

Evaluating the Effectiveness of E-Learning Courses Based on the Kirkpatrick Model

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ABSTRACT

The Education and University cases have a long history in the human life; as world entered in the information and communications era, the education appeared as the E-learning and virtual university, and it has been considered and welcomed more than past according to the unique advantage of studying in these universities, therefore a program of educational activities can justify its own value only when provides reliable and valid evidence about the effect of education on participants' behavior and performance improvement. This issue refers to important aspect of education and training evaluation which is usually called as the "education effectiveness" or "evaluating the effectiveness of education" and is the most important process of curriculum which its proper implementation will provide extremely useful information about the way of planning and implementing the curriculum, and achieve a useful basis for assessing the educational performance. The present study, which is a kind of Case Studies, evaluates the effectiveness of e-learning courses based on the Kirkpatrick model (at the Shahid Beheshti University). The main purpose of this research is evaluating the significant difference between the status quo and desired status of effectiveness in the educational system of electronic courses. In order to examine this relationship the hypotheses were proposed, and the effectiveness of e-learning system was evaluated at four levels of Kirkpatrick model considering the conceptual model; the effectiveness of each level was assessed based on the components specified for each level by the two-sided paired comparisons student T-test for normal indicators and the two-sided paired comparisons of Wilcoxon signed rank test for abnormal indicators. In addition, the significant differences between the status quo and desired status were evaluated according to the variables such as participants' educational status, age, gender and employment. Consequently, based on the obtained information and data analysis, the study hypotheses determine and prove that there is a significant difference between the status quo and desired status, before and after educational course, in terms of four levels of Kirkpatrick model.

KEYWORDS: E-Learning; Effectiveness; Virtual University; Kirkpatrick Model.

INTRODUCTION

The growth of IT (Information technology) and effect of telecommunications equipments on the depth of society, have changed the educational tools and methods in the communities; and this change is in a way through which each person at any time and place can learn by facilities specified by him. The technology advances and its cheaper cost raised the think of using new tools for knowledge transfer in the communities, and then creating and expanding the Internet has considered the e-learning after the distance education in order to take advantage of current facilities for developing the education in communities. Accordingly, the e-learning creates proper and important facilities in the field of education for communities.

Nowadays, teaching and learning are not limited to the classrooms, and e-learning is a new method which is used for teaching. Besides, there are a lot of institutions and universities in Iran and around the world which will ultimately fail despite the vast investment in e-learning and massive publicity.

Therefore, understanding the factors affecting the acceptance of e-learning systems and students' tendency to continue using these systems, and the factors affecting their effectiveness from the user's viewpoint are so important and help universities and institutions in order to lead their investment to the effective factors. Thus, it should be noted that these trainings should be established according to the scientific principles and methods in order to meet the needs of obtained result otherwise the trainings will be ineffective and in some cases waste the capital. It can never be argued that the education is beneficial in itself, unless the provided trainings are evaluated. By creating the evaluation system of education quality, a tool is provided by which the university will be able to reconsider its activities. The level of university consideration to the assessment process reflects its tendency to improve the current educational processes and eliminate the existing shortcomings. The evaluation is a tool for understanding the value of phenomena and judging them. By measuring the effectiveness of trainings, the strengths and weaknesses of programs can be identified, the right choices are chosen for self-improvement, and the necessary recognition for planning high quality programs can be achieved.

The importance of educational efficacy

Since some projects for implementing e-learning fails and universities incur high costs in order to implement e-learning, performing the need assessment process of requirements in establishing the e-learning and its effectiveness in universities are extremely important in order to increase the project success rate. By evaluating and assessing the effectiveness of e-learning for students and identifying the characteristics of desired e-learning systems in the virtual world as well as recognizing the leading patterns of e-learning and evaluating the status quo and desired status of e-learning and the gap between them at Shahid Beheshti University, the evaluation can be defined as a final step in the learning process, aimed to improve the education or judging the value and effectiveness of curriculum. A comprehensive evaluation can indicate the effectiveness of educational results and provide a feedback by which we can find whether the offered trainings have been effective in achieving the desired goals or not. Moreover, if an integrated educational evaluation is implemented after the curriculum, it can be an important tool in improving the quality of educational programs. Thus, evaluating the effectiveness of programs and held courses are the most important cases which should be considered in each educational unit, especially at universities. In addition, since promoting the learners' awareness and skills is done through the virtual educational programs, evaluating the effectiveness of educational courses help and contribute greatly in increasing the quality of held courses in order to enhance the effectiveness of courses and develop the virtual educations by using the qualitative and quantitative results of programs and projects.

The aim of this study is investigating the significant difference between the status quo and desired status of e-learning system effectiveness at Shahid Beheshti University; therefore identifying the factors affecting the effectiveness of implementing the e-learning as well as the factors affecting the improvement of electronic courses effectiveness, also providing the strategies for being successful, making effective e-learning for students participating in these courses, solving the problems, and filling the gap between the status quo and desired status in e-Learning are very important.

Electronic or virtual learning

According to the lexical definition, it refers to a set of educational activities which is done by using the electronic tools such as audio, video, computer, network and virtual ones. Based on the conceptual definition, an active and intellectual learning is a method which changes the process of teaching, learning, and knowledge management; also it plays a vital and crucial role in expansion, strengthening, and cultural sustainability of information and communication technology. [9]

A simple and practical definition of the e-learning term is as follows: It is a way of learning or teaching, so that the preparation, delivering, and management processes are done by the multi-technology training support and are available locally or globally. [16]

In other words, the e-learning is the use of the Internet for learning, and this purpose can be achieved via the Internet connection and web browser at any place or time. The E-learning is a new kind of education in which students do not need to attend planned classes; in fact there is a virtual learning environment in the network. [10]

The traditional educational methods meet no longer the huge demand for education, and the e-learning, as a strategy for transition to information society, is provided rather than the conventional learning, with this difference that it is done by the most literate people in the community rather than the illiterate ones. [12]

The e-learning provides numerous opportunities for individuals' learning which were not previously possible. By this way, the chance of learning from a renowned and prestigious university will be possible; it is no need to change the lifestyle and thereby you do not need to leave the job or migrate on your own or family. [11]

The study which was conducted by Parr & David and it aimed to determine the successful learners' attitudes who were participating in the electronic courses and evaluate the reasons for their success in these courses in comparison to in person courses, indicated that the kind of educators, learners' individual interest, and the total devoted time have been the most important reasons for their success. [17]

Liav suggested three factors in order to design the e-learning environments are: the learners' characteristics, the structure of learning, and interaction. Understanding the society needs is essential to develop and create the e-learning. First, the learners' characteristics such as attitude, motivation, believe, and their confidence should be specified. [15] The learning is through an electronic media such as web-based content, multimedia applications, CD-ROM, virtual classrooms with live interaction with teacher, and electronic participation via e-mail by the Internet software. [8]

Dimensions of electronic or virtual education

Content, teachers, facilities of portal, facilities of training and educational assistance, quality, feedback, interaction, planning and implementation, motivation and attitudes, skills and knowledge, changes in job behavior, learning, job behavior, morale and job satisfaction, and achieving the business goals can be mentioned

as the components of virtual education. In this study, the mentioned variables are considered as the components of e-learning and studied in order to measure the effectiveness of e-learning course.

Effectiveness

In the management literature, the effectiveness is defined as doing right things, and efficiency defined as doing something right. The concept of effectiveness is within the concept of efficiency; in fact, the effectiveness means evaluating the effectiveness amount of measures in order to achieve the predetermined goals. Effectiveness is a cyclical, ongoing process which starts at the planning level of project; it includes all activities which are toward the goals and also determine whether performing them has been desired and good. In this research the effectiveness of course is reviewed based on the Kirkpatrick model of effectiveness and using a questionnaire.

Virtual University

Nowadays, the virtual education is considered at universities and scientific centers as a new and efficient method. The Internet as a global network has caused massive changes in science and technology of different communities. The information is available for Internet users at any place and time and this has led the academic and research institutions including universities to have the opportunity to provide a virtual learning environment for the public. (5)

If the book was considered as the main source of information about the education until yesterday, today the education is faced with new communication environments and tools. Recent advances in computer and information industry, the emergence of local, regional, international information networks, and particularly the Internet, Multi-media, and the communications technology, have provided new tools and methods for designers, planners, managers, and educational programs executives. The influence of new information technologies on educational centers (schools to universities) and even houses has generally changed the simple relationship between teachers and students. Thus, the traditional patterns of learning have been changed and users are faced with the high volume of information and knowledge.

Nowadays, most of the leading countries in the telecommunications are developing and setting up virtual classrooms and universities or developing their traditional systems. Besides the vast benefits, the creating and managing these institutions will also has problems and challenges. But obviously, the virtual universities will be good places for the emergence of talents, creativities, and innovations. [7]

Virtual University is an educational center which provides curriculum and study courses to students through the Internet, and students meet their educational needs using the Internet from the remote distance. Therefore, the "Virtual University" is a remote learning in which the Web and Internet technology are used for student educating and evaluation [2].

The traditional universities need to adapt the new evolution and changes. In a new environment, teachers' and professors' role will be changed. Most of them will play the facilitator, coach, or instructional designers' role. Therefore, changing, designing, and setting up the appropriate educational management systems are required. The remote educational systems are considered as a tool for continuing education, and these trainings can include teachers and students at any age, location, position, and social and political status might, with any kinds of education.

Evaluating the educational effectiveness

The evaluation is the most effective way by which the efficiency of curriculums will be improved, because it is a systematic and principled process that by collecting information about the general principles and its performance we can analyze the guidance, decision making, and performance of various components of education. Most of experts believe that the evaluation is a regular process to determine a value, purpose, or price of something, in the other words, the evaluation is a regular collecting of description and information, and judging in order to make a decision. The evaluation or Valuation term simply refers to determining the value for everything or value judgment. The evaluation is called a systematic process for collecting, analyzing, and interpreting the data in order to determine whether the desired objectives have been achieved or are being achieved and to what extent. [4]

If the evaluation is related to the education, it refers to the judgment process about the aspects of learner's behavior and includes a set of skills which help to specified whether the learner has achieved the determined objectives or not. The evaluation is an integral component of an education system. [6] The educational evaluation can be an important tool in improving the quality of educational programs if it is implemented with integrity after doing the educational program. The evaluation is the most important process of educational planning, and its correct doing provides the useful and important information about the way of planning and implementing the educational programs, and the useful basis is achieved in order to evaluate the educational performance of training centers. The educational evaluation is a gathering process of needed outputs in order to

determine the educational effectiveness, and the effectiveness is a process which learners are received from the education.

Kirkpatrick evaluation model

There are several models and patterns in order to determine the value of educational courses; the Kirkpatrick evaluation model is one of the most important ones. Most popular evaluation models in recent years are based on the four-level educational evaluation model which was first presented by Kirkpatrick (1959). [13]

This pattern is described as a comprehensive, simple, and practical model for the most of the educational opportunities, and is known as a criterion in this field by most of experts. Kirkpatrick has defined the evaluation as a determination of effectiveness in a training program and divided the evaluation process into four levels. One of the most popular and practical educational evaluation models is the Kirkpatrick's four-level model (reaction, learning, behavior, and results). [6]

The criteria of level 1 and 2 (reaction and learning) are gathered before learners go back to their jobs, and the criteria of level 3 and 4 (behavior and results) are measured with a degree which education learners use in their jobs. It means that the Levels 3 and 4 are used to determine the converting rate of training to the job. [1]

Level I: Evaluating the Reaction

The reaction means the rate of action and reaction which learners show in all factors affecting the implementation a training course. The reaction measures the participants' tendency (satisfaction) to the educational program. These surveys seek to get participants' opinions about the teaching, curriculum, assignments, training facilities, classrooms or tools, training content, and so on. [14]

Level II: learning

Learning is the determination of learning the skills, techniques, and facts which are taught to participants in the course and became clear for them. The learning can be defined as the amount which participants change their attitude and improve their knowledge, or increase the skill which is the result program consideration. Some educators explain that learning does not happen in any places unless the behavior is changed. The learning at four levels occurs only when one or more following cases occur:

Trends are changed, knowledge is increased, and skills are improved. If the behavior is changed, one or more of these changes should be occurred. [14]

Level III: Evaluating the transfer of learning (behavior change)

The behavior is the way and amount of changes which is occurred in the participants' behavior when they attend in training courses and it can be clear by continuing the assessment in the real work environment. The third level of education evaluation consists of determining whether the learned information and skills are implemented during the training courses in the workplace and whether there have been felt tangible and significant changes in the participants' behavior in the courses. (8) Donald Kirkpatrick raised the term "Evaluating the third level" for the first time. His purpose for this term is that measuring the resulting changes in job behavior is as a result of learning new knowledge and skills in the training courses.

Level IV: Results

The meaning of Results is achieving the goals which are directly linked to the workplace. Measuring this level is difficult, and the evidences such as Outcomes, Reducing the costs, Redoing, Increasing the quality of products, Sales and Profits are examined. [14]

According to Kirkpatrick's four-level model, there is a logical framework for evaluating; he showed this model in a pyramid, and states that all these presented four levels are important in his model and do not need to be ignored, because by measuring the results of each level we can have a certain interpretation of the other levels of this model. [6]

Two initial levels of evaluation take place within the training environment and they are called the "warm evaluation", while two final levels are measured in the people's workplace and are known as the "cold evaluation". This type of evaluation is too difficult and requires at least 1 - 2 years from holding the course. [8]

Conceptual model

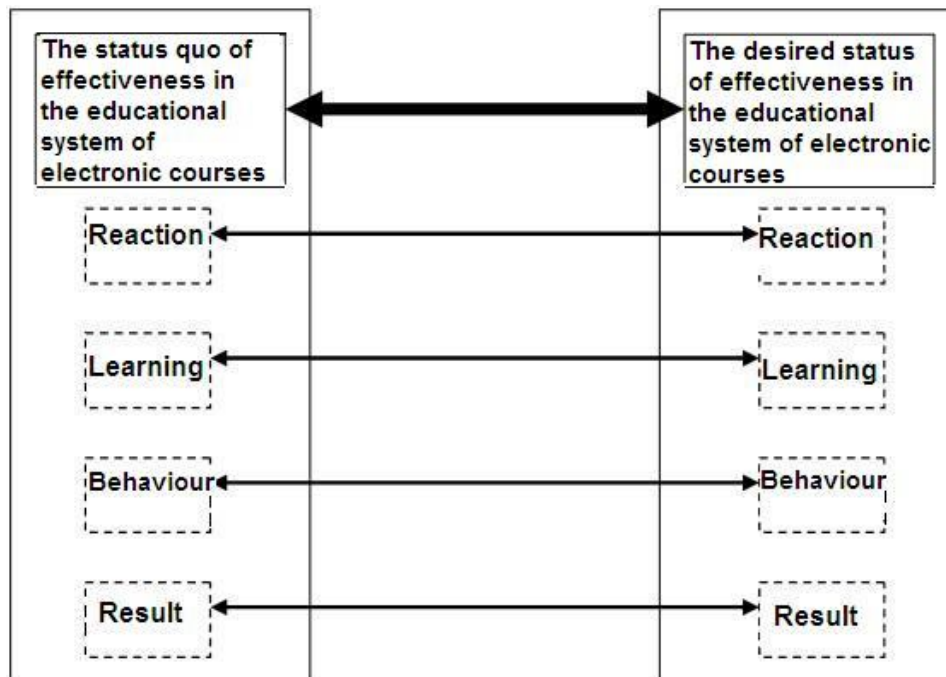


Figure 1 - Conceptual model of evaluating the effectiveness of e-learning system

The significant differences between the status quo of effectiveness in the educational system of electronic courses and the desired situation are about to be reviewed based on the four levels of Kirkpatrick's model including the reaction, learning, behavior, and results.

Research Hypothesis

The main hypothesis of research:

There is a significant difference between the status quo and desired status of effectiveness in the e-learning system at Shahid Beheshti University.

Research sub-hypotheses:

- 1-2 – There is a significant difference between the status quo and desired status of effectiveness in the e-learning system at Shahid Beheshti University based on the "Reaction" aspect.
- 2-2 - There is a significant difference between the status quo and desired status of effectiveness in the e-learning system at Shahid Beheshti University based on the "Learning" aspect.
- 3-2 - There is a significant difference between the status quo and desired status of effectiveness in the e-learning system at Shahid Beheshti University based on the "Behavior" aspect.
- 2-4 - There is a significant difference between the status quo and desired status of effectiveness in the e-learning system at Shahid Beheshti University based on the "Results" aspect.

RESEARCH METHODOLOGY

Scientific researches are divided into three categories including the basic, applied, and developed researches based on the aim of study. [3] This research is a type of applied research. In addition, the scientific researches can be divided into descriptive researches (Non-educational) and experimental research based on the way of data gathering. The current study is a kind of applied and descriptive research.

This research is descriptive in terms of method and solidarity, and practical in terms of the applied goal, because it aims to evaluate the effectiveness of the electronic courses at Shahid Beheshti University. This study is a today-oriented study in terms of time, because it aims to describe the status quo. During this study we review the status quo, gather the information, derive the conclusions for present and future applications, and evaluate the available gap between the status quo and the desired status for more efficient effectiveness in electronic courses in the future.

The questionnaire is used in order to gather information, so that for collecting needed data a questionnaire was designed with Likert range according to the descriptive nature of research in order to detect the students' reaction, learning, behavior, and results who were participating in the e-learning courses and in the status quo, desired status, and before and after the courses; this questionnaire included 42 questions and was

distributed electronically and manually among the students. The statistical population included the e-learning students in the information technology course at Shahid Beheshti University who were at three levels including the graduated, at thesis level, and final term students, and their number was equal to 73.

The simple random sampling method was used for sampling. Since the statistical population in this study is specified, the following formula is used in order to determine the sample size:

(1)

$$n = \frac{N \times (Z_{\alpha/2})^2 \times p(1-p)}{\varepsilon^2 \times (N-1) + (Z_{\alpha/2})^2 \times p(1-p)}$$

In the above formula, n represents the sample size, N the statistical population size, p the success ratio, and ε the estimated accuracy. The inference of success ratios in statistical population (p) is important. If researcher cannot achieve the proper estimation for p, he can consider it equal to 0.5 and calculate n. In this study, the success ratio in the statistical population is also considered p=0.5. ε is also the estimated accuracy. In this study, ε is considered equal to 0.07. Thus, the sample size in the study is equal to:

$$n = \frac{73 \times 1.96^2 \times 0.5 \times 0.5}{0.07^2 \times (73-1) + 1.96^2 \times 0.5 \times 0.5} \approx 53 \quad (2)$$

As it is seen in the formula, the sample size is approximately 53 individuals which are chosen randomly from the statistical population. To achieve this sample size, 60 questionnaires were distributed, and we succeeded in gathering 53 questionnaires after much effort.

The content validity was considered in this questionnaire, and it prepared by the study of texts, documents, and resources as well as the scientific reliable texts and the research background of questionnaire. To validate the questionnaire, all questions in the questionnaire are prepared based on the study and review of various research sources and some honorable experts' advices are used. Moreover, the opinions expressed by the academic experts, some students, and guidance by some faculties are used in order to ensure the content validity.

The Cronbach's alpha method is used to determine the reliability of questionnaire. In order to calculate the Cronbach's alpha coefficients, the variance of samples for each subset in the questions of total questionnaire should be calculated, and then alpha be calculated by the following equation. [3]

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum_{i=1}^k S_i^2}{S_{sum}^2} \right) \quad (3)$$

In this equation, K is the number of questions in the questionnaire, S_i^2 is the variance of question i, and S_{sum}^2 is the variance of total questions. The reliability test of questionnaire was conducted for 84 main questions. The Cronbach's alpha coefficient was calculated equal to 0.947 for 35 questionnaires; therefore it can be argued that the given questionnaire has the acceptable reliability.

In a questionnaire which was provided in order to evaluate the participants in the e-learning courses, the students' effective factors and identified components were evaluated based on the four levels of Kirkpatrick model; the components of each level are:

Reaction level: content, teacher, planning and implementation, training cases and educational assistance facilities, the quality of educational course, facilities (LMS portal), and the interaction;

Learning level: changing the attitude, increasing and improving the skills, and increasing knowledge;

Behavior Level: motivation and willingness to change the behavior, changing the behavior, and transfer of learning in the vocational program;

Level results: Morale and job satisfaction, and achieving the business objectives.

In order to analyze the research data and test the hypothesis of research, the non-parametric and parametric statistical methods, Kolmogorov - Smirnov test for determining the normality of indicators, two-sided paired comparisons student T-test for normal indicators, and the two-sided paired comparisons of Wilcoxon signed rank test for abnormal indicators were used. Based on the obtained results, there are significant differences between the status quo and desired status, before and after the educational course, and the effectiveness of e-learning systems at Shahid Beheshti University in terms of all aspects. In addition, there are significant differences between the status quo and the desired status of research components according to the research variables of educational position, at three groups including the graduated, thesis level, and final term students. Therefore, the used non-parametric tests at this part were the two-sided paired comparisons test, and the two-sided paired comparisons of Wilcoxon signed rank test; also the age group, gender, and participants' employment status was examined by the non-parametric Mann-Whitney U-test.

Conclusion

The null hypothesis at the level of error 5% is rejected for all their levels and components because the significance level is equal to 0.000 and less than the error 0.05; thus the difference of views average is not equal to 0, it means that the average of views at the status quo, desired status, and before and after the course is different. Therefore, based on the results of the questionnaire, there are significant differences between the status quo and desired status of effectiveness in the e-learning system at Shahid Beheshti University according to the reaction aspect and also its constituent components. This difference is negative; it means that the status quo is worse than the desired status, also the effectiveness is negative. The results of above research question analysis have shown that there is a significant difference between the status quo and the desired status of effectiveness in the e-learning system based on the reaction aspect. Moreover, according to the results of questionnaire, there is a significant difference between the status quo and the desired status of effectiveness (before and after the course) in the e-learning system at Shahid Beheshti University based on the learning, behavior, results, and also the constituent components. This difference is positive because it is better than before, based on the sample individuals, three above levels, and their components after the educational course, and in fact the course has had a positive effect. Therefore, the results of above research question analysis have shown that there is a significant difference between the status quo and the desired status of effectiveness in the e-learning system based on the learning, behavior, and results aspects.

In addition, there were significant Levels larger than the error value 0.05, the assuming the equality of opinions average was rejected in three groups including the graduated, at the thesis level, and final term students, which indicated that these criteria were equal for all three groups. Based on the obtained results, the equality of opinions average in different age groups was not rejected for the age group because the significance levels were larger than the error level 0.05, and this indicated that these criteria were equal for all age groups. About the gender, according to the results, the equality of opinions average for girls and boys was not rejected because the significance levels were larger than the error level 0.05, and this indicated that these criteria were equal for both groups. In addition, about the job situation and according to the non-normality of some indicators, the opinions of both employed and unemployed groups and the non-parametric Mann-Whitney U-test were used in order to compare to the individuals' average view about the components of the study; according to the obtained results for two components including the Learning and Results, the equality of opinions average for employed and unemployed students was not rejected because the significance levels were larger than the error level 0.05, and this indicated that these two criteria were equal for both employed and unemployed students. But for two components including the Reaction and Behavioral, the equality assumption of opinions average for employed and unemployed students was rejected because the significance levels were lower than the error level 0.05, and this indicated that these two criteria were not equal for both employed and unemployed students.

Suggestions

Familiarize individuals before becoming students with the virtual university by the cultural support and culture making, in order to accept the responsibility in the educational process, therefore the cultural support is essential in the virtual education.

Provide a context under which students are changed from passive recipients to active participants in the learning environment; there are feedback and interaction between students and professors, professors encourage students to participate in discussions and receive feedback, and receiving feedback from students is done periodically.

Use better communications infrastructure in order to use the IT (Information technology) facilities more in transferring the optimal concepts and methods of training, for example, the special communication lines are built for speed access and higher quality communication.

Make opportunities for students and master appointment.

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