

Strategic Evaluation of Web-based E-learning; a review on 8 articles

¹Shahriar Mohammadi, ²Sajad Homayoun

¹ IT Group, Industrial Engineering, K. N. Toosi University of Technology,
 Tehran

E-mail: mohammadi@kntu.ac.ir

² Graduated in IT Group, Industrial Engineering, K. N. Toosi University of Technology,
 Tehran

E-mail: Sajadhomayoun@gmail.com

Abstract

Today electronic learning is an important educational topic, and choosing an appropriate, applicable approach in education is of great importance. We may encounter the question: why should we evaluate systems? Our answer can be one of these: (1) Instantaneous management of pros and cons; (2) designing a long-term strategy; (3) evaluation of managers' performance. Our main issue in this article is that we evaluate systems based on strategy, goals as well as objectives. According to 8 articles, we have made up a set of criteria to evaluate e-learning systems. The criteria are divided into four components or LISC: (1) Learning, (2) Interface, (3) Social, and (4) Content. Then we displayed the results as one visual stage diagram to demonstrate to managers.

Keywords: E-learning, web-based learning, strategic evaluation.

1. Introduction

Information technology has provided a wide window towards education. Its advantages are but not limited to (1) low expense, (2) educational justice, (3) distance education, (4) education repetition, etc. Most articles on evaluation circle around electronic business websites[1, 2, 3, 4, 5], while the number of papers on evaluation of electronic education systems is limited. The articles on the evaluation of e-learning systems have employed the current criteria existing in the same article. Like W.C. Chiou et al [6], we believe that for evaluating each system, we should consider that system's objectives and strategies. In other words, it is not appropriate to compare two systems bearing different objectives and strategies with the same criteria. As such, we need a novel approach in the area of evaluation of electronic educational systems. Section 2 provides a set of suggested criteria. In section 3, research

proposal is given. Section 4 reports a case study , and section 5 remarks on conclusion.

2. Criteria for evaluation of electronic educational system; a review of study

Most researchers take existing research resources on a topic as a proper starting point for a new study. It should be noted that there is no strong body of knowledge on the evaluation of electronic educational systems. Therefore, we decided to review the existing literature to provide an evaluation of simple electronic system.

We start our review with a search on articles stored in two we-pages i.e. Google scholar, and ScienceDirect.com. Totally, 47 articles are found, and 8 articles are selected as the best ones once their abstract and introduction sections are read and analyzed. Table 1 displays selected articles.

Table 1: Selected articles for Search Process

No.	Authors	Reference Number
1	Daniel Y. Shee, Yi-Shun Wang	[8]
2	Sevgi Ozkan, Refika Koseler	[9]
3	Rafael Andreu, Kety Jáuregui	[10]
4	Kum Leng Chin, Patrice Ng Kon	[11]
5	Ru-Jen Chao , Yueh-Hsiang Chen	[12]
6	Yi-Shun Wang	[13]
7	Gwo-Hshiung Tzeng, Cheng-Hsin Chiang, Chung-Wei Li	[14]
8	Yi-Shun Wang, Hsiu-Yuan Wang, Daniel Y. Shee	[15]

ext we classified introduced criteria for selecting articles. After our initial analysis, electronic educational system is divided into four main

dimensions called LISC: (1) Learning, (2) Interface, (3) Social, and (4) Content. The criteria are

classified in the related sub-dimension. Table 2 displays dimensions and criteria.

Table 2: Dimensions and criteria.

1. Learning Capability of controlling learning progress Capability of recording learning performance Learning Models Synchronous Learning Asynchronous Learning Learning Record Self Learning Participant Motivation and System Interaction Interactive course Learn from past performance Consideration for disabled students	3. Social Learner Cognitive Process Environment facilities Ease of discussion with other learners Ease of discussion with teachers Ease of accessing shared data Ease of exchanging learning with the others Learning Community Personalization Student commitment IT support Protection of students' details and privacy Intellectual property rights
2. Interface Ease of use User-friendliness Ease of understanding Operational stability Quality of Website Platform Personalization Webpage Connection Multimedia tools/technologies Download Speed	4. Content Learning Models Course Design Up-to-date content Sufficient content Useful content E-Learning Material Self Learning Course Quality Instruction Materials Interactive course Up to date course information Offline/online resources Language support Intellectual property rights Qualified e-learning course designer Course materials prepared in advanced Library facilities/support Availability Content Personalization provides information you need at the right time easy to understand

Now, there is a strong set of criteria, and as it was stated earlier, we want to evaluate based on the related strategy and goals of e-learning system.

3. Proposal

We have divided e-learning process into 3 phases: Registration and before registration is a phase when a new user enters the environment or a recently registered user navigates the components of e-learning environment. Learning is the next phase when learning is conducted and Exam and Quiz is the last phase focusing on evaluation process (Figure1).

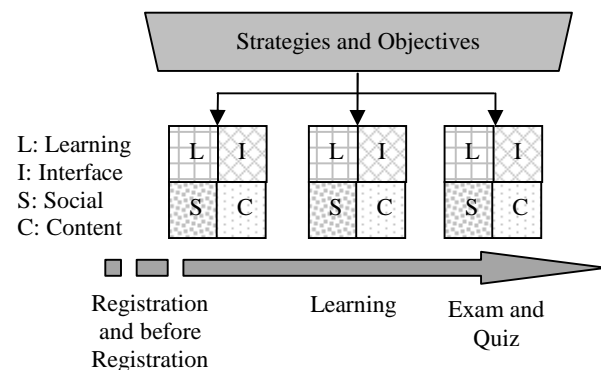


Fig. 1 Our Viewpoint on E-learning System Phases.

The four introduced dimensions and criteria are effective in each section and require evaluation. Finally, we arrive at a diagram that visually displays the condition of each dimension in being near to the intended ideal by the manager.

[6, 7] presented a five-stage model for evaluating e-commerce web-sites, displayed here in Figure 2. We have employed this model for final evaluation of an e-learning website based on our classified criteria.

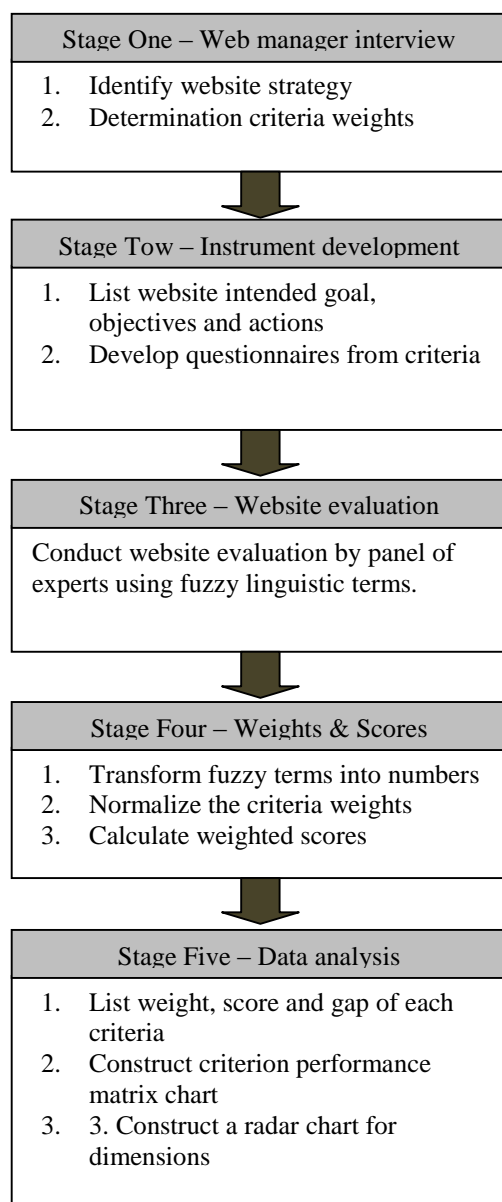


Fig. 2 Five-stage Model proposed by W.C.Chiou et al. [6] to evaluate e-commerce web-sites.

4. Case Study

We have selected an e-learning system to show the way our proposed method is implemented.

The evaluated web-site is called Z. This website is involved in teaching English conversation and writing to Persian speaking learners.

First Stage: Identification of Web site strategy and criteria.

Step 1. Detecting e-learning system goals and objectives

The manager of Z website has termed goals as Strong Resource and Easy Learning and objectives as below.

1. Variety of resource
2. Strong conversation
3. Strong writing
4. Ease of Use
5. Good Interface
6. Interactive Quiz

Step2. Choosing proper criteria considering goals and objectives.

Step3. Constructing a hierarchical evaluation structure.

Step4. Assigning Weight to each criterion by manager. We ask the manager to determine the importance of criteria by fuzzy linguistic terms: "very unimportant," "unimportant," "somewhat unimportant," "neutral," "somewhat important," "important," and "very important".

The fuzzy quantity of these terms is: 0.09, 0.23, 0.36, 0.50, 0.64, 0.78, and 0.91.

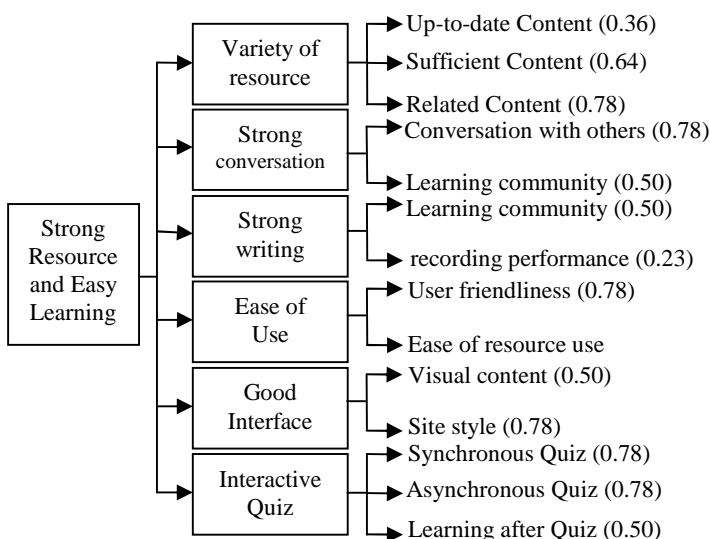


Fig. 3 Hierarchical evaluation structure and criteria weights of Z site.

Second Stage: Web-based evaluation instrument development.

Step1. Changing criteria to questions which can be calculated.

Step2. Designing questionnaire with respect to selected criteria.

Third Stage: Execution of Web site evaluation.

Step1: Choosing a panel of experts as evaluators.

Step2: Evaluation by evaluators. Scoring by fuzzy linguistic terms. The fuzzy terms of this section include “strongly disagree,” “disagree,” “some-what disagree,” “neutral,” “somewhat agree,” “agree,” and “strongly agree.”

Where their quantities are: 0.09, 0.23, 0.36, 0.50, 0.64, 0.78, and 0.91.

Fourth Stage: S_{ijk} , where i is an objective, j is its related criteria, and k is an evaluator.

Step1. Normalization of Criteria Weight.

Normalization is performed using formula 1.

$$W_{ij} = \frac{W_{ij}}{\sum_{j=1}^n W_{ij}} \quad (1)$$

Step2. Calculating average scores, weighted scores, and objective scores.

$$AS_{ij} = \sqrt[n]{\prod_{k=1}^n S_{ijk}} \quad (2)$$

where n is the number of evaluators. The weighted score of criterion j (WS_{ij}) and the weighted score of an objective (OWS_i) are calculated using the following equations:

$$WS_{ij} = AS_{ij} \times NW_{ij} \quad (3)$$

$$OWS_i = \sum_{j=1}^n WS_{ij} \quad (4)$$

where n is the number of criteria j under an objective i .

Table 3: Z site's LISC dimensional average weights and scores in three phases.

Objective (O_i)	Criteria (C_{ij})	W_{ij}	AS_{ij}	G_{ij}	NW_{ij}	WS_{ij}	OWS_i
1. Variety of resource	1. Up-to-date Content	0.36	0.32	-0.02	0.20	0.06	0.32
	2. Sufficient Content	0.64	0.35	-0.29	0.36	0.12	
	3. Related Content	0.78	0.32	-0.46	0.44	0.14	
2. Strong conversation	1. Conversation with others	0.78	0.44	-0.34	0.61	0.27	0.38
	2. Learning community	0.50	0.28	-0.22	0.39	0.11	
3. Strong writing	1. Learning community	0.50	0.44	-0.06	0.68	0.30	0.35
	2. Capabilities of recording performance	0.23	0.16	-0.07	0.32	0.05	
4. Ease of Use	1. User friendliness	0.78	0.42	-0.36	0.46	0.19	0.41
	2. Ease of resource use	0.91	0.42	-0.49	0.54	0.22	
5. Good Interface	1. Visual content	0.50	0.14	-0.36	0.39	0.05	0.24
	2. Site style	0.78	0.32	-0.46	0.61	0.19	
6. Interactive Quiz	1. Synchronous Quiz	0.78	0.42	-0.36	0.38	0.16	0.35
	2. Asynchronous Quiz	0.78	0.40	-0.38	0.38	0.15	
	3. Learning after Quiz	0.50	0.16	-0.34	0.24	0.04	

The average LISC dimensional weight (AW_{td}) and average score (AS_{td}) in each phase can be calculated following formula (8) and (9), respectively.

$$AW_{td} = \frac{\sum_{j=1}^n W_{tdj}}{n} \quad (8)$$

Fifth Stage: Web strategy consistency analysis.

Step1. Analysis of Gap Value for each criterion.

The manager should take into account criteria or low average scores. Gap or the threshold announced by the manager determines strategy deviation. If the quantity of G is higher than threshold, that criterion is recognized as a criterion incompatible with the strategy and therefore it should be considered.

Needless to say, the amount of threshold depends on the resources available for manager to manage.

$$G_{ij} = AS_{ij} - W_{ij} \quad (5)$$

where i is an objective and j is its related criteria.

Step 2. Constructing a criteria performance matrix chart. This diagram is constructed to graphically show the status of criteria to the managers, and they are able to set priority on their plans to remove inconsistencies of criteria or strategies.

Step3. Analysis of LISC dimensions and efficiency of 3-stage process

$$AW_d = \frac{\sum_{j=1}^n W_{dj}}{n} \quad (6)$$

$$AS_d = \frac{\sum_{j=1}^n AS_{dj}}{n} \quad (7)$$

where d is a LISC dimension ($d = 1$ to 4), j is a criterion number, and n is the number of criteria under the LISC dimension.

$$AS_{td} = \frac{\sum_{j=1}^n AS_{tdj}}{n} \quad (9)$$

where t is the transactional phase ($t = 1$ to 3), d is a LISC dimension ($d = 1$ to 4), j is the criterion number ($j = 1 \sim n$), n is the total criterion number under the LISC dimension in each phase, W_{tdj} is the

weight of criterion j under a dimension d in phase t , and AS_{tdj} is the average score of criterion j under a dimension d in phase t .

Table 4. Dimensions and related criteria

Dimensions(d)	Related Criteria (C_{ij})	AW_d	AS_d
1. Content	C_{11}, C_{12}, C_{13}	0.59	0.33
2. Social	C_{21}, C_{22}, C_{31}	0.59	0.38
3. Interface	$C_{41}, C_{42}, C_{51}, C_{52}$	0.74	0.32
4. Learning	$C_{32}, C_{61}, C_{62}, C_{63}$	0.57	0.28

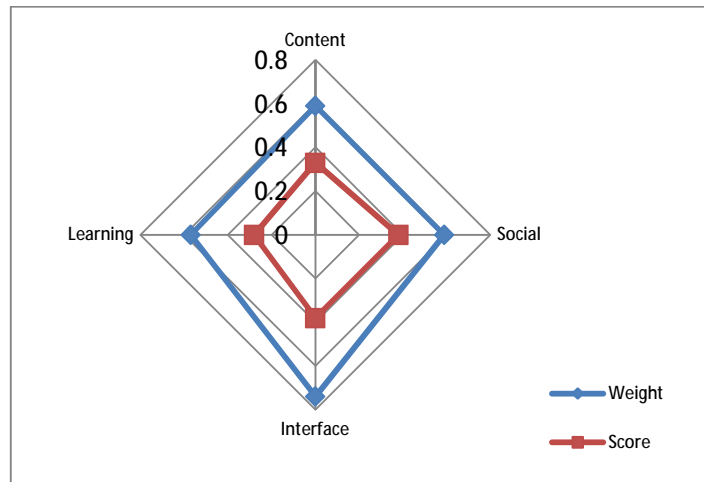


Fig. 4 Result in a radar chart.

Table 5: Status of Criteria of each dimension in different phases

	Phase 1. Registration and before registration			Phase 2. Learning			Phase 3. Final Quiz		
	Criteria	AW_{td}	AS_{td}	Criteria	AW_{td}	AS_{td}	Criteria	AW_{td}	AS_{td}
1. Interface	C_{41}, C_{51}, C_{52}	0.68	0.29	$C_{41}, C_{42}, C_{51}, C_{52}$	0.74	0.32	C_{41}, C_{51}	0.64	0.28
2. Learning	N/A			C_{32}, C_{51}	0.50	0.29	C_{61}, C_{62}, C_{63}	0.68	0.32
3. Content	C_{11}, C_{13}	0.57	0.32	C_{11}, C_{12}, C_{13}	0.59	0.33	N/A		
4. Social	C_{21}, C_{22}, C_{31}	0.59	0.38	C_{21}, C_{22}, C_{31}	0.59	0.38	N/A		

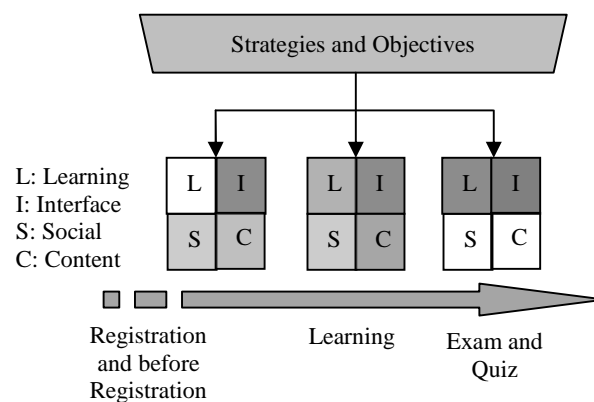


Fig. 5 Final format of each dimension compared with normal status for manager.

5. Conclusion

Considering the development of electronic services, attention towards web-site evaluation is of much importance. As there is a limited body of literature review on e-learning evaluation criteria, we selected 8 high-level articles. The audience of this article are managers who tend to increase service quality as well as researchers working on e-learning. It was stated that in evaluations, special attention should be given to website strategy. Employing the method proposed by W.C. Chiou et al. [6, 7], we have evaluated an e-learning website using criteria introduced in our review of literature.

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