EMPLOYEES' PERFORMANCE THROUGH APPRAISAL E-COURSES

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ABSTRACT
This article describes the employees' skills and knowledge progress through several virtual courses (e-Training) coordinated by an American County Appraisal District during the period 2000-2010; where, each employee must maintain updated his/her state-license and as well as the overall employment requirements with the District. A nonparametric statistical technique named bootstrap method was selected (whose justification is explained) to perform the data analysis. This report focuses on the statistical summary of the employees' performance through course examinations, and as well as on the linear tendency of the annual labor turnover ratio %; a diagram of parameters is shown to facilitate the comprehension of the factors involved in the learning-training process; which is an activity intrinsically related with the intellectual capital of an organization.

KEYWORDS: e-Training, e-Learning, Internet, bootstrap method, parameters diagram.

1. INTRODUCTION

The purpose of this article is to describe some relevant aspects of the e-Training programs, and to get the right conclusions from an appropriated statistical analysis about the data generated from a sample of employees that had been participating in an e-Training program during a period of 11 years (2000-2010).

The term "e" of e-Training meant to be electronic, just like every other e (i.e. e-Commerce, e-Business, etc.); and the span of electronic in the term e-Training can include: Internet, intranet, extranet, satellite broadcast, audio/video tape, interactive TV and CD ROM.

Teaching involves the transfer of knowledge and feedback at two levels: group communication and individual communication.

The virtual courses provide the opportunity to obtain a professional training when face-to-face training and geographical, physical and schedule limitations exist; but some employees without this kind of limitations are using this resource expecting easy courses, less assignments, or less effort; and in this way to obtain a higher

examination grade. Thus, the virtual courses are real academic challenges for all trainers, whose priority is to offer high-quality training maintaining an ethical and professional environment.

First was the arrival of the computer and later on the appearance of Internet; but, before the communication via Internet, the "distance learning" courses were provided by correspondence (mail); the technology is periodically and progressively changing our knowledge; the technology has always been the changing force for mankind [[3] Close 2000]. Now the Internet combined with other technologies enables any person to have access to a never-ending process of information and knowledge.

The technology and the Internet empower individuals and facilitate a more active position in the e-learning and e-training process.

Some of the advantages of taking virtual courses are the convenience and the flexibility for studying from any computer at any time and any where, which permits to comply with working, personal and family responsibilities; but the most notorious disadvantages are the lack of interaction with trainers, advisors and job-mates, the lack of updated computing equipment (hardware & software) and the lack of self-didactic skills (the discipline of reading). The trainers/advisors provide power-point and audio presentations for the lessons, but it do not make up for the lack of a lecture; because most of the power point presentations are taken directly from the manuals. Therefore, reading is an essential part in being successful in virtual courses. About not-frequent disadvantages, we can mention the lack of computer knowledge from employees, the slow e-response time from advisors and the lack of reading's skills [[12] Steen 2006]. In addition, the exams will be held under controlled conditions of place, date and time.

2. INTERACTIVE SOFTWARE

The major objective of interactive software is to provide to the learners with an understanding of how to interpret results, and how to solve problems (*basic competences*) as applied to job scenarios. In general, the selected software should run in different modes**:** First, using the instruct mode, the user gain an understanding of the technique and/or methodology. Second, using the practice mode, the participant gains the mastery of the technique with hints and help available to assist his/her training. Third, using the certify mode, the user are required to obtain his/her certificate indicating mastery of the topic without help or hints. At the end of a time-period of training, the employee will be credited for each certificate earned. The total credit will be equal to a specific percentage with each certificate carrying a specific weight.

3. E-TRAINING AND TECHNOLOGY

The term e-Training can include Internet and several more electronic media technologies; of course, in this world of global communications, other factors affecting the e-Training activity are the virtual teaching styles/techniques as well as the social environment (see Figure 1).

Cisco Systems is one of the largest corporations of e-Training users (technical participants) that explains its compromise with the e-Training's components, where "components" can include content delivery in multiple formats, management of the training experience, and a networked community of learners [[6] Crews 2012],

content developers and experts. e-Training provides faster learning at reduced costs, increased access to learning, and clear accountability for all participants in the learning process. In today's fast-paced culture, organizations that implement e-Training supply their work force with the ability to turn change into an advantage [[9] Kirschner 2001].

In this context the differences between e-Training, and online-training should be noted**:** e-Training represents the whole category of technology-based training, while online-training is synonymous of a web-based training; in order to be more precisely, an online-training is in fact a component of e-Training. Thus, we can sketch a definition of e-Training as any combination of virtual teaching methods and styles supported by different electronic media technologies including Internet [[10] Pena-Sanchez, 2007], Intranet, Extranet, Satellite Broadcast, Audio/Video Tape, Interactive TV, CD ROM, etc.

e-Training helps us increase access to training and ensure that it is immediately relevant and cost-effective. Some advantages of an online-training include: Anywhere, Anytime, Anyone: e-Training is available 24 hours a day, around the world. Organizations can distribute training and relevant information to multiple locations easily and conveniently, allowing employees to access training at their convenience.

Training Definition: *"Organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill".* **Source: http://www.businessdictionary.com/definition/training.html**

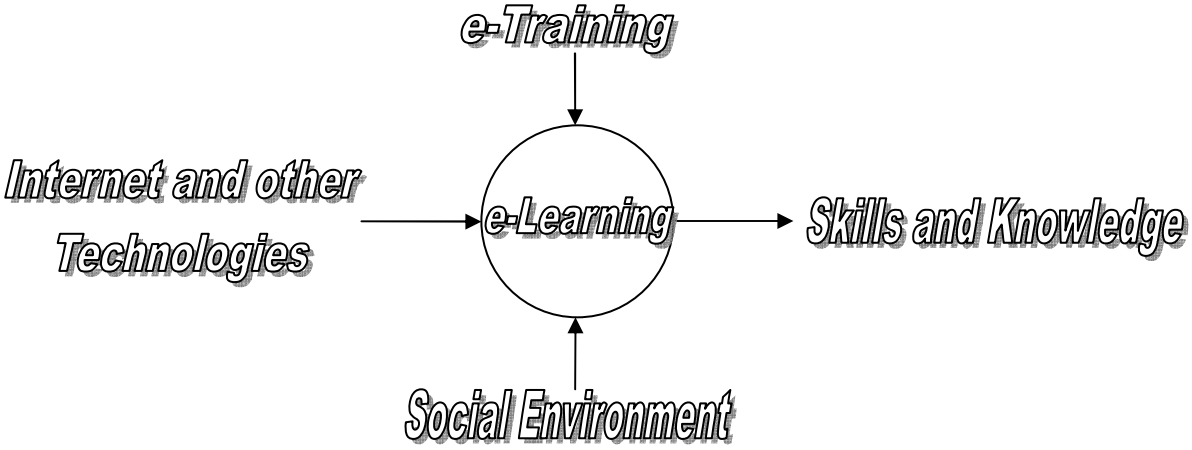
Since geographical and time barriers are virtually removed, e-Training is no longer limited to a few people who can travel to a seminar or conference. e-Training can occur throughout organizations and e-collaborative individuals, accelerating the transfer of knowledge, and transforming training from an isolated example of qualified development into a powerful tool [[8] Jones 2002] for managerial decisions.

4. RESEARCH HYPOTHESES

The following hypothesis uses the employee performance through the examination on the virtual-courses taken by the employee, where the dependent variable is his/her percentage (%) of correct answers. In all organizations if the employee score is less than a specific minimum sufficient score (say a M %), then the employee must be rescheduled to retake the virtual-course and its correspondent exam until he or she will be reaching or exceeding the M % score; thus, the research hypothesis is

H_{A1}: □ < M□□□□□□□□□□□□□□□□□□□□□□□□□□□□

Figure 1. The e-Learning process and its related factors



Where □ represents the average percent of correct answers, which can be associated to the effectiveness average of the training program for all employees. Then, the corresponding null hypothesis is

$$H_{01}: \square \geq M\ \% \qquad (2)$$

The manager of the human resources department in collaboration with his/her training coordinator will be defining the M % score for each virtual-course.

Year after year (from 2000 until 2010) the ratio of the number of removed employees (terminations) from his/her organization to the number of employees on payroll (positions) [[2] BLS 2012] during the same year represents a measure of the labor turnover (LT)**:**

$$LT = [\text{Terminations} \div \text{Positions}] \bullet 100 \qquad (3)$$

We want to test the assumption or hypothesis that during the last five years the e-Training program has been reducing the labor turnover ratio in this organization; clearly, the dependent variable will be labor turnover proportion; whose reduction can be measured through a negative change in its linear tendency. Consequently, the second research hypothesis is

$$H_{A2}: \square_{2006\text{-}2010} < \square_{2000\text{-}2005} \qquad (4)$$

Consequently, the appropriated null hypothesis is

$$H_{02}: \square_{2006\text{-}2010} \geq \square_{2000\text{-}2005} \qquad (5)$$

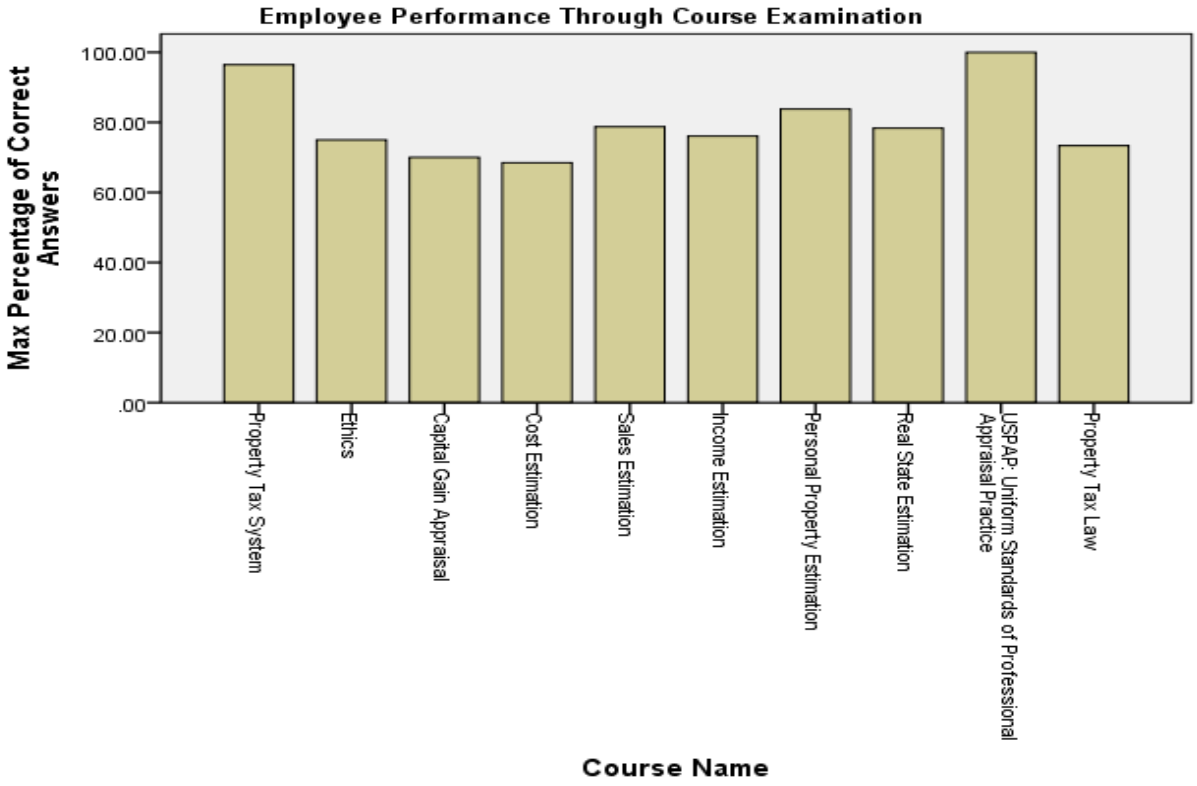
Where, □ represents the slope of the linear trend for the labor turnover percentage at the specified period of time.

5. DATA AND METHODOLOGY

A sample of 11 years with an average of 51 employees per year (and a standard deviation of 6 employees per year) at an American County Appraisal District was used to test the previous hypotheses. The first dependent variable corresponds to the employees' final score reported as the percentage of correct answers per course examination, for 10 different courses [[13] USPAP 2008], the course names are shown in Figure 2; this percentage can be viewed as a measure of the effectiveness of the training program. The second dependent variable is the labor turnover ratio during a period of 11 years from 2000 to 2010, where each employee must maintain updated his/her state-license and also his/her overall employment requirements with the District [[1] Borchard 2012].

To avoid any conflict related to the lack of fulfillment at parametric assumptions**:** Normal distribution of the dependent variable, homogeneity of variances, etc.; we have been decided to test the previous null hypotheses through a nonparametric technique [[5] Conover 1999] named *bootstrap method*.

Figure 2. Percentage of Correct Answers per Course Examination



6. STATISTICAL ANALYSIS

Table 1 contains the bootstrapped results for the variable Percentage of Correct Answers; where the lower limit of the 90% Confidence Interval bootstrap estimate is **75.1140**; and so, the first null hypothesis will be rejected for any **M** score less than **75.1140**, at a significance level of □=0.05; this is because working with a **90 % CI:** each curve-tail has a half alpha value of 5 % or 0.05 as probability measure.

Similarly, Table 2 indicates that the first null hypothesis will be rejected at any M score less than **74.02781**, for a significance level of □=0.025.

To test the 2nd null hypothesis we decides to estimate the bootstrapping statistics for the linear regression slope of the labor turnover ratio using the factor time in years as the independent variable; the years 2000-2010 were relocated with values from **1 to 11** respectively. Figure 3 contains the information associated to the 2nd null hypothesis. The Tables 3 and 4 contain the bootstrapped statistics estimates of such linear regression slopes for periods 2000-2005 and 2006-2010 respectively.

As we can see on Table 4 the 2nd null hypothesis can be rejected, given that the lower (**-12.980**) and the upper (**-4.830**) limit for the slope during period 2006-2010 shows both negative values, which is an indication of a negative tendency (or reduction) for the labor turnover ratio at this segment of time; while, during the period 2000-2005 Table 3 shows a negative lower limit (**-1.940**) combined with a positive (**7.531**) upper limit; therefore, the data indicate that there is no linear trend ($\beta \approx 0$) for the period 2000-2005.

Table 1. Bootstrapping statistics for the variable Percentage of Correct Answers for a 90% Confidence Level.

	Mean Estimate	Bootstrap for One-Sample Test [a]				
		Bias	Std. Error	Sig. (2-tailed)	90% Confidence Interval	
					Lower	Upper
Percentage of Correct Answers	80.02300	.03386	3.19462	.001	**75.11400**	85.73024

a. Bootstrap results are based on 1000 bootstrap samples

Table 2. Bootstrapping statistics for the variable Percentage of Correct Answers for a 95% Confidence Level.

	Mean Estimate	Bootstrap for One-Sample Test [a]				
		Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
					Lower	Upper
Percentage of Correct Answers	80.02300	-.07338	3.13597	.001	**74.02781**	86.50655

a. Bootstrap results are based on 1000 bootstrap samples

Table 3. Bootstrapping statistics for the linear tendency of the labor turnover ratio from 2000 to 2005.

Model: $\hat{y} = \beta_0 + \beta_1 t$ $1 \leq t \leq 6$	Estimate	Bootstrap for Coefficients [a]				
		Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
					Lower	Upper
β_0	22.597	-.737	9.298	.114	8.622	40.195
β_1	1.507	.330	2.628	.426	**-1.940**	**7.531**

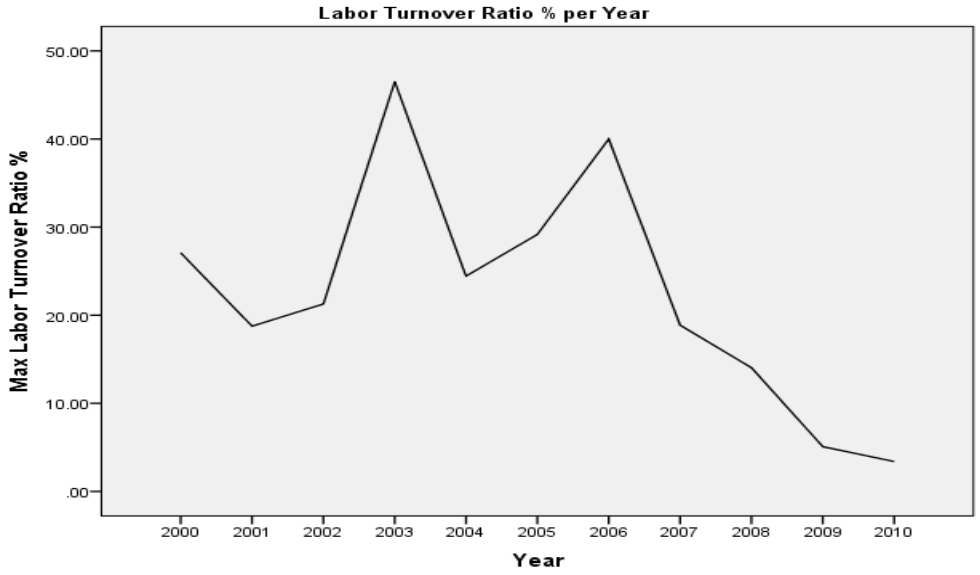
a. Bootstrap results are based on 1000 bootstrap samples

Table 4. Bootstrapping statistics for the linear tendency of the labor turnover ratio from 2006 to 2010.

Model: $\hat{y} = \beta_0 + \beta_1 t$ $7 \leq t \leq 11$	Estimate	Bootstrap for Coefficients [a]				
		Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
					Lower	Upper
β_0	94.585	-1.957	25.120	.138	56.512	130.860
β_1	-8.701	.075	2.775	.194	**-12.980**	**-4.830**

a. Bootstrap results are based on 1000 bootstrap samples

Figure 3. Annual Labor Turnover ratio



7. CONCLUSIONS

Our conclusion supported by a nonparametric statistical analysis through the bootstrap method is that the effectiveness of a training program measured as the employee performance depends on several factors (see Figure 1), whose optimal combination in general produce tangible benefits.

The first null hypothesis, where the dependent variable is the percentage of correct answers, can be rejected for any M score less than the lower confidence limit (**75.1140** at □=0.05; or **74.02781** at □=0.025); consequently we can conclude that for those employees whose percentage of correct answers is equal or exceeds to M should not be required to retake the exam (Tables 1 & 2); meanwhile, for the 2nd null hypothesis, where the dependent variable is the labor turnover ratio, Table 4 shows a decreasing linear tendency during the last five years (2006-2010), which can be interpreted as a reduction on the labor turnover, provided that both limits of the confidence interval for the slope appear as negative estimates; the diminishing behavior of the annual labor turnover ratio since 2006 is exhibited in Figure 3.

From Figure 1, we have a new perspective**:** We can see or perceive the **Internet** as the **"New Virtual Industrial Revolution"**.

One the contributions of this article is precisely Figure 1, which is presented as a diagram of "parameters"; this diagram enables a research team to identify and review signal factors (Internet and other technological tools), control factors (e-Training methods), and noise factors (social environment) that affect the e-Learning activity. This result in creating an understandable and well-defined e-Learning function in terms of a measurable objective**:** the improvement of skills and knowledge.

8. RECOMMENDATIONS

Given that "e-Learning" can be viewed as a process in which the learners increase their skills and knowledge (see Figure 1); by experience, we can say that the lack of skills as a self-didactic is a critical factor for to be a successful online learner. Therefore, before initiating a virtual course [[13] USPAP 2008], we recommend reinforcing such abilities**:** habit for reading, reduction and/or elimination of distractions, optimal time-planning to meet the technical prerequisites [[14] USPAP 2012], to attend the induction provided by the e-Training supervisor, etc.

Some quantitative oriented courses (cost estimation, income evaluation, etc.) are difficult because they contain formulas and it would be better to see an instructor explaining his/her interpretations and applications during a classic training, than to read about the subject matter in a manual or handbook.

9. DIRECTIONS FOR FURTHER RESEARCH

These findings should influence both administrators and instructors about their choice for some software and/or technology to support technical learning [[7] Hilton 1999]. As instructors we all should seek the most effective and efficient tool for basic competences, as well as for e-collaborative tasks.

It is hoped that this paper will foster more research into the relationships between software diversity, e-communication [[4] Clyde 1999] and academic tasks for e-Learning purposes, so that more effective and efficient decisions will occur both in universities and organizations [[11] Sitkin 1992].

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