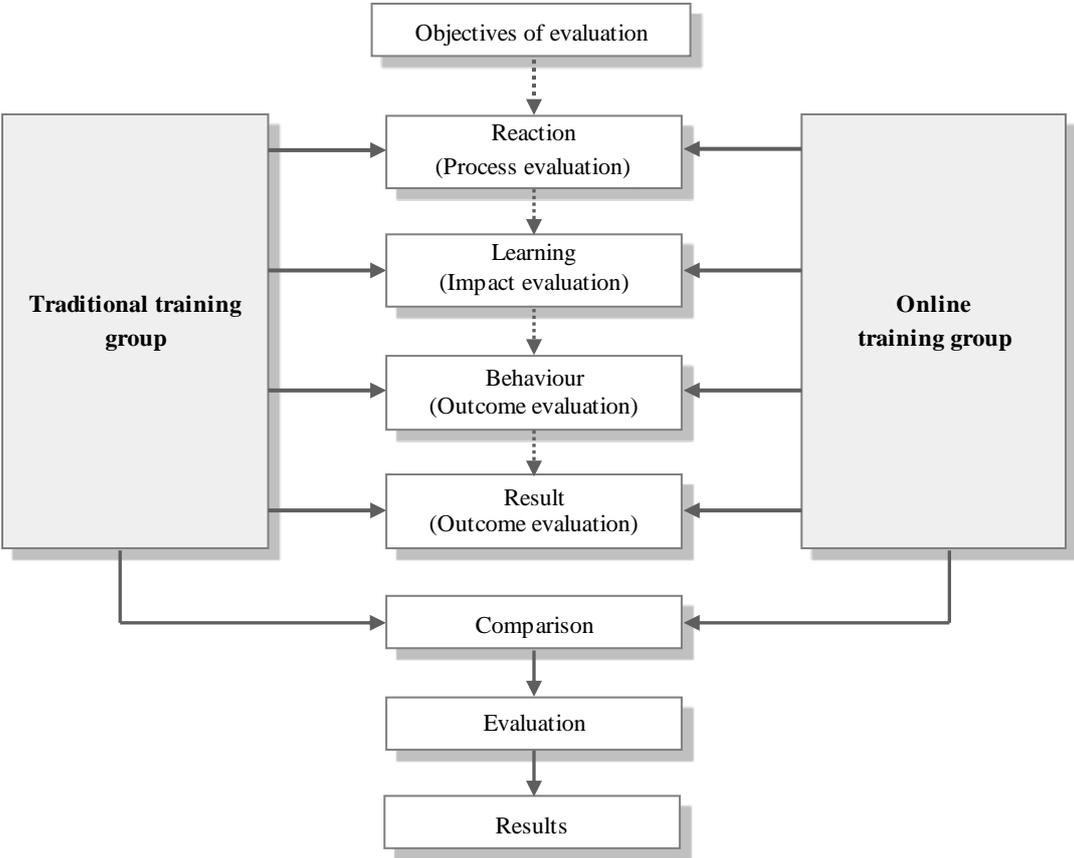


Figure 1: An effective evaluation framework of online learning .(*Tran Thanh Dien 2006*).

These comparisons are implemented under each evaluation level of Kirkpatrick's model. From the comparisons, we can evaluate whether the existing e-learning training program is effective or not, comparing with traditional learning. In this study focus on safety and health course which is covered to our study scope.

4. RESULT EVALUATION

The study's quantitative data collection results are reported first, followed by the qualitative data collection results. The quantitative phase collection results were gathered using online surveys completed by Top management of manager, site manager and supervisor, Administrative and technical employees. Qualitative data collection results were gathered using interviews of employees and the managers of the company.

Quantitative data collection results. Due to short time period, the data is based the researcher experiences working of internal audit in all areas of all departments at the company last two years before and the accumulation data based on the questions were developed on questionnaire. The researcher will take further investigation soon on their expectation answer by distribution of questionnaire. The Survey will be sent to the 60 employees in the two training methods of safety and health training program for the study. The expectation response rate of 51.7% and the survey responses were captured in a database that allowed the data to be reported into a Microsoft Excel 2007 spreadsheet. There were 53 questions in the survey.

Before this study proceed to comparative of both method training effectiveness, The first thing is to categorize of respondent to the two groups based on data responded of question no. 2 till question no. 7. Question no. 2 till question no. 5 were took as a consideration factors of e-learning group employee and question no 2, 6 and 7 were took as a consideration factors of traditional group employee. The scale would be considered is following answer:

Question	Question details	The consideration answer
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2	How many years have you been employed in this position?	4 or 6 years and 6 and above
3	How would you rate your level of computer literacy?	Good and excellent
4	To the best of your recollection, approximately how many e-learning training in safety and health courses provided by the corporation have you completed	5 or more
5	To the best of your recollection, approximately how long ago did you complete the most recent e-learning training in safety and health courses?	Less than 3 months ago
6	To the best of your recollection approximately how many traditional training in safety and health courses provided by the corporation have you completed?	3 or 4 5 or more
7	To the best of your recollection, approximately how long ago did you complete the most recent traditional training in safety and health course?	Less than 3 months ago

The consideration answer above in this study has be considered based on previously study.

From the researcher expectation the employee shown 32% is covered to the consideration answer for question no. 2 till no.5 and 48% covered to the consideration answer for question no.2, 6 and 7. While 20% more of respond is not covered all the category. Meaning 32% from the respond is e-learning group and 48% is traditional group. The two of the group will be compared of the effectiveness for both training method based on the variables were distributed to them through online questionnaire.

The analysis results in the evaluation items that belong to four evaluation levels of the proposed framework are depicted as the following table. The result is based on the research question such as follows:

1.0 Is there a significant difference in course contents perception between e-learning training group and traditional training group?

2.0 Is there a significant difference in course objective perception between e-learning training group and traditional training group?

3.0 Is there a significant difference in course material perception between e-learning training group and traditional training group?

4.0 Is there a significant difference in training facilities perception between e-learning training group and traditional training group?

5.0 Is there a significant difference in training schedule perception between e-learning training group and traditional training group?

6.0 Is there a significant difference in staff knowledge and skill perception between e-learning training group and traditional training group?

7.0 Is there a significant difference in staffs' attitude perception between e-learning training group and traditional training group?

8.0 Is there a significant difference in staffs' learning transfer to the job performance perception between e-learning training group and traditional training group?

9.0 Is there a significant difference in cost injured employees perception between e-learning training group and traditional training group?

Therefore, in order to answer the research questions, this study used the *t-test* analysis (Independent-samples *t-test*) method since there were only two independent groups in this study and it is meant to test the existence of difference of mean of one variable for two independent groups. Even though for the first level of Kirkpatrick model in course content, course objective, course material, facilities and schedule were used pair sample statistics test. The reason all the evaluation items is not belong of the two group, they were covered for all respondent reaction. The comparative base on the training type of e-learning and traditional training. From the analysis, will be found the achievement of the two traditional group and e-learning group, the level are reaction, learning, behavior and result by doing the significance test for two means.

Table 4.1: The analysis results of evaluation items in employee and manager response achievements of the fourth level Kirkpatrick model between traditional training and e-learning training methods.

H	Evaluation items	DA		Mean differenc e	p=sig.(2- tailed)	Significant difference	Accepte d /rejected
		T	O				
H ₁	Course content	87.1	83.9	.032	.325	No	R
H ₂	Course objective	74.2	77.4	-.032	.325	No	R
H ₃	Course Material	87.1	93.5	-.226	.090	No	R
H ₄	Facilities	71.0	96.8	-.226	.017	Yes	A
H ₅	Schedule	96.8	80.6	.162	.169	No	R
H ₆	Knowledge and Skill increase	66.7	50.0	.167	.426	No	R
H ₇	Attitude changes	86.0	80.0	.067	.712	No	R
H ₈	Behavior from Learning transfer to the job performance	33.3	30.0	.000	1.000	No	
H ₉	Result of Cost injured	73.3	90.0	-.167	.328	No	

Notes: H=Hypothesis; DA=Degree of Agreement; T=Traditional learning; O=Online learning; A=Accepted; R=Rejected.

4.2.1 *The reactions of participants*

The expectation data reported is from traditional and e-learning training. In this part, we test the difference of the two type of training' in safety and health of courses. The hypotheses include $H_1, H_2, H_3, H_4, H_5,$

4.2.1.1 Course content (H_1)

For the course content, we have three questions. The observed frequencies with respect to agreement degree (including “agree” and “strongly agree”) in the different course contents are calculated by percent of the total number of the observed frequencies of four questions that involved in course content item. The results of statistical analysis indicated that the result on agreement degree in the traditional course (TC) is 87.1% while which in the online course (OC) is 83.9%.

From the two tailed significance (.325) is not statistically significant at confidence interval of 95%. In this case, without the negative sign (-) of the mean difference is explained that the mean of the agreement degree for OC is less than which for TC. However, from the tested result, we **reject hypothesis H_1** . Therefore, we can conclude that there is not significant difference in the result of course contents between two environments: traditional learning and online learning (see Table 4-1).

The statistical results also show that almost questions (variables) depicting the course content are not significantly different.

4.2.1.2 Course objective (H_2)

For the course objective, we have two questions for course objective. The results of statistical analysis indicated that the observed frequencies with the agreement degree at the different course designs between two learning environments is different, 74.2% in TC comparing with 77.4% in OC.

The two tailed significance (-.325) is not statistically significant at confidence interval of 95%. In this case, the negative sign (-) of the mean difference is explained that the mean of the agreement degree for OC is more than which for TC. However, from the tested result, we **reject hypothesis H₂**. Therefore, we can conclude that there is not significant difference in the result of course objectives between two environments: traditional learning and online learning (see Table 4-1).

From the statistical results, we can see that three of four questions depicting the course design are significantly different except the high quality of course materials.

4.2.1.3 Course material (H₃)

In this session, we also have two questions. The observed frequencies with respect to the agreement degree at the different instructional methods are different. The output of statistic shows that the agreement degree of the students in OC (87.1%) is more than which of them in TC (93.50%).

The two tailed significance (-.090) is not statistically significant at confidence interval of 95%. In this case, the negative sign (-) of the mean difference is explained that the mean of the agreement degree for OC is more than which for TC. However, from the tested result, we **reject hypothesis H₃**. Therefore, we can conclude that there is not significant difference in the result of course objectives between two environments: traditional learning and online learning (see Table 4-1).

4.2.1.4 Facilities for training (H₄)

We have three questions for training facilities. The observed frequencies with respect to the agreement degree at the different facilities for learning between two learning environments are different, but not too much. While agreement degree in TC is 71.0%, which in OC is 96.8%.

The t test statistic output indicated that the \two tailed significance (-.017) is completely statistically significant in the range of $\alpha = .05$. This leads to the **acceptance of hypothesis H₄**. Therefore, we can conclude that there is significant difference in the data of training facilities between traditional training and training environments (see Table 4-1).

From the statistical results, we can see that three questions depicting the course design are significantly different except the high quality of training facilities.

4.2.1.5 Schedule for learning (H₅)

We depend on the two questions for training schedule. The observed frequencies of the students' agreement degree at the different learning schedules between two learning environments are more different. There were 96.8% of the students taking TC and 80.6% of them taking OC.

The difference in the mean (-.226) is not statistically significant at confidence interval of 95%. In this case, the negative sign (-) of the mean difference is explained that the mean of the data' agreement degree for OC is more than which for TC. However, from the tested result, we **reject hypothesis H₅**. Therefore, we can conclude that there is not significant difference in the result of course objectives between two environments: traditional training and online training (see Table 4-1).

4.2.2 *The learning achievements of the employees*

In this part, we test mean difference of the achievements in learning of the employee in two types of courses. The hypotheses include H₆, and H₇.

4.2.2.1 Knowledge and Skill increase (H₆)

Depend on the nine questions for evaluating the employee knowledge and skill increases. The observed frequencies with respect to the agreement degree at the different knowledge and

skill increases of the employee between two learning environments are different. From the data in TC agreed with rate of 66.7% of the students achieving high skills while this rate in OC is 50.0%.

However, the results of the t test statistic indicated that the difference in the means (.167) is not statistically significant. From the result, we **reject hypothesis H₆** at $\alpha = .05$. Therefore, we can conclude that there is not significant difference in the employee knowledge and skill increases between traditional training and online training (see Table 4-1).

4.2.2.2 Attitude changes (H₇)

In this session, we are depend on the nine questions for evaluating attitude changes. The observed frequencies with respect to the agreement degree at the different attitude changes between two training environments are different: 86.0% for TC comparing with 80.0% for OC.

However, the results of the t test statistic indicated that the difference in the means (.067) is not statistically significant. From the result, we **reject hypothesis H₇** at $\alpha = .05$. Therefore, we can conclude that there is not significant difference in the employee attitude increases between traditional training and online training (see Table 4-1)

4.2.3 *The behavior of the employees*

In this part, we test mean difference of the achievements in learning of the employee in two types of courses. The hypotheses is H₈.

4.2.3.1 Behavior on the job performance ((H₈))

In this session, we have eight questions for evaluating behavior on the job performance The observed frequencies with respect to the agreement degree at the different behavior between two training environments are different: 33.3% for TC comparing with 30.0% for OC.

However, the results of the t test statistic indicated that the difference in the means (.000) is not statistically significant. From the result, we **reject hypothesis H₈** at $\alpha = .05$. Therefore, we can conclude that there is not significant difference in the employee attitude increases between traditional training and online training (see Table 4-1)

4.2.4 The Result of the organization

In this part, we test mean difference of the result of the company in safety and health area. The hypotheses is H₉.

4.2.4.1 Cost injured of employee (H₉)

In this session, we have two questions for evaluating attitude changes. The observed frequencies with respect to the agreement degree at the different attitude changes between two learning environments are different: 73.3% for TC comparing with 90.0% for OC.

However, the results of the t test statistic indicated that the difference in the means (-.167) is not statistically significant. From the result, we **reject hypothesis H₆** at $\alpha = .05$. Therefore, we can conclude that there is not significant difference in the cost injured between traditional training and online training (see Table 4-1)

4.1 Analysis of results

4.3.1 Reactions of participants

The reactions of result represent the employee perception in the course content, course objective, course material, facilities and schedule for training,

For course content, course materials and course objective are not significant difference in the result between traditional training environment and online training environment. This might be easily interpreted based on current online training program in practice. Most of the courses that are converted to e-courses to apply to online learning did have significant changes in their contents. Normally, the instructors do not attach special materials to the course contents with respect to online training environment, but other more important issues are paid proper attention.

However, there is significant difference in result of training facilities between these two training environments, preferable to online training. The course that are mainly clear design and objectives as well as accurate tests make a great progress with respect to online environment.

Facilities for training are also a concerned issue. Statistical results show that there is significant difference in facilities for training between two training environments. From practically tested results, it reflects the training conditions of online training environments in general as well as the online learning program particularly at the organization. The current facilities of several online learning programs have more really met the demands of employees. The facilities depend on the economic conditions of the company and employees as well as ICT development degree of this organization. Compared with traditional training environment, online training environment is more prominent in providing facilities for training of employees.

On the contrary, for schedule for learning, there is not significant difference in result between two training environments in favor of both training. This difference is mainly convenient for timing of course. In this study, the case study is both training methods have arrangement of time is very appropriate for training. Normally, instructors gradually assign work , so felt convenient for their training and easy to arrange time for communicating with instructor and their classmates through email or forum anywhere and anytime. This is a significant advantage of employees' own training time initiative in both training environment. Therefore, employees satisfaction with respect to this environment is an obvious issue.

For whole participants' reactions, the statistical result indicated that there is not significant difference between two learning environments. Although employees' have initial satisfaction with respect to online training environment, their satisfied demands in training are unlimited. In spite of significant difference in course design, almost participants, especially employees' expected online course to be furthermore improved. When asked, "how would we improve the course?", almost employees expected to be added more techniques for online course. Furthermore, most of the employees asked to be made activities for online course more interesting. In short, there are significant differences in facilities evaluation items, in favor of online environment, but participants' reactions as a whole are not significantly different.

4.3.2 Learning achievements

Knowledge and skills increases are shown in employees-evaluation about what they have achieved. The results of this study indicated that there is not significant difference in students' knowledge and skills increases between two training environments. This demonstrates that achieved knowledge and skills with respect to both traditional training and online training environments is similarly important to employees. This result is also satisfied with the analyzed results of course content, facilities and the rest above mentioned. As we

known, during taking the online course, employees did not only expect in knowledge and skills increases, but also expected another aspect of online learning environment:

New training method. When asked “What is the most important issue that you need for your jobs after taking this course”, nearly half of employees said that they expected from training method of online course while this rate is not significant in traditional course. This proves that new training method partially contributed to employees achieved knowledge and skills. Although they do not expect to obtain more knowledge and skill with respect to online course, in practice, their achieved knowledge from two kinds of courses are similar. It is an important issue that is expected by us as well as education managers. Skill increases often go together with knowledge increases. And like knowledge increases, there is not significant difference in skill increases between traditional learning and online learning environments. According to manager, employees who take online course have increase in skills comparing with traditional course. These skills mainly focus on using computers such as searching information on the Internet, and so forth. However, it is only increase of some skills in online course, but not all. The manager undertaking online course evaluated that practical skills of employees would increase much more if facilities for training were more and more improved.

The Attitude also is an important issue that not only affects to what employees learnt in the courses, but also demonstrated employees’ behavior with the respect areas at job place, so it makes self-motivated for employees. If the people in the organization do not have positive attitudes toward work safety, injury and illness still occurs, and the training program would fail. In this study, there is no significant difference in employees’ training attitude between two training environments, in favor of online learning. This can be interpreted based on several reasons. Online learning is a new training method that makes an attractive force for employees as they take the online course. The online course’s forms, especially graphical interface, give employees a positive view about training. In addition, the course organization

and arrangement of instructors encourage interest in training of employees. Even though, online training more provided for among technical and production people, they were more exposed in beware environment and their attitude in safety and health should be more practical than the rest of employee type. Unfortunately, the group of online training have a less positive attitude on online environment than the traditional one. This is an indispensable tendency in education and training development.

The output of whole learning indicated that there is a significant increase in training achievements of employees in traditional training environment compared to online training environment. A broader view might be to consider active ingredients in new training method. Perhaps from the current technology expand will influence the resolution of online training weakness.

4.3.3 Behavior on the job performance

The behavior, we evaluate their job performance in safety and health area whether they comply their learning from the training. The frequency of Agreement degree showed the lowest compared to others evaluation level. In the evaluation, traditional training higher achievement rates than online training. Thus, It can be a picture of the extent of the effectiveness of training in terms of the behavior of workers in safety and health.

4.3.4 Cost injured of employee

The cost injured of employee is a one of the key measurement of the organization result for a practice that has been carried out. The cost is defined as the angle of the provisions of the financial aspects, time and efficiency if the accidents occur among their workers due to employee error and negligence in handling the task. The result of the Agreement degree

frequency showed online training is higher than traditional training. Even though, the both training is not much differences.

4.2 Comparison with related work

As mentioned earlier, this study carried out a comparative evaluation between traditional training and online training,. The statistical results indicated that there is not significant difference in between these two learning environments.

The results of this study were consistent with the research described by Tran Thanh Dien (2006). However, this study was specified in industrial safety and health in with respect to two learning environments were the same. According to Tran Thanh Dien's research results, there is a significant difference in learning outcomes between online and traditional learners and online instruction can be a viable alternative for higher education. Tran Thanh Dien's research, has significant practical implications for education because many institutions are offering more online programs. While, in this study has significant practical implication for industry organization. Even though, both studies also contribute to the current literature in the area of online learning.

Furthermore, the results of this study are also consistent with some previous research such as the research of Nelson (2001), Redding and Rotzien (1999), and etc. This might be related to some reasons, due to differences in samples, courses, online instructional strategies, and online technologies.

1. CONCLUSION AND FUTURE WORK

Online training programs have been developed and deployed at several institutions. Choosing a model to measure these programs is a concern of education managers. In this study, a framework for measuring effectiveness of online learning environment, comparing with traditional learning environment, was proposed. This framework was developed based on

Kirkpatrick's four-levels evaluation model that is often used to separately evaluate training programs. For each evaluation level of the framework, variables including questions and evaluation items were tested to determine differences between two learning environments.

This case study was aimed to conduct to 60 staffs' who are everyone involved of the training whether as a e-learning and traditional classroom in safety and health training, as a real population that would be taken as a research samples. From the 60 staffs', about 70% of employee's are of technical background and they are placed at relevant divisions which are Production, Maintenance, Safety (EHS), Quality Control, Warehouse and Store, the rest of 30% of employees have been placed in management divisions such as Finance, Human Resources and Admin, Supply Chain and IT department. This study was expected all the staffs' were involved to the both trainings in the same courses in safety and health.

The statistical results showed that there is not significant difference in employees' learning achievements between two training environments. Based on the agreement degree percentage on level evaluation resulted shown more higher is from traditional training, this is look like most of employees' preferable to traditional training as a possible result of the interview. However, because of the size of case study and the limitation of research period, some recommendations are necessary to be considered for future development.

In this study, only one online course was chosen to evaluate its effectiveness comparing with one traditional course. In order to verify these comparative results, evaluation should be carried out based on several online courses. In addition, data collection should be done through online questionnaire if possible.

Furthermore, the period for evaluation should be extended. In this study, the evaluation was only focused on researcher experiences from previously audit and survey report. In order to comparatively evaluate effectiveness of online training based on the proposed framework.

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