EVALUATION METHODS FOR E-LEARNING:
AN ANALYTICAL STUDY

Dr. M. Natarajan
Senior Principal Scientist
Ex-Head, Education & Training, NISCAIR
Editor, Journal of Scientific & Industrial Research (JSIR)
Dr K S Krishnan Marg
New Delhi – 110012, India
E-Mail: drnatarajanm@gmail.com

Abstract

The purpose of this paper is to understand the concepts of e-learning with the evaluation techniques available for it. Some of the Indian initiatives of open educational resources (OERs) are also explained. Due to the enormous growth of educational institutions, the advancement of information communication technology, enhanced the way of learning and the resources available for learning and teaching are changing in hybrid way. Therefore the e-learning has come in a big way from all types of organizations and higher educational institutions. Different methods of accessing the e-content are made available in multimedia environment, as the technology helps to include the audio, video, animated files in the learning environment. This article gives an analytical study of some of the existing evaluation methods for e-learning, as it becomes necessary due to the growth of e-learning environment. It discusses the innovative methods of evaluation.

Keywords: e-learning, OERs, interactivity, LMS, NPTEL, EKalavaya, success models.

Introduction

Educational institutions, research centers, libraries, government agencies, commercial enterprises, advocacy groups, and a multitude of individuals have rushed to connect to the Internet (Johnson, 1999) due to the development of World Wide Web. It is clear that the Internet and WWW profoundly influence society in general and colleges and universities in particular. Not since the printing press was invented by Johann Gutenberg in the 15th century has an “invention” generated such potential to change dramatically how people communicate and interact with one another. More sophisticated and affordable technology has motivated many universities and colleges to offer a variety of alternatives to traditional classroom instruction. The internet has facilitated the establishment of electronic learning (e-learning) education systems. The rising
popularity of e-learning is attributed to its ability to enable students to study without the constraints of time and space and to reduce internal training costs for some organizations. Given this rising popularity, creating effective e-learning environments has become a top priority for educational institutions. These alternatives include distance education courses via television at remote classroom sites and both synchronous and asynchronous internet courses. Many of the traditional classroom activities can be recreated technologically through computer conferencing, electronic mail, bulletin boards, and the internet. In fact, the use of the internet to deliver distance education has grown faster than any other instructional technology. Tremendous growth in online communication has been the cause for the rapid growth of technology-mediated distance learning at the higher education level. To make use of e-learning applications efficiently, there is an important need to measure the success and effectiveness of the e-learning system systematically (Global Industry Analysts, 2008). Integration of the Information Communication Technologies (ICTs) has become inevitable in e-learning, and assessing the same is the only way to ensure that higher education programs delivered via technology are of high quality, developing theories and criteria for judging e-learning success become essential. Therefore, there is a need for an analytical study on evaluation of e-learning.

E-Learning

E-learning as "delivery of training and education via networked interactivity and a range of other knowledge collection and distribution technologies" (Fry, 2000) although some saw only Internet delivery as "e" learning (Bibby, 2000) and others preferred to speak widely of "distance education" that uses a wide range of device independent technologies (Lance, 2000).

E-learning is a means of education that incorporates self-motivation, communication, efficiency, and technology. Because there is limited social interaction, students must keep themselves motivated. The isolation intrinsic to e-learning requires students to communicate with each other and the instructor frequently to accomplish their assigned tasks. E-learning is efficient as it eliminates distances, subsequent commutes; the e-learning content is designed with media that can be accessed from properly equipped computer terminals, and other means of Internet accessible technology. i.e. E-learning is a flexible term used to describing a means of teaching through technology.
E-learning can be defined as web-delivered and/or web-supported teaching and learning using computer, multimedia, and internet technologies. It is the use of Internet and digital technologies to create experiences that educate fellow human beings (Horton). E-Learning refers broadly to an interactive learning system where ICT plays a key role in providing flexible access to information and resources. The development of e-learning products and the provision of e-learning opportunities is one of the most rapidly expanding areas of education and training.

Benefits of E-Learning

The benefits are as follows:

- Just-in-time;
- Accessible from any site with the right equipment;
- Cost-effectiveness;
- Personalization;
- Learner centered learning;
- Contemporary;
- Scalable structure;
- Interactivity;
- Uniformity of content;
- Content updated rapidly;
- Blindness of the learning engagement and Measurement of programmed performance. (Block & Dobell, 1999)

Open Educational Resources (OERs)

OERs are free materials that are cataloged in a central repository and can be accessed by learners and colleagues anywhere in the world, even if their libraries and universities are inaccessible due to logistics or politics, or they lie under mountains of mud, rivers of water, or tons of rubble. Of course an end-user must have a data network in place, but given the wide proliferation of mobile phone technologies, access is more widespread than ever before. OERs are meant for teaching, learning, and research in the public domain and have been released under an intellectual property license that permits their free use. OERs include full courses, course materials, modules,
textbooks, streaming videos, tests, software, and any other tools, materials or techniques used to support access to knowledge (William and Flora Hewlett Foundation, 2008).

OER is compatible with the goal of using e-learning to achieve the strategic objective of promoting maximum participation in education. Educational institutions are expected to use e-learning to make their education available to people outside traditional target groups. With OER, individuals can be given easily accessible experiences with online learning, even those who do not belong to the generation that has grown up from the outset with computers and the Internet (digital natives, screenagers, homo zappiens). OER both complements and facilitates access to e-learning (Schuwer, 2009).

**Indian initiatives for OERs:** There are many initiatives in the world for OER by different higher educational institutions. However, OER in India took as a major initiative specifically for creating open educational tools and resources towards basic sciences and engineering education. The National Program on Technology Enhanced Learning (NPTEL) is a joint venture by seven Indian Institutes of Technology and Indian Institutes of Science and funded by the Ministry of Human Resource Development, Government of India to enhance the quality of engineering education in the country by developing curriculum-based video and web courses (http://nptel.iitm.ac.in). Phase 1 of the programme has resulted in the production of 120 web-based courses and 115 video courses, each of 40–50 hours duration. These courses are in the core sciences, computer science, civil engineering, electrical engineering, electronics and material engineering. Over 300 faculty from all Indian Institutes of Technology and Indian Institutes of Science have been involved in developing course content, with the objective of improving the quality of engineering education in the next tiers of engineering institutions, including teachers and students from rural areas.

Another illustrative open education initiative is Ekalavya (http://ekalavya.it.iitb.ac.in), launched by Indian Institute of Technology, Bombay. In this project, content developed in various Indian languages is distributed over the Internet. The Ekalavya project has developed an Open Source Educational Resources Animation Repository (OSCAR) that provides web-based interactive animations for teaching. OSCAR provides a platform for student developers to create animations
based on ideas and guidance from instructors. Funding for the Ekalavya and OSCAR project comes mainly from private industry.

**E-Grid** by the (http://www.edugrid.ac.in/) Human Resource Ministry of the Indian Institute of Information Technology (IIIT), Kerala, provides subject-specific portals that are developed and maintained by subject domain experts. Currently, this programme offers OER only for science and engineering.

There are many more initiatives in India like i) **IGNOU**, New Delhi also developed a national digital repository viz e**Gyankosh** (www.egyankosh.ac.in), which envisages to store, index, preserve, distribute and share the digital learning resources of open and distance learning in the country. It contains 30558 course materials with multimedia content covering the subjects from agriculture, computer and information sciences, education, engineering and technology, humanities, etc. ii) **Consortium for Educational Communication (CEC) Learning object Repository** for co-coordinating 17 Educational multimedia research centers for television programmes in various languages and for different disciplines. iii) **National Science Digital Library (NSDL – http://nsdl.niscair.res.in)** of NISCAIR – created contents on specific subjects under DSpace. iv) **NCERT** (www.ncert.nic.in/textbooks/) has developed the school textbooks in digital format in many languages and made them available free. v) **Sakshat** (www.sakshat.ac.in) by MHRD for connecting the freely available e-books and other digital contents from NCERT, NBT and other sources. Due to the growth of e-learning from institutions, organizations, universities and private organizations, there is a need for evaluating them.

**Evaluating E-Learning**

Many universities are investing manpower and money to enhance their e-learning hardware and software infrastructure (system). Evaluating the effectiveness of e-learning is critical for those considering the adoption of such systems. The primary objective of this evaluation is to determine the effectiveness or appropriateness of an e-learning system, given a particular educational goal. A considerable number of studies have evaluated various measures of e-learning effectiveness (Roffe, 2002; Mhod et al., 2004; Marks et al., 2005). Studies have identified five primary aspects in evaluating e-learning effectiveness. These include the quality of the system, learner attractiveness, instructor attitudes, service quality, and supportive issues (DeLone and McLean,
2003; Tzeng et al., 2007; Wang et al., 2007; Liaw et al., 2007; Chao and Chen, 2009; Ozkan and Koseler, 2009). E-learning allows learners to gain professional knowledge on their own, especially in an asynchronous system. The multi-criteria decision-making approach is suitable for the evaluation of tasks, such as e-learning, that have a variety of success measures. On the other hand, the traditional multi-criteria approach assumes independent relations between all measures (Liaw, 2008), whereas in real situations, success measures are often interdependent. The process of evaluating e-learning effectiveness using a group-decision approach is very complicated, given the interdependence of measures such as linguistic preferences and subjective concepts. Hence, fuzzy set theory provides an appropriate approach to describe the measures and their levels of importance.

DeLone and McLean (1992) have introduced the e-learning since 1992. The success models were then given by Holsapple and Lee-Post’s, which are adapted from DeLone and McLean’s (2003). DeLone and McLean identified six dimensions of success factors: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. These were incorporated into their original overall success model shown in Figure 1.

![Fig 1.](image)

Holsapple and Lee-Post the e-learning Success Model makes the process approach explicit to measure and assess success. They used the process approach to posit that the overall success of e-learning initiatives depends on the attainment of success at each of the three stages of e-learning systems development: design, delivery, and outcome analysis. Design stage is evaluated along three success factor dimensions: system quality, information quality, and service quality. The research study by Ozkan and others (2009) combine all these important aspects of e-learning success assessment models, and develop a comprehensive e-learning success assessment model.
There are many ways to classify the measures available for evaluating an e-learning system. Their proposed model constitutes 46 LMS success criteria for evaluation. The criteria are grouped into six main categories in accordance with each criterion correlation (Figure 2). These six main categories are as follows:

1. Technical issues: system quality (eight criteria).
2. Technical issues: service quality (six criteria).
3. Technical issues: content quality (14 criteria).
4. Social issues: learner perspective (five criteria).
5. Social issues: instructor attitudes (nine criteria).
6. Supporting issues (four criteria).
In this model, it is to underline the importance of each aspect of an LMS which directly effects the overall success and learner's satisfaction. Namely, in this model, LMS is divided into subcategories and these subcategories are evaluated individually; and the overall LMS success can be defined as the cumulative sum of success levels of all these individual parts. HELAM Model (Fig 2) has been adapted from different IS and e-learning success evaluation systems models.

**Tools and instruments for evaluation of e-learning**
There are many tools available for the evaluation of e-learning. However, they are divided into two types. Firstly there are many on-line data gathering instruments for assessing, typically, the user interface characteristics of software (e.g. student perception questionnaires) or secondly, there are devices to record and analyse usage by duration and frequency of log-in, pages accessed, user profile etc. But these are sophisticated in their design and ingenuity but lack guidance on interpretation and analysis. Much of existing practice is overly focused on the technology – and on learner reaction to the use of technology. Socio-economic factors such as class or gender are seldom considered and even learning environment variables such as the subject environment are all too often ignored.

Even though many projects have been carried out for evaluation of e-learning, only five major clusters of variables have emerged finally. They are individual learner variables, environmental variables, technology variables, contextual variables and pedagogic variables. Each of these can be disaggregated into more precise groups and can be identified / isolated as follows:

- **Individual learner variables** include physical characteristics (e.g. age, sex, and physical abilities), learning history (negative/positive experience, level of attainment, duration, recency etc.), learner attitude (positive/negative), learner motivation (high/low) and familiarity with the technology.

- **Learning environment variables** include the immediate (physical) learning environment, the organisational or institutional environment and the subject environment.

- **Contextual variables** include socio-economic factors (e.g. class, gender,), the political context (e.g. who is funding/paying for the e-learning and for what reason?), cultural background (e.g. how highly is learning/e-learning valued?) and geographic location (e.g. country, language, urban/rural).

- **Technology variables** include hardware, software, connectivity, the media and mode of delivery.

- **Pedagogic variables** include level and nature of learner support systems, accessibility issues, methodologies, flexibility, learner autonomy, selection and recruitment, assessment and examination and accreditation and certification.

**Levels of Evaluation**
Other ways of evaluating the e-learning are by reaction, learning, behavior and the results. They are discussed below:

**Level 1: Reaction**

Level 1 evaluation helps us to monitor learners' emotional acceptance of e-learning. It may be essential in gathering the testimonials and statistics to generate a positive buzz around e-learning by the use of:

- Let learners vote on course design
- Set up a course discussion thread
- Use chat or instant messaging for a focus group
- Gather feedback continually
- Gather feedback continuously
- Record meaningful statistics automatically

**Level 2: Learning**

E-learning provides learners with easy-to-use and inexpensive testing tools that create tests and standards-based on reporting mechanisms to record and report scores. Advanced e-learning applications use testing results to design custom learning programs for learners by

- Testing tools
- Standards-based score reporting

**Level 3: Behavior**

Change in behavior occurs outside the e-learning experience; its evaluation is less coupled with the e-learning or to the technologies needed for e-learning in order to

- Measure on-the-job performance
- Evaluate individual action items
- Use data recorded by other corporate systems

**Level 4: Results**

Class room training evaluation is easy, as it is visible and may be interactive during session. But the evaluation of the results for e-learning is more difficult. The kinds of business and
institutional changes one want to measure for Level 4 seldom has only one cause, and they may take years to manifest. When evaluating at Level 4, one may have to trade accuracy for credibility. (William Horton is a consultant and author in the area of technology-based training ©2005 VNU Business Media.)

**Objectives of Evaluation**

Evaluation is a relatively young field and evaluation approaches can be grouped around their parent discipline so that one can tend to find ‘mathematical approaches’ or ‘sociological approaches’.

FitzPatrick et al identify 5 major clusters of evaluation approaches:

1. **Objectives oriented evaluation approaches**
   Here the evaluation process should establish, whether the purposes, goals and targets have actually been achieved – and, if not, why not. It is sometimes called ‘goal-driven’ evaluation.

2. **Management oriented evaluation approaches**
   It is meant to serve decision makers and hence the evaluator can be most effective by focusing the evaluation products on the needs of managers, policy-makers, administrators and practitioners.

3. **Consumer oriented evaluation approaches**
   For this reason it tends to be summative, rather than formative and is concerned primarily with product evaluation. It relies heavily on criteria referenced evaluation techniques such as benchmarking or kite marking and is understandably popular with standards agencies and ‘watchdog’ organisations.

4. **Expertise oriented evaluation approaches**
   It is based on the notion of ‘connoisseurship’ and criticism and relies on the subjective professional judgement and expert knowledge of the evaluator. It may be formal or informal, based on individual expertise or, more usually, on the collective expertise of a panel. It relies far less on external tools and instruments than other forms of evaluation and more on the experience and wisdom of the evaluator.

5. **Participant oriented evaluation approaches**
   It is a popular approach wherein project participants as its starting point. An educational project for women returners would include the learners themselves, the project staff, the
management team and the funders but may also include the wider community, the learners families, the schools attended by the learners’ children, childcare agencies or whatever. This approach includes many sub-groups that share all or some of the above characteristics including responsive evaluation, naturalistic evaluation, and utilization focused evaluation and empowerment evaluation.

**Learning-orientated evaluation approaches**

This is a relatively new group of approaches and not one that was included in FitzPatrick et al’s classification. The operating principle is that the purpose of evaluation is to contribute to some form of collective or organisational learning. Different models within this overall approach are based on different theories and types of learning including ‘corrective’ or behavioural learning, cognitive learning and social learning. The outputs and processes of the evaluation form the inputs of the learning.

**Conclusion**

It has discussed the concepts of e-learning and some of the initiatives undertaken in Indian Universities and higher education institutions. The benefits are also discussed with the open education resources (OERs) available now for open access. Some of the Indian OERs are discussed. The evaluation of e-learning is very much important as users try to use it from any where at anytime of an e-learning programme. Also the retrospective analysis should enable enterprises to detect the weaknesses and strengths of their learning programme with regard to its organisational, pedagogic and technological implications. The main aim of the evaluation is to help managers of small, medium enterprises to detect strengths and weaknesses of the e-learning programme they are currently running, and thus providing them with particular information on organisational, pedagogic and technological implications of the training measure. Moreover, the evaluation aims at supporting the enterprise in finding ways of making training programmes more sustainable. It has discussed many evaluation methods available for e-learning. However efforts should be made to standardize the evaluation techniques. LIS professionals should be aware of all these and try to implement the e-learning modules accordingly.

**References**


