Assessment model of E-learning for higher education

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Abstract: In this article, to evaluate the effective factors on the quality of E-learning, some researches are carried out on assessment of E-learning during 2001-2009 and the effective factors on the quality of E-learning are identified and extracted. Human factor, infrastructural, cultural, legal, economical and political, management and leadership, support and international factors as the effective factors on the quality of education, evaluate the quality of E-learning by 85 codes. Also, in this quality research, the important degree, influence of each factor and the effect of factors on E-learning quality are defined. The results of this research define the quality of the university E-learning quality and determine the merits and demerits of each part separately.

1. Introduction

The challenges of Higher education in the third millennium, made Higher education to move toward maintain and upgrading educational system. The rapid growth of science and technology, the limited financial resources of universities, the increasing demand of Higher education systems, increasing demand of various and flexible educations, the emergence of knowledge community, requirement of more qualitative labor and permanent learning are amount the challenges of Higher education in the third millennium that should be solved. The results of the recent researches, consider proper application of the new methods based on IT and communication technologies such as E-learning as the best strategies to improve the quality of learning –teaching process, create equal learning opportunities and considering personal differences and also improving a person and its environment and it is totally meet the demands of Higher education.

One of the most important challenges of education quality in E-learning system is the various factors and effective variables in this ground and different classifications that are done from different aspects and based on different cultural and location situations. In this research it is attempted to identify main variables affecting the education quality and define the degree and importance of each factor separately. The results of the research can be a good strategy for E-learning executives in Higher education to test their education quality and remove the problems and improve education quality.

In E-learning vocabularies, there are different and sometimes opposite discussions in review of literature. Some of the researchers consider E-learning the same as virtual learning and they believe that this education is occurred in a virtual space for more cooperation and one of its important properties is creativity. These researchers believe that virtual learning is blended with some concepts including electronic knowledge, E-book, E-library, virtual class, virtual lab, virtual teacher, virtual student and virtual school. Some of the researchers use this kind of concepts for E-learning and they believe that E-learning and internet based training are these kinds of trainings (Tasdighi& Tasdighi, 1387). In this case, Badrul Khan introduced different names includingWeb Based Learning(WBL), Internet Based Training(IBT), Distributed Learning(DL), Advance Distributed Learning (ADL), Web Based Instruction (WBI), On line Learning (OL), Open Flexible Learning (OFL), synonym of E-learning. Professor Berner Lindstrom (2009) in its fourth national conference and the first international conference of E-learning introduced some vocabularies as Distance learning (DL), Open and Distance learning(ODL), Web Based Learning (WBL), Flexible Learning (FL), Net Work Learning (NWL) as synonym of E-learning. So the studies done in this field make the researchers to use vocabularies " distance", "virtual learning", internet based learning" and E-learning" with the similar meaning in review of literature. Because the following concepts overlap with each other, E-learning is a learning occurring in the network environment and a set of multimedia technologies, super media and Tele-communications are used. Internet is the main cause of change in E-learning. Philosophically, E-learning is based on structural and cooperation based views and some of the experts believe that it is the most important technology to support the modern approaches to teaching and learning (Charlene Dodd, 2009, cited in Garrison, R., & Anderson, 2003).

Today evolutionary trend of E-learning programs is in a way that makes the assessment of E-learning programs necessary. Here there are some questions raised in E-learning such as:

1-   Is E-learning effective?
2-   How is the influence of social and cultural conditions on the situation of E-learning programs?
3-   Is the expenditure to benefit of E-learning programs ratio positive?
4-   What are the problems of successful E-learning programs?

Responding these questions requires the evaluation of E-learning programs (Saketi, 1385)

In this quality research, to present a model on which the quality of E-learning is being evaluated in Higher education, at first 11 models of E-learning assessment in 2001-2009 are studied. Then, the effective factors on the assessment of E-learning quality are identified. Also, in review of literature, the researcher found some factors and components effective on E-learning, but they were less considered in assessment models. For example, in HELAM model that was presented in 2009 by Informatics Institute, Middle East Technical University, Ankara, Turkey to evaluate E-learning systems of students, 6 effective aspects on E-learning quality and 46 criterions were indicated. Having a comprehensive view to the effective factors on learning quality in comparison with other researches, the given model is not considered as the main factor of international cooperation and considering cultural issues as the factors on E-learning quality. In another model called E-learning quality model, the researchers tried to evaluate the assessment aspects of E-learning in Higher education. The results of these researches are published in 2008 by SNA (Swedish National Agency).

In this model, the policies of communication networks and projects set up are done on the basis of European cooperation. The most important factors in this model are learning –teaching materials, virtual environment and interaction between the teacher and student, obtained from the study of various articles. The researchers of this agency with the study of 20 articles in 2007 and 13 articles during 2006-2007 and the information obtained from electronic questionnaires on E-learning in the Higher education of Australian Universities Quality Agency(AUQA).

Associated of University and College of Canada (AUCC), Danish Evaluation Institute (EVA), Finnish Higher Education Evaluation Council (FINHEEC), Accreditation Organization of the Netherlands and Flanders (NVAO) Norwegian Agency for Quality Assurance in Education (NOKUT), Quality Assurance Agency for Higher Education (QAA), Council for Higher Education Accreditation (CHEA(, presented 10 effective factors on the quality of E-learning including, content-material, the structure of virtual environment, interaction, cooperation, assessment of the students, flexibility, adaptability, support (students and staffs), experience and qualification of the staffs, organizational leadership, resources allocation and the generalities of process aspects and modeled it for assessment. But in this model special consideration is not taken to legal, cultural, economical and political issues as the effective factors on the quality of E-learning. In the third international conference of Modern (E-) Learning" MeL 2008, Varna, Bulgaria, which was held in Bulgaria in 2008, the European Foundation for Quality Management, was proposed by Jeanne Schreurs. In this research, the researcher reviewed the models used previously for the assessment of the organizations. He presented the model by reviewing two Kirkpatrick models, the modified European Foundation for Quality Management to assess E-learning. In this model some effective components such as financial factor, technological infrastructures, ethical, cultural, economical and political, legal and international cooperation are ignored. Badrul H.Khan, the independent advisor of Federal organization E-learning and the lecturer of education technology in Washington university in his first book in 2004, presented P3 (People-Process-Product) Model indicating a comprehensive image of E-learning. In 2005, he proposed a framework influencing E-learning systems and learning issues in an extensive and complex set considering the factors influencing E-learning environment system. He finally by combining P3 (People-Process-Product) Model and E-learning framework proposed a comprehensive model for the assessment of E-learning called as the comprehensive model of E-learning assessment. This model considers E-learning framework as a particle in octahedral to review in chain with raising the related questions to each of the aspects of E-learning framework. But in this model financial, expenditure factor and international cooperation are not considered.

In the current research it is attempted to extract effective factors on the assessment of E-learning with a comprehensive view. The extracted components are presented in 8 main groups, 8 criterions and 91 indicators to measure the effective factors on the assessment of E-learning quality at Higher education level in table 1.

Table 1- The studied resources to extract the effective factors on the assessment of E-learning

Factor	Criterion	
Human	Teacher	Ozkan,sevgi , Koseler, Refika (2009)- Swedish
	Student	Agency(2008)- Jeanne Schreurs(2008)- Graham
		Attwell(2006)- Badrul H. Khan(2005)- Saketi
		(1385)- Terrie Lynn Thompson,
		Colla J. MacDonald (2005)- Lam, P. & McNaught,
		C.(2005)- Benchmarking of Virtual Campuses (2003)-
		Sustainable Environment for the Evaluation of Quality in E-learning (2003)-Hilary Page-
		Bucci(2002)- Roderick Sims(2001
Infrastructure	Technology and technical	Ozkan,sevgi , Koseler ,Refika(2009)-
		Swedish Agency (2008)- Graham Attwell(2006)- Badrul H.
		Khan(2005)- Saketi (1385)
		- Terrie Lynn Thompson , Colla
		J.MacDonald(2005)- Lam, P. & McNaught, C.(2005)-
		Benchmarking of Virtual Campuses (2003)- Sustainable
		Environment for the Evaluation of Quality in E- learning (2003)- Hilary Page-Bucci (2002)- Roderick Sims(2001)
	Pedagogical	Ozkan,sevgi , Koseler ,Refika(2009)- Swedish Agency(2008)- Jeanne Schreurs(2008)- Graham
		Attwell(2006)- Badrul H. Khan(2005)-
		Saketi(1385) Terrie Lynn Thompson , Colla
		J.MacDonald(2005)- Benchmarking of Virtual Campuses
		(2003)- Sustainable Environment for the Evaluation of Quality
		in E- learning (2003)- Hilary Page-Bucci (2002)- Roderick
		Sims(2001)
	Learning environment	Ozkan,sevgi , Koseler ,Refika(2009)-
		Swedish Agency(2008)- Jeanne Schreurs(2008)- Graham
		Attwell(2006)- Badrul H. Khan(2005)- Saketi (1385) - Terrie
		Lynn Thompson , Colla J.MacDonald(2005)- Lam, P. & McNaught, C.(2005)- Benchmarking of Virtual Campuses
		(2003)- Sustainable Environment for the Evaluation of Quality
		in E- learning (2003)- Hilary Page-Bucci(2002)- Roderick
		Sims(2001)

Support	Educational – service	Ozkan,sevgi , Koseler ,Refika(2009)-
		Swedish Agency(2008)- Jeanne Schreurs(2008)- Graham
		Attwell(2006)- Badrul H. Khan(2005)- Saketi (1385) Terrie
		Lynn Thompson , Colla J.MacDonald(2005)- Lam, P. &
		McNaught, C.(2005)- Benchmarking of Virtual Campuses
		(2003)- Sustainable Environment for the Evaluation of Quality
		in E- learning (2003)- Hilary Page-Bucci (2002)- Roderick
		Sims(2001)
	Financial and cost	Ozkan,sevgi , Koseler ,Refika(2009)-
		Terrie Lynn Thompson , Colla J.MacDonald(2005)-
		Benchmarking of Virtual Campuses (2003)- Sustainable
		Environment for the Evaluation of Quality in E- learning
		(2003)- Hilary Page-Bucci (2002)- Roderick Sims(2001)
	Ethical	Ozkan,sevgi , Koseler ,Refika(2009)-
		Swedish Agency(2008)- Badrul H. Khan(2005) -Lam, P. &
		McNaught, C.(2005)- Benchmarking of Virtual Campuses (2003)-
		Sustainable Environment for the Evaluation of Quality in E-learning (2003)- Hilary Page-Bucci (2002)- Roderick
		Sims(2001)
Cultural		Graham Attwell(2006)- Badrul H. Khan(2005)-
		Sustainable Environment for the Evaluation of Quality in E-learning (2003)- Roderick Sims(2001)
Economical and political		Ozkan,sevgi , Koseler ,Refika(2009)-
		Graham Attwell(2006)- Badrul H. Khan(2005)-
		Sustainable Environment for the Evaluation of Quality in E-learning (2003)-
Legal		Ozkan,sevgi , Koseler ,Refika(2009)-
		Graham Attwell(2006)- Badrul H. Khan(2005)-
		Saketi (1385)- Lam, P. & McNaught, C.(2005)- Sustainable
		Environment for the Evaluation of Quality in E-learning
		(2003)- Hilary Page-Bucci (2002)-
International cooperation		Swedish Agency(2008)- Stromquist (2007)-(1286)
		Bazargan and Gholizadeh- Middlehearst (2002
Management and leadership		Ozkan,sevgi , Koseler ,Refika(2009)-
		Swedish Agency (2008)- Jeanne Schreurs (2008)-Badrul H.
		Khan(2005)- Saketi(1385) - Lam, P. & McNaught, C. (2005)-
		Roderick Sims(2001)

2. Research method

This study is done by quality method, library research and Delphi technique in 3 stages. The data obtained in the first station is done as library method, based on internet resources and studying scientific and research articles related to research basis as the followings.

1-   The study of model, and the framework of E-learning assessment during 2001-2009

2-   Extracting components and effective factors on E-learning assessment

3-   Removing common components and selecting the components more referred in research literature.

4-   Extraction of indicators and codes related to factors

The second stage of this research is done as qualitative and by Delphi technique. The obtained data in this section are analyzed by interview, E-mail, telephone call with 9 lecturers and experts in research field. Three main activities in this stage are as the followings:

1-   Making questionnaire based on first stage results for validity

2-   Using Delphi method to get comments from lecturers and sum up the comments

3-   Making the final form of questionnaire

The third stage of research, determination of assessment criterions for the related questionnaire by:

1-   In a survey of the lecturers to determine the factors importance degree in the assessment of E-learning

2-   Asking the opinion of the lecturers to determine the assessment criterion

3-   Having a conclusion of the opinions and delivery of the assessment of the E-learning quality model

The research method in this stage was qualitative and the obtained data from two opinion poll forms were collected by interview, E-mail with 12 research experts.

Statistical population of this research are subject experts and experienced lecturers of educational science with Ph.D. degree of human science with teaching experiences on E-learning courses and registered articles and researches in this field who participated in this research for validity of the initial framework and responding opinion poll form , by quality method and Delphi. Sampling in this group is done as non-random, purposeful and based on the criterions.

Validity and reliability of research instruments

In this study, a researcher –built questioner and two opinion poll forms are used. To provide questionnaire and opinion poll form the followings are done:

-    Review the theoretical principles, evaluation of scientific resources, previous researches, comments of lecturers and subject experts and searching database in internet.

-    Making the draft questionnaire in the form of 6 main factors, 8 criterions and 91 cods

-    Making opinion poll form to determine the importance degree and effect of each factor in the assessment of E-learning quality at Higher education level and determining the rank of each factor

-    Making opinion poll form to determine the judgment criterion about the quality of E-learning in four levels of good quality, acceptable quality, weak quality and unacceptable quality

-    Making special questionnaire of opinion poll from students based on the opinion of experts in the form of 8main factors, 8 criterions and 85 codes.

For validity of the research instruments, content validity and face validity. To calculate the reliability coefficient of the related questionnaire, Cronbach's α (alpha) is used.

Reliability coefficient for effective factors on the assessment of academic E-learning quality based on Cronbach's α (alpha) are calculated separately for human factor, 0.89, infrastructure, 0.93, support, 0.87, culture, 0.75, legal, 0.82, economical and political, 0.85, international cooperation, 0.88 and management and leadership factor, 0.9.

The data analysis method

Delphi method is used to analyze the quality data of the research. In the analysis of the collected data from descriptive statistics, frequency tables, average, standard deviation and percent are used for the selection of effective factors on the assessment of the quality of academic E-learning. The determination of the validity of assessment of the academic E-learning quality, average and percent are done by Spss software.

3. Results

The proposed assessment framework for validity by subject experts was given to the experts in the form of questioner with more emphasize on 8 main factors effective on the quality assessment, 8 criterions and 91 codes for the factors measurements.

Also, in an opinion poll form the importance degree and the effect of each factors on the assessment of E-learning quality at Higher education level and the rank of each factors were asked from experts. In the current opinion poll form, judgment criterion about the quality of E-learning is determined by experts at four levels of good quality, acceptable quality, weak quality and unacceptable quality. The

data obtained from validity and opinion poll form are analyzed by quality and Delphi technique method and the results were presented as the proposed model of E-learning internal assessment. To present the proposed model, opinion poll form of the experts was made on the determination of the importance degree and the effect of each factor in the assessment of the quality of E-learning at Higher education to determine the rank of each factor and the influence percent of each factor on the quality assessment. To do this, 8 effective factors on assessment of academic E-learning quality were given to subject experts to classify the factors based on their importance and register each rank in its column. Then, considering this ranking, the share of each factor is determined based on percent that the sum of 8 factors equal 100. After collecting the data of opinion poll form, the assessment of academic E-learning quality model was made. This model is shown in table 2.

Table 2- Assessment of E-learning internal quality at Higher education level

Rank	The effective factors on the quality of E-learning		The number of indicators	The share of each factor in %
1	Infrastructure factor	Technical and technological	5	28
		Pedagogical	10	
		Learning environment	10	
2	Human factor	Student	9	21
		Teacher	11	
3	Support factor	Education and service	7	15
		Financial and costs	3	
		Ethical	5	
4	Management and leadership factor		6	14
5	Cultural factor		3	7
6	Legal factor		3	5.5
7	Economical and political factors		8	5
8	International cooperation factor		5	4.5
8 factors			85 indicators	100%

In this model regarding the obtained information, the effective factors on the assessment of E-learning quality at Higher education level are shown based on the importance factor of each one and its influence factor on the quality of education.

Also, to determine the judgment criterion about the quality of E-learning, another opinion poll form is given to 12 experts in the research area. The result of survey of the second form, according to the upper limit frequency and down limit of the sum of comments, table 3 is determined as a criterion for the

judgment of the situation of the studied academic E-learning.

Table 3- The judgment criterion about the quality of E-learning

Judgment criterion in %	Quality of E-learning
80-100	Good quality
65-79	Acceptable quality
50-64	Weak quality
Below 50	Unacceptable quality

4. Discussion and conclusion

Meeting the demands of Higher education challenges in the third millennium requires the education quality improvement in universities and Higher education institutions. Today as we are faced with the rapid growth of E-learning course around the world, we should apply good strategies and by being aware of the current situation of E-learning system in the country, the efficiency of the courses are done. So it is necessary to have assessment framework and validity especially for investigating the improvement of learning –teaching process. The main problem discussed in this research is finding a framework by which academic E-learning executives can test the educational quality of their universities. In this research it is attempted to identify the main variables effective on the quality of learning and define the importance of each factor in the assessment of education quality separately. By studying the given models about the assessment of E-learning, the assessment model of internal quality of E-learning are presented based on the effective factors on the quality of education. The proposed model is assessed from validity aspect by the opinion of the experts.

The most important differences of the current model in comparison with the given model of E-learning assessment in other countries are as the followings:

1-   In different resources, experts presented the effective factors on the assessment of E-learning quality in different classifications. In this research it is attempted to extract all the factors in different factors and after deleting the similar and repetitive cases, the effective factors on the academic E-learning quality is presented in a more complete classification in 8 main group and 8sub-groups in the form of the proposed model. Table 4shows the effective factors on the quality of E-learning referred in the proposed models of review of literature and the factors ignored to present a comprehensive model based on effective factors with Higher accuracy.

2-   In the proposed model, it is attempted not to put the effective factors on the quality of E-learning at the same rank and each factor

is defined based on the importance degree and the influence on the assessment of the education quality and the influence amount.

3-   A table is drawn for the judgment criterions about the assessment of E-learning quality to be a factor to determine the quality of E-learning at Higher education level.

4-   The introduced indicators in the proposed model are a good guide for executers to find the weak points and improve the strong points of E-learning at Higher education level that can be a good instruction to improve the quality of E-learning

5-   According to the proposed model and prioritization of the effective factors on the quality of E- learning at Higher education level and the results and evaluation starting point of education weak points considering the importance degree of each factor can be prioritized.

Table 4- The evaluation of the effective factors on the quality of E-learning obtained from review of literature

| Model, framework	The effective factors on the quality of E-learning	The ignored factors
HELAM model (2009) Hexagonal E-Learning Assessment Model	The quality of the system, service quality, content quality, student's view, teacher's view, support issues	Cultural, international cooperation
E-learning quality model (2008)	Content- material, the structure of virtual environment, interaction, cooperation, assessment of the learners, flexibility, adaptability, support the learners and staffs, experience, qualification of the staffs, organizational leadership, resources allocation, generalities and process aspects.	legal, cultural, economical and political
European Foundation for Quality Management (2008)	resources and contents, learning process (personal, cooperative, support), educational results	financial and costs, ethical, cultural, economical and political, legal and international cooperation
Graham AttWell (2006)	Learners, learning environment, technology, background variables, educational variables.	Financial and costs, ethical, international cooperation, management and leadership
Comprehensive approach to E-learning assessment (2005) Comprehensive Approach to Program Evaluation in Open and Distributed Learning	organization, teaching and learning, technology, design, assessment, supporting resources, management, moralities	Financial and costs , international cooperation
Saketi model (2005)	Human force, program production process, produced programs.	Financial and costs, ethical, cultural, economical and political, international cooperation
Demand-Driven Learning Model (2005)	Structure, content, delivery, services, results	, ethical, cultural, economical and political ,legal, international cooperation, management and
model (2005) e 3 learning e 3 learning(A Three-Layered Cyclic Model of E-Learning Development and Evaluation)	leadership	
	strategies (Assessment questions framework), improving programs, data collection, data analysis, decision making	Financial and costs, ethical, cultural, economical and political, legal, international cooperation
Benchmarking of Virtual Campus (2003)	giving service to the students, learning resources, teachers support, assessment, accessibility, output and efficiency (financial aspects), technology resources, organization execution	cultural, economical and political, international cooperation, management and leadership
Sustainable Environment for the Evaluation of Quality in E-learning (2003)	learning resources, learning principles process, content learning	international cooperation, management and leadership
Hilary page-Bucci model (2002)	Training and teaching, communicational interactions and facilities, students, teachers, accessibility to resources and educational facilities, technical support	financial and costs, cultural, economical and political, international cooperation, management and leadership
Roderick Sims model (2001)	strategical goals, content, site design, interaction, assessment, support, having access to the results (feed back)	Economical and political, legal, international cooperation
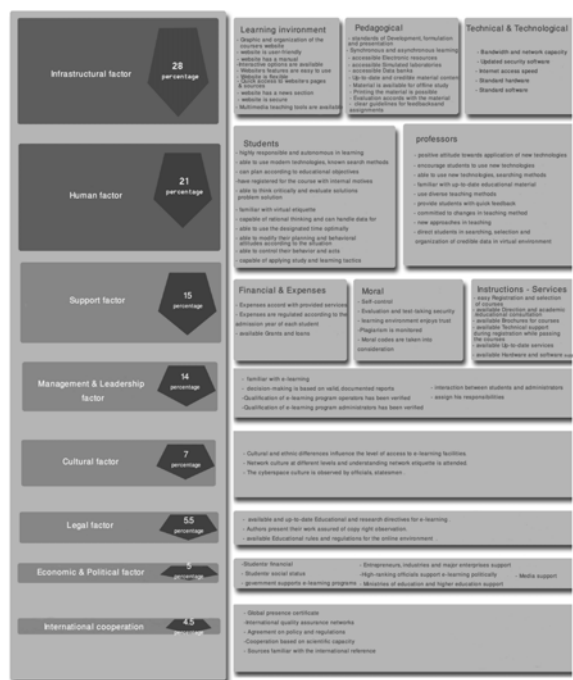
Fig 1: Suggested pattern for evaluation of internal quality of E-learning at higher education

Finally, it is worth to mention that this research doesn't claim to be successful in dealing with all the effective factors on the assessment of the academic E-learning quality, but it is attempted to have a comprehensive view on the assessment of E-learning quality to pave the way for the interested

people in researching in the assessment of academic learning quality.

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