

# A Feedback-based Framework for Continuous Evaluation of e-Learning Activities

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*Abstract:* - In the Information Society, e-learning is one of the most valuable approaches for education and lifelong learning.

Starting from the analysis of the main characteristics of e-learning processes, in this paper an effective framework for the evaluation of e-learning activities is presented.

The results demonstrate that the accurate evaluation of e-learning activities by the proposed framework allows the most effective use of ICT systems by the various stakeholders involved in the e-learning processes and the creation of a positive e-learning environment.

*Key-Words:* - E-learning Evaluation, Quality, Distance Learning, Lifelong Education.

## 1 Introduction

In the Information Society, e-learning represents a valuable approach for education and lifelong learning. The enormous development of ICT technologies has led to changes not only in economical processes but also in social and individual aspects of daily life [1, 2, 3].

Therefore, in the last years, many public and private institutions have been strongly attracted by e-learning. At the beginning many efforts have been focused on technological aspects related to infrastructure and connectivity. More recently, e-learning is considered as a learning process enhanced by technology. Thus, several issues are now arising related to the most profitable use of technology for e-learning activities, for teaching and training, for content management and so on [4, 5].

In this direction a key aspect of any e-learning activity concerns its quality and the most effective methodologies for its evaluation with respect to the e-learning products (e-learning courses, etc.) and processes (course design, production and use, etc.) [6, 7, 8]. In this field, the trivial assumptions that distance learning is impersonal and dehumanizing since it reduces the possibility of interactions [9, 10] has been recently revised on the basis of the evidence that a strong feeling of learning community can be developed also in ICT-based distance environment [11, 12, 13]. In fact, as clearly stated also by the European Community Commission, several researches show that e-learning can be as efficient as traditional learning [14, 15, 16, 17, 18].

In order to “measure” quality and impacts of e-learning processes several approaches have been considered.

In particular, Kirkpatrick [19] considers the evaluation of educational outcomes and defines four different levels: *client satisfaction*, *real learning*, *behaviour modification*, and *efficacy of investment*.

Rossi et al. [20] proposed an open-system model in which an evaluation is categorized by type, as an *input evaluation*, a *process evaluation*, an *output evaluation*, and/or an *impact evaluation*. An *input evaluation* estimates the capabilities of the system in using equipment and technical expertise. For a *process evaluation*, the evaluator examines the process by the analysis of the effectiveness of all components of the program. An *output evaluation* verifies the direct effects of the program by evaluating its results. An *Impact or outcome evaluation* concerns long-term results of the program and its effects on society.

Worthen et al. [21] identifies six evaluation strategies that can be used for the evaluation of educational programs: *Objectives-oriented* - In this case the evaluation focuses on determining the extent to which program and instructional objectives have been met; *Management-oriented* - It is meant to serve decision-makers and is particularly useful for making decisions about the reallocation of funds; *Consumer-oriented* - This strategy focuses on the development of information on products, that is essential for the appeal of distance education programs; *Expertise-oriented* - It mainly depends upon professional expertise to judge an educational program; *Adversary-oriented* - It attempts to use

both positive and negative views into the evaluation itself; *Participant-oriented* – It is a naturalistic strategy that involves all stakeholders. It is used in qualitative research studies to evaluate and match all opinions.

In this paper, starting from the analysis of the main characteristics of e-learning processes, an effective framework for the evaluation of e-learning activities is defined. It is based on the use of “quality models” and involves all the main stakeholders of the e-learning activity according to a closed-loop strategy whose finality is the continuous improvement of effectiveness and efficiency.

Finally, some experimental results, obtained from activities in progress at the University of Bari, are reported. They demonstrate the validity of the proposed framework in determining the continuous improvement of the e-learning environment.

## 2 On the evaluation of e-learning activities

A framework for the evaluation of e-learning activities must adopt strategies well suited for the various stakeholders and types of finalities [6, 16].

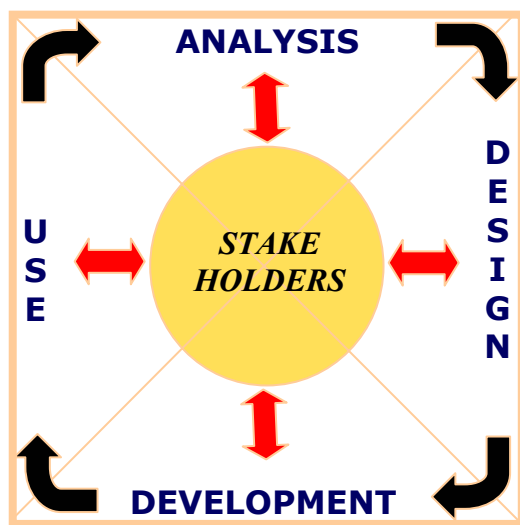


Fig.1 The Evaluation Framework

In this research e-learning is considered as the result of a continuous iterative process of *analysis* (of requirements, working conditions, etc.), *design* (of solutions, organizations, products, etc.) , *development* (of products, operative environments, etc.) and *use* (of e-learning systems, products, educational environment, etc.). Each phase produces relevant information for the next one. The effectiveness of the frameworks descends from the capability to acquire the necessary information from

each phase and to use it properly for improving the next phase, continuously [6, 16].

Moreover, since e-learning activity strongly depends on human interaction (even supported by ICT). Therefore, for each phase of an e-learning process a suitable feedback based evaluation is defined, based on a participant-based strategy. In fact, the participant-based strategy is general and flexible enough to be adapted to the different types of analysis and individuals involved into the e-learning activities. For this purpose well defined quality models have been designed and used, according to the general framework used for the evaluation of e-learning activities schematically reported in Figure 1 [6].

Of course, for each phase of the evaluation framework it is necessary to choose a set of parameters (indicators) in order to carry out the assessment by the various stakeholders, depending on the diverse finalities of the evaluation analysis (for instance: *client satisfaction, real learning, behaviour modification, efficacy of investment*).

On the other hand, several stakeholders can be considered, as for instance: teachers, trainers, students, managers of faculty secretaries, e-learning project leaders, e-learning course didactic designers, e-learning course graphic designers, CM experts, LMS experts, etc.

Table 1 Stakeholders vs stage evaluation

	Analysis	Design	Development	Use
Teachers		X		X
Trainers		X		X
Students				X
Managers of faculty secretaries		X		X
E-learning project leaders	X	X	X	
E-learning course didactic designers		X	X	
E-learning course graphic designers		X	X	
CM experts,	X	X	X	
LMS experts,	X	X	X	

Although all these actors are implicated at one or more phases in the e-learning process, each actor plays a specific role at each phase and therefore he/she must be involved properly to the evaluation, by a well-suited set of indicators related to various disciplines concerning the learning processes:

pedagogy, sociology, psychology, legal aspects, technical aspects, economic and political aspects, etc. For instance, Table 1 shows the actors involved to each phase for evaluation.

Of course, through the evaluation of each phase of the e-learning process, many information can be acquired and used for improving the next phase. For instance, from the “use” phase phase , information concerning products (usability, accessibility, etc.), learning environment (degree of cooperation and collaboration, etc.) and technological support (effectiveness, etc.) can be expected.

### 3 e-learning evaluation: experiences at the University of Bari

For the aim of the e-learning activities currently in progress at the University of Bari, the following main stakeholders have been considered [16]: students, teachers and managers of Faculty secretariats. Evaluation has been carried out by well-defined “quality models” at the level of ICT tools and e-learning activity.

Concerning the evaluation procedure of ICT tools, specific “quality models” have been proposed for the evaluation of the Course Maker “Lectora Publisher” [22, 23] and the Virtual Classroom of the Learning Management System “NetLearning” [24], according to standard methodologies [25, 26, 27].

The “quality model” concerning the CM “Lectora Publisher” consists of four sets of indicators [6]. The first set is related to the general characteristics as for instance functionalities of the editor, variety of the supported media, usability of the product etc.; the second set concerns the use of objects and involves characteristics as the comprehensibility of object properties, the simplicity in setting actions and their utility, etc; the third set of indicators concerns the tests and involves the variety of test types and their options, the simplicity in creating tests and so on; the fourth set of indicators concerns the publication characteristics as the variety of publication types, the clarity of the publication procedures (also with respect to AICC standard), the clarity in error warning signs, etc. .

The “quality model” concerning the Virtual Classroom of the “NetLearning” LMS consists of three sets of indicators [6]. The first set is related to the administration options, such us the overall functionalities of the Virtual Classroom administration services and the intuitiveness of their use; the second set concerns the accessing facilities, such as the clarity of icons and related operations,

usability of links etc.; the third set of indicators concerns the use of the Virtual Classroom based on audio-video quality, interactive tools etc.

Concerning e-learning activities, the quality model is based on three sets of indicators [6]. They concern the course content, the teacher and the didactic activity. In particular for that concerning the course content, the users are requested to judge characteristics as to what extent concepts are discussed in depth, their correctness, the amount of information and the degree of interest derived from the arguments presented. Concerning the evaluation of the teacher, some of the most important characteristics that students judge are the teacher clarity, his capability in creating a positive learning environment, the degree of attractiveness generated toward the discipline, his capability in using examples to support learning. Finally, the didactic activity is evaluated by considering relevant characteristics as the effectiveness of multimedia supports and ICT equipment, the degree of the overall organization, etc.

All the quality models are based on three different types of questions:

- Evidences (closed questions);
- Personal estimation (closed questions);
- Comments (open questions).

In this work, the evaluation measurements are preformed by using the standards reported in Table 2, according to the UNI ISO 9000-9001 [28, 29]. In this way, the stakeholders express their judgement on the selected characteristics, obtaining a numeric evaluation, that evidences the strength points and the eventual deficiencies of the e-learning activity.

**Table 2 Standards of estimation**

Level	Judgement	Score
SATISFACTORY	Superior to the requirements	3
	Acceptable	2
	Just acceptable	1
UNSATISFACTORY	Not accetable	0

### 4 Experimental Results

From the use of the feedback-based evaluation framework proposed in this paper, several results have been obtained in the field of evaluation of the e-learning processes currently in progress at the University of Bari. Although the complete presentation of the results is not reported in this paper (the interested reader can found it in the literature [6, 12, 13, 16]), some of the most relevant

aspects for the aims of this paper are briefly summarized and discussed in the following.

The overall score obtained for the evaluation of the Course Maker and the Virtual Classroom is 2.3 and 2.1, respectively. Therefore, the products are considered globally as more than acceptable. The overall score for the e-learning courses is equal to 2.1. Therefore, also in this case the result is more than acceptable. Moreover, from the analysis of the quantitative outcomes it results that a set of initiatives should be made for the success of the e-learning activity, in order to support the various stakeholders involved into the e-learning process in performing specific tasks related to the effective use of ICT systems.

Specifically, on the basis of the information acquired by the “quality models”, a specific set of training activities has been designed and developed for teachers and managers of faculty secretaries. In fact, although teachers play a fundamental role in the e-learning activities, also managers of faculty secretaries are involved into the e-learning activities since e-learning platforms generally make available useful information for the advancement of student careers. Therefore, they must be instructed in using the e-learning platform for extracting the right data useful for their work [13].

Therefore, teachers have been involved to specific training activities concerning the CM “Lectora Publisher”, which mainly focus on the following topics:

- *Learning Objects (development and management);*
- *Multimedia Components (development and management);*
- *Publication (AICC and SCORM compliance).*

The training activities relate to the Virtual Classroom mainly focus on the following topics:

- *Integration of standard didactic contents;*
- *Test (development and management);*
- *Tracing of individual learning activities;*
- *Reporting and statistics (at individual and virtual classroom level);*
- *Creation, planning and administration of educational activities;*
- *Creation of user profile;*
- *Management of user profile;*
- *User access control and authorization management;*
- *Virtual Classroom with audio-video on-line interaction among users, electronic blackboard, application sharing, etc.;*
- *E-mail, forum, chat and message management.*

Concerning the managers of faculty secretariats, they have been involved to training activities on the

following main topics concerning the Virtual Classroom:

- *Tracing of individual learning activities*
- *Reporting and statistics (at individual and virtual classroom level;)*
- *Creation of user profile;*
- *Management of user profile;*
- *User access control and authorization management;*
- *E-mail, forum, chat and message management.*

## 5 Conclusions

This paper presents a framework for the evaluation of e-learning activities. The framework adopts a *participant-oriented* strategy in which the various stakeholders of the e-learning activity provide, according to a closed loop continuous approach, a feedback on the different phases of the activity.

Some experimental results, carried out in the context of the e-learning activities currently in progress at the University of Bari, demonstrate the utility of the proposed approach in identifying and resolve possible criticisms in the e-learning processes.

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