



A Model for Effectiveness of E-learning at University

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Abstract

In the digital age, e-learning systems have been employed as new equipment in the higher education system in different universities. Considering the importance of optimization of this system, this research is aimed at providing a model for the effectiveness of e-learning at in higher education systems .The study is a descriptive survey study in terms of its data collection method.The population includes all the students of electronic courses at the University of Tehran .This population includes 1481 students of the University of Tehran in the academic year 2019-2020 .Regarding the population size, 300 students were selected based on stratified sampling, using Cochran’s formula. Lisrel and Amos software were used for data analysis .In the first step, by literature review, and based on the collected information, 87 components were identified to be related to e-learning effectiveness .Then, based on the highest frequency of the identified components in one hand, and their significance from the experts ‘viewpoints, on the other hand, 14 components were finally selected and classified in three major classes including; pedagogical, individual and technical related factors.

Keywords: E-learning, effectiveness, Students, Higher education, University of Tehran.

Introduction

The information and communication (TIC) revolution, higher access to computers in higher education, and universities encountering challenges such as higher demand for education and the emergence of new technologies as tools for providing education services in the global market have forced universities to reconsider their traditional roles and create new organizational structures (Martinez et al., 2009). Such a structural change has created a new model for teaching-learning systems, known as e-learning. In other words, on the one hand, e-learning is a result of a paradigm change in higher education and serves as a powerful instrument for universities to achieve their strategic goals (i. e., education, research, and providing services to the society and industry (Divjak et al., 2006), and on the other hand, it is an innovative approach to develop access to higher education (Al-Samarraie et al., 2018). Thus, education systems today propose e-learning as a part of learning activities in higher education (Garrison et al., 2011; Guri et al., 2005) since not only does it provide better educational services but also leads to information exchange and collaborative learning among teachers and learners (Dominici et al., 2013; Nichols, 2008).

In this respect, a review of the literature indicates that e-learning systems are an essential approach in the higher education of the digital era, creating learner-based education environments, bringing flexibility into learning methods (Shopova, 2014), and introducing changes in the teaching-learning process in higher education systems (Venkataraman et al., 2015). By utilizing the latest achievements of the ICT era (Salloum, 2019), e-learning has created new approaches (Doherty, 2006; Levy, 2007), providing bright horizons in education. Studies suggest that e-learning is becoming prominent topic because it is laying the ground for extensive interactions (Garrison et al., 2003), easy use for students and professors (Kelly, 2004; Bauer, 2004), reduced cost and time waste, learner-orientation (Wang, 2003; Chiu et al., 2008; Arkorful, 2015), improved educational progress of students (Mothibi, 2015), shifting education orientation from teaching to learning, increased flexibility and interaction in higher education (Salloum, 2019), and bringing a balance between university candidates and university capacity (eJaffee et al., 2006; Castle et al., 2010).

Meanwhile, e-learning is also criticized for weak student evaluation, negative impact on social skills (Arkorful, 2015), lower position of face-to-face communications, weak teamwork spirit and individual commitments, and weak education material conclusion (Uppal et al., 2015). This makes the effectiveness of e-learning a crucial problem for higher education managers. Thus, one of the main tasks of institutes offering e-learning services is to improve the quality and beneficiaries' satisfaction. The non-consideration of e-learning system evaluation imposes challenges, such as irresponsibility of invidiously for their assigned tasks, low learning quality, waste of human and financial resources, mental harm due to failure in

achieving objectives, dropouts, the disappointment of eligible individuals by observing unfairness in their organization, and non-awareness of new problems and their causes. The importance of effective evaluation, on the one hand, and doubts of many individuals, including higher education practitioners, on the effectiveness of e-learning, on the other hand, makes it more important to evaluate the effectiveness of e-learning courses. Thus, the investigation of e-learning effectiveness has been considered in recent years. Overall, it can be said that determining the effectiveness of e-learning as a new teaching-learning approach not only allows for using feedbacks to improve new and oriented education methods but can also provide comprehensive information on how successful it has been in achieving its objectives and what factors prevented it from properly achieving such objectives, so that measures can be taken to improve the quality and realize the goals.

In this respect, identifying the main e-learning related factors is the first step toward e-learning effectiveness evaluation. Thus, this study is mainly aimed at identifying and evaluating the factors related to e-learning effectiveness, and consequently designing a model for evaluating the system in higher education. The main questions of the research are mentioned below :

- 1) What are the related factors of e-learning effectiveness, and ranking the factors based on student views?
- 2) What is the best model for evaluating the e-learning effectiveness?

Theoretical background

Although e-learning typically refers to the use of ICT in the teaching-learning process, it also does refer to online learning, virtual learning, distributed learning, network learning, and web-based learning. These all refer to education processes that employ ICT to implement simultaneous and non-simultaneous learning (Naidu, 2013). International researchers and organizations have attempted to develop e-learning definitions from various perspectives (Liu et al., 2009). The Organization for Economic Cooperation and Development (OECD) defines e-learning as the use of ICT in different education processes to support and improve learning in higher education institutes, including the use of ICT as a traditional complementary in physical classes, online learning, or a combination the two approaches (Arkorful et al., 2015). In a more comprehensive definition, e-learning is described as a learning method in which learners utilize the internet to acquire knowledge and make individual senses, develop learning experience, achieve learning content, interact with contents, teachers, and other learners, and receive support in learning.

In this regard, Welsh et al (2003) suggested that e-learning could be described as education content or learning techniques that are facilitated by electronic technologies and are aimed at enhancing the expertise, general knowledge, and capabilities of learners at an international level. Stockley (2003) defined e-learning as a tool for the transfer of education or educational programs through electronic instruments, such as computers and mobile phones, to facilitate and enrich the teaching-learning process (Trakru et al., 2019).

In the present study, e-learning refers to an approach in which learners employ the internet to acquire knowledge, make individual senses, develop learning experience, achieve learning content, interact with the contents, educators, and other learners, and receive support in learning (Anderson, 2004). A review of the literature indicates that although e-learning improves individual performance and the skills required to deal with the challenges of the 21st century, leading to reconsideration in learning approaches in some cases (Noesgaard et al., 2015), it is difficult to evaluate the effectiveness of e-learning. Thus, it is necessary to consider e-learning effectiveness evaluation. E-learning effectiveness evaluation is aimed at determining the extent to which e-learning has provided the practical skills required by the organization.

Heder (2003), proposed that some outcomes of e-learning effectiveness evaluation determine the realization of educational objectives, learners' observable results, how correctly works are performed, the abilities obtained in achieving objectives due to learning, and also investigate the extent to which learners match with their organizational position expectations. The literature suggests that although researchers used different variables to measure e-learning effectiveness, including learning outcomes, learning transfer, perceived learning, skills or aptitudes, attitudes, satisfaction, obtained skills, and the cost (Noesgaard et al., 2015), the main objective of all e-learning institutes is to improve learning outcomes. Also, the main factors of improved learning are enhanced participation, self-discipline, and dual and multiple interactions (Garrison et al., 2011; Persico et al., 2014). Given that the review of previous studies indicates that educational institutes usually evaluate e-learning systems to realize the effectiveness of learning outcomes and compare them to previous results, the present study treats e-learning effectiveness as the realization of student learning outcomes.

Empirical background

The evaluation of E-learning effectiveness has a long history in empirical higher education studies since education programmers and managers have always investigated whether e-learning could be a good alternative for face to face learning since the beginning of new technologies' development. Levy (2007) proposed a proper approach to evaluating the effectiveness of e-learning systems. They believed that an e-learning system could be

described as effective when its learners see its features as valuable and grade their satisfaction with those features meaningfully (Yazdani et al., 2012). As mentioned by Levy (2007), learning outcome evaluation is the dominant approach in e-learning effectiveness evaluation (Noesgaard & Ørngreen, 2015). Yuwono et al., (2018) demonstrated that the results obtained by studying e-learning achievements are better than learning results in common educational practices.

Noesgaard et al. (2015) conducted a meta-analysis, identifying nineteen methods to define effectiveness. 57 % of the reviewed studies investigated the effectiveness of higher education. 56 % of the studies defined e-learning effectiveness as learning outcomes. They qualitatively classified a set of e-learning effectiveness definitions, methodologies, and tools. They identified key factors that influence e-learning effectiveness including the context in which the e-learning solution is used; the artifact (the e-learning solution itself) and the individuals that use the artifact. They were found that support and resources, the individuals' motivation and prior experience and interaction between the artifact and the individuals that use it all influence effectiveness. Alhabeeb et al. (2018) proposed factors affecting e-learning effectiveness to be inclusive features, teachers' characteristics, ease of access, support, and education. Zammel et al. (2018) suggested that e-learning effectiveness was dependent on learning motivation, reflecting learns and technologic systems.

Gamage et al. (2014) studied factors influencing e-learning effectiveness. They identified ten factors to analyze e-learning effectiveness, including interaction, cooperation, motivation, opportunities network, education, content, evaluation, usability, technology, and support. Mohammad Ali and et al. (2018), found that variables such as time, cost-friendliness, and being able to work independently, add value to the learning of the students, usable for active learning, faster, quick response, applicable outside the classroom and quality of e-learning significantly affect the effectiveness of e-learning. Sridharan et al. (2010) developed a model in their study which contains four factors affecting e-learning effectiveness and these are Pedagogy, technology, learning resources, metadata ontology. The experiment conducted by (Yunus & Salim, 2013), illustrated the effectiveness of e-learning through individual motivation & attitude, individual learning style, theory-objective-learning outcome & knowledge transfer, interactivity & content, structure design, interface design, multimedia design, instruction and help, learner-facilitator interaction, learner-learner interaction, and learner-content interaction. Finally, Attwel (2006) designed tools for evaluating e-learning that include five factors of learners, context, environment, technology, and pedagogy. Table 1 provides the most important dimensions in e-learning effectiveness proposed by researchers since the 2010-2019.

Table 1. Related factors of E-learning effectiveness

Researchers(year)	Dimension/factor
Urdan, 2000	Learner-focused measures, performance-focused measures, culture-focused measures, and cost-return measures.
Liaw, 2008	Multimedia instruction, interactive learning activities, and system quality.
Ming-Lang Tseng and Ru-Jen Lin, 2011	Five primary dependence aspects were identified and evaluated, namely: quality of the system, learner attractiveness, instructor attitudes, service quality, and supportive issues.
Sfenrianto et al., 2018	Culture, technology and infrastructure, and content satisfaction.
Farid et al., 2018	Quality service, attractiveness, network, system quality, current features including performance, availability, and usability, and future sustainability and ability.
Asoodar et al., 2016	Leader, educator, course, technology, design, environment.
Yunus& Salim, 2013	individual motivation and attitude, individual learning style, theory-objective-learning outcome and knowledge transfer, interactivity and content, structure design, interface design, multimedia design, instruction and help, learner-facilitator interaction, learner-learner interaction, and learner-content interaction.
Al-rahmi et al., 2015	Self-efficacy, interface, community, usefulness, students' satisfaction and intention to use e-learning.
Alrawashdeh et al., 2013	Performance, reliability, usability, productivity, maintainability, portability.
Zhang & Cheng, 2012	Planning evaluation, development evaluation, process evaluation, product evaluation.
Balyk et al., 2017	Technological, educational, organizational and communicational criteria.
Vivekananthamoorthy et al., 2014	Faculty empowerment, faculty-student interaction, automatic collection of user behavior patterns to facilitate.
Almarzooqi, 2020	Learning characteristics, learning mode, evaluation, multimedia richness
Cheawjindakarn et al., 2013	Access, learning and effectiveness, student support, cost-effectiveness, faculty members' satisfaction.
Hand, 2012	Writing tools, including; accessibility, proportionality, usability.
Wu& Hwang, 2010	technical system and the social system(Extrinsic Motivation and learning climate) at the learning environment level and the individual level
Mbarek& El Gharbi, 2013	Teacher characteristics (motivation, self-efficacy, anxiety), contextual characteristics (feedback, training method, learning delivery).
Kay, 2011	Design quality, learning processes.

Researchers(year)	Dimension/factor
Islam et al., 2010	Reaction and satisfaction, participation and interaction, familiarity with online learning technology.
Abdellatif et al., 2011	Service content, system performance, system reliability, information technology.
Alsabwy et al., 2011	Information quality, system quality, usefulness, user (customer) satisfaction, user value (internal), customer value (external), intelligence organization, delivered service quality, technology infrastructure services.
Ahmed, 2010	Accountable teachers, usability, customization, content quality.
Masoumi as cited Upadhyaya et al., 2019	Student support, faculty support, organization, learning design, learning processes.
Noesgard & Ørngreen, 2015	Individual (subject), contextual scaffolding (context +object) and e-Learning solution and process (artefact).
Attwell, 2006	Learners, context, environmental, technology, pedagogy.
Kheir Andish, 2015	Including university-related factors, student characteristics, teacher characteristics, educational factors, and environmental factors.
Sridharan et al., 2010	Pedagogy, technology, learning resources, metadata ontology.
Ali et al., 2018	Contents structure, usability, faster learning, quick responsiveness, learning quality, time and cost-friendly, the usability of the outside of the class, appropriate for working independently.
Chopra et al., 2019	system quality, service quality, and information quality
Zammel et al., 2018	motivation to learn, the reflexivity of the learner and the e-learning System quality.

The review of the literature indicates that studies were conducted on the evaluation of e-learning in higher education; however, insufficient studies investigated e-learning effectiveness evaluation, and most studies were limited to the organizational education level. Thus, the present study attempts to propose an e-learning effectiveness evaluation model in higher education from the perspective of students (including individual, organizational, and technological dimensions) through the utilization of a comprehensive framework obtained from forty-three e-learning effectiveness evaluation models (with an emphasis on the models designed by Noesgard & Ørngreen , 2015 and Attwell , 2006). Fig. 1 illustrates the proposed conceptual model. Finally, it is worth noting that only students were included as stakeholders due to the extensiveness of stakeholders and limitations.

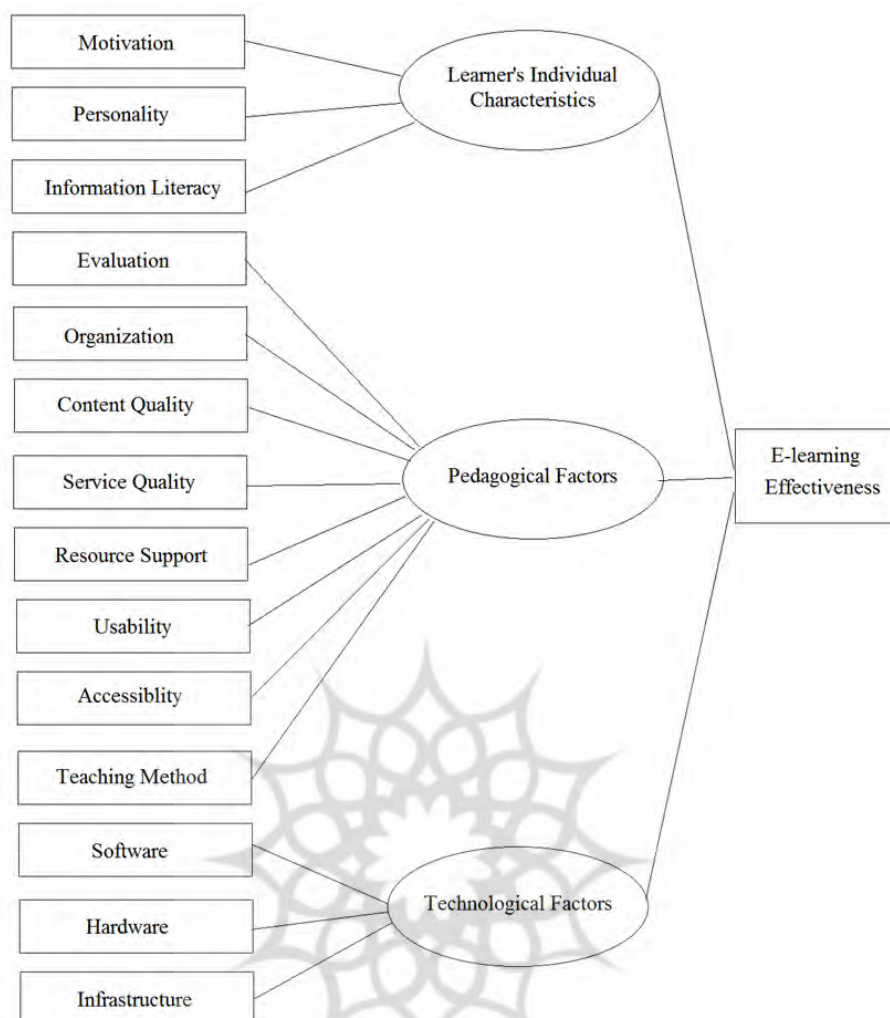


Figure 1. The proposed conceptual model

Materials and methods

This study is practical in terms of its objectives and a descriptive-survey in terms of its data collection method. Data were collected by taking notes. Then, 87 components were identified for e-learning effectiveness based on the data. The most frequent components were identified and delivered to experts to determine their importance. Furthermore, by using Friedman test, the most important components were selected based on their priorities. Finally, 14 components were selected and classified into three general groups: namely individual, pedagogical, and technological. Based on the components, a questionnaire was designed with 41 items on the four-point Liker scale, in which one represented very high, while four stood for very low. The questionnaire's validity was examined by expert views. Also, its reliability was obtained to be 0.963 by Cronbach's alpha. The statistical population consisted of 1481 e-learning course students at the University of Tehran in 11 faculties and campuses in the academic year of 2019-2020. Applying the Cochran formula and proportionate stratified sampling, 300 students were selected as respondents. Finally, Lisrel and Amos analyzed the

quantitative data. According to the E-Learning Center (table 2), the population for the study included all students in e-learning programs of University of Tehran who are studying in the academic year 2019-2020 .The sample in this study by university faculties is as follows:

Table 2. Distribution of participants by faculty/colleges

Total	Faculty/colleges										
	College of fine arts	College of engineering	Faculty of law and political science	Faculty of theology and Islamic studies	Faculty of foreign languages and literatures	Faculty of entrepreneurship	faculty of management	Faculty of physical education and sport science	Faculty of psychology and education	College of farabi	
300	23	42	34	20	24	30	23	19	32	53	Frequency
100	7.7	14	11.3	6.7	8	10	7.7	6.3	10.7	17.7	Percent

As can be seen in Table 3, KMO and Bartlett's Test has been used for measuring the Sampling Adequacy and the results are shown in the table below:

Table3. KMO and Bartlett's Test Kaiser-Meyer-Olkin Measure

KMO and Bartlett's Test Kaiser-Meyer-Olkin Measure of Sampling Adequacy		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.813
Bartlett's Test of Sphericity	Approx. Chi-Square	3986, 5410
	df	524
	Sig	...

Data analysis

By identifying and classifying e-learning effectiveness evaluation components obtained from the literature review, the most important e-learning effectiveness evaluation factors were derived to be motivation, personality, information literacy, evaluation, organization, content quality, service quality, resource support, usability, accessibility, teaching and learning, software, hardware, and infrastructure. Table 4 shows the initial questionnaire's confirmatory factor analysis (CFA) fitting indexes.

Table 4. The questionnaire is confirmatory

Fitting Indexes		Value	Criterion	Interpretation
Absolute	χ^2	1935.47	-	-
	Df	760	-	-
	df, χ^2	1935.47/760	<5	Satisfactory fitting
	GFI	0.88	>0.85	Satisfactory fitting
	AGFI	0.83	>0.80	Satisfactory fitting
	RMR	0.062	<0.1	Satisfactory fitting
Confirmatory	RFI	0.92	>0.90	Satisfactory fitting
	IFI	0.91	>0.90	Satisfactory fitting
	CFI	0.90	>0.90	Satisfactory fitting
	NFI	0.93	>0.90	Satisfactory fitting
	NNFI	0.90	>0.90	Satisfactory fitting
Parsimonious	RMSEA	0.072	<0.1	Satisfactory fitting
	PNFI	0.75	>0.60	Satisfactory fitting

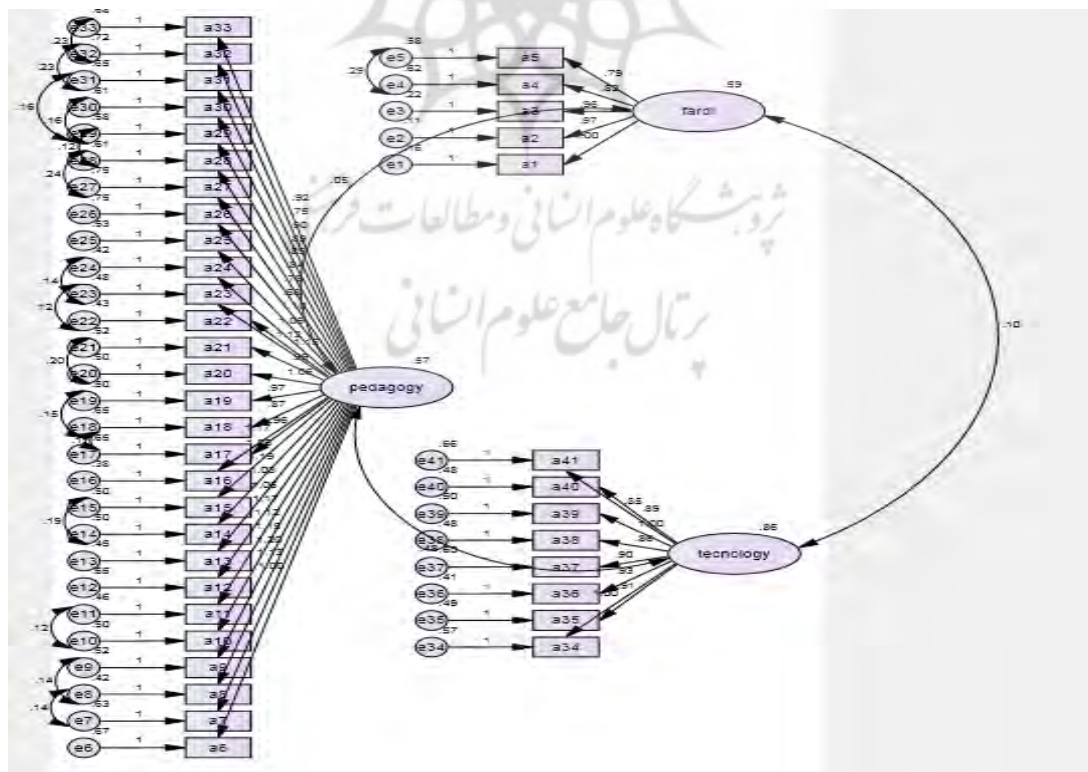


Figure 2. Result of confirmatory factor analysis (CFA)

Table 5. Cronbach's alpha of related factors of e-learning effectiveness

Category	Items	Path Coefficient	Cronbach's Alpha	Total Cronbach's Alpha
Individual	1	0.889**	0.893	0.963
	2	0.916**		
	3	0.485**		
	4	0.629**		
	5	0.622**		
Pedagogical	6	0.678**	0.981	
	7	0.731**		
	8	0.815**		
	9	0.769**		
	10	0.768**		
	11	0.794**		
	12	0.730**		
	13	0.757**		
	14	0.786**		
	15	0.744**		
	16	0.822**		
	17	0.672**		
	18	0.633**		
	19	0.720**		
	20	0.749**		
	21	0.718**		
	22	0.798**		
	23	0.774**		
	24	0.786**		
	25	0.755**		
	26	0.510**		
	27	0.564**		
	28	0.633**		
	29	0.662**		

Category	Items	Path Coefficient	Cronbach's Alpha	Total Cronbach's Alpha
Pedagogical	30	0.653**	0.981	0.963
	31	0.646**		
	32	0.554**		
	33	0.644**		
Technological	34	0.775**	0.916	
	35	0.768**		
	36	0.805**		
	37	0.731**		
	38	0.753**		
	39	0.796**		
	40	0.763**		
	41	0.649**		

*p ≤ 0.5

** p ≤ 0.001

As can be seen table 5, all the path coefficients are significant. Cronbach's alpha was obtained to be 0.963 for the questionnaire. Also, Cronbach's alpha was derived to be 0.893, 0.98, and 0.92 for the individual, pedagogical, and technological categories. This indicates the internal consistency of the questionnaire items. Additionally, the components were analyzed for their importance by student views. The Friedman test was used to examine the prioritization of the main e-learning effectiveness evaluation categories. Table 6 provides the results.

Table 6. The Friedman test results for the prioritization of e-learning effectiveness evaluation categories

Variable	Mean Rank	Priority
Individual	2.46	1
Technological	1.83	2
Pedagogical	1.81	3

The chi-squared test result of the Friedman test was obtained to be 102.77 for the three general components, with the significance level being found as satisfactory (sig<0.001). Thus, there were significant differences between the main e-learning effectiveness evaluation components. The Friedman test results indicated that the most important e-learning

effectiveness evaluation components were individual, technological, and pedagogical factors, respectively. Table 7 represents the Friedman test results for the prioritization of e-learning effectiveness evaluation components.

Table 7. The Friedman test results for the prioritization of e-learning effectiveness evaluation components

Variable	Mean Rank	Priority
Motivation	10.25	1
Personality	9.55	2
ICT literacy	9.07	3
Teaching-learning evaluation	6.97	9
Usability	6.84	10
Accessibility	4.71	6
Organization	7.75	4
Content quality	6.99	8
Service quality	6.62	11
Teaching-learning method	6.23	14
Support systems	6.30	13
Software	7.21	7
Hardware	6.33	12
Infrastructure	7.49	5

The chi-squared test result of the Friedman test was derived to be 401.78, with the significance level being found as satisfactory ($\text{sig} < 0.001$). Therefore, there were significant differences between the e-learning effectiveness evaluation components. The Friedman test suggested that the most important e-learning effectiveness evaluation components were motivation, personality, ICT literacy, organization, infrastructure, accessibility, software, content quality, teaching-learning process evaluation, usability, service quality, hardware, support, and teaching-learning method, respectively. These categories, based on research studies, are listed as follows:

1. individual factors included three components: motivation (Yunus& Salim, 2013; Mbarek & El Gharbi, 2015; Al-rahmi, 2015), personality (Mbarek&El Gharbi, 2015; Al-rahmi, 2015; Kheir Andish, 2015) and ICT literacy (Islam, 2010).
2. pedagogical factors included 8 components; evaluation of the teaching-learning process (Zhang & Cheng, 2012), usability (Alrawashdeh et al, 2013; Hand, 2012; Ahmad, 2010;

Ali, Hossain, & Ahmed, 2018), accessibility (Cheawjindakarn, 2013; Hand, 2012; Ali, Hossain, & Ahmed, 2018; Ahmed, 2010), organization (Yunus & Salim, 2013; Balyk, Oleksiuk, & Shmyger, 2017; Sridharan et al, 2010), content quality (Ali, Hossain, & Ahmed, 2018; Sridharan et al, 2010; Ahmad, 2010; Abdellatief et al, 2011; Yunus & Salim, 2013; Sfenrianto et al, 2018), quality of service (Farid et al, 2018; Abdellatief et al, 2011; Alsabwy, 2011), methods of Teaching-learning (Yunus & Salim, 2013; Cheawjindakarn, 2013; Kay, 2011; Masoumi as cited Upadhyaya et al, 2019) and supporting resources (Noesgaard et al, 2015).

3. Technical factors included three components; software (Hand, 2012; Alsabwy, 2011; Noesgaard and et al, 2015; Sridharan et al, 2010; Yunus & Salim, 2013; Balyk, Oleksiuk, & Shmyger, 2017), hardware (Farid et al, 2018, Balyk, Oleksiuk, & Shmyger, 2017; Abdellatief et al, 2011; Sridharan et al, 2010) and infrastructure (Balyk, Oleksiuk, & Shmyger, 2017; Sridharan et al, 2010; Alsabwy, 2011; Sfenrianto et al, 2018).

Discussion and conclusion

Evaluating the effectiveness of e-learning is critical for higher education institutes and universities. The purpose of this study was to identify and evaluate factors affecting e-learning effectiveness at the University of Tehran. (A total of 87 e-learning effectiveness evaluation components were suggested, but they can be classified into three general categories. Another purpose of the present study was to evaluate the e-learning effectiveness based on the identified factors from the students' perspective. The results of the analysis showed that all components are higher than average. Finally, the third aim of the study was to rank the components of e-learning effectiveness from the students' view. The results showed that the following components are more important for students: 1 -Motivation 2 -Personality 3 -ICT literacy 4 -evaluation of the teaching-learning process 5 -Usability 6 -Accessibility 7 -organization 8-Content Quality 9-Quality Service 10 -methods of Teaching-learning -11 -supporting resources 12-Software 13-Hardware 14-Infrastructure. Based on the status of e-learning effectiveness and its importance in higher education systems, and in order to maintain the current conditions and improve the effectiveness in the future, the following recommendations are proposed:

- It is necessary to identify and evaluate ICT literacy and organizing complementary training courses based on students' requirements;
- Teachers and students should be encouraged to utilize the tools available in learning management systems to enhance interactions between students and teachers;
- Universities should try to prepare a comprehensive digital library;

- Guidelines should be provided to students at the beginning of the teaching-learning processes. The guidelines should specify the responsibilities of students, teachers, and support staff;
- Teachers should pay particular attention to providing feedback on students' educational progress during semesters. Besides, such feedbacks should be continuous and timely;
- The e-content should be evaluated by students, and also revised and updated continuously;
- University authorities should have a plan for receiving students' feedbacks on service quality while establishing practical programs to deal with weaknesses in the feedbacks;
- Skillful and efficient teachers that can work with e-learning systems should be employed;
- The views, criticisms, and propositions of students must be viewed as the knowledge received from one of the most important stakeholders, and universities need to value the criticisms as improvable weaknesses.

Limitations

Limitations of the study are as follows:

The present study has several limitations which can be the basis for providing valuable recommendations and suggestions for future work in this research area. The first limitation of this study is that the data collected was analyzed by using the quantitative approach, Therefore, the qualitative method may be adequate for a comprehensive investigation of factors affecting E-learning effectiveness. Secondly, the investigation of the factors affecting e-learning effectiveness in the present study was limited to students but in future more can be included from colleges faculties perspective.

Innovation

Given the importance of e-Learning in Iranian universities, this study explores the related components of e-learning effectiveness that actually provide the basis for developing standard questionnaires for continuous monitoring and fostering the effective learning climate for students.

References

- Abdellatif, M., Sultan, A.B.M., Jabar, M. A., & Abdullah, R. (2011). A technique for quality evaluation of E-learning from developers' perspective. *American Journal of Economics and Business Administration*, 3 (1), 157-164.
- Ahmed, H. M. S. (2010). Hybrid E-Learning acceptance model :Learner perceptions. *Decision Sciences Journal of Innovative Education*, 8 (2), 313-346.
- Alhabeeb, A., & Rowley, J. (2018). E-learning critical success factors :Comparing perspectives from academic staff and students. *Computers & Education*, 127, 1–12.
- Ali, M., Hossain, S. K., & Ahmed, T. (2018). Effectiveness of E-learning for university students : Evidence from Bangladesh. *Asian Journal of Empirical Research*, 8 (10), 352-360.
- Almarzooqi, J. M. H. Y. (2020). *An evaluation of the effectiveness of face-to-face versus e-learning in the UAE Civil Defence sector* (Doctoral dissertation).
- Al-rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015). The effectiveness of using E-learning in Malaysian higher education :A case study Universiti Teknologi Malaysia. *Mediterranean Journal of Social Sciences*, 6 (5), 625-625.
- Alsabawy, A. Y., Cater-Steel, A., & Soar, J. (2011). Measuring E-learning system success (Research in progress). In *Proceedings of the 15th Pacific Asia Conference on Information Systems (PACIS 2011)* (pp. 1-15). Queensland University of Technology.
- Al-Samarraie, H., Teng, B.K., Alzahrani, A. I., & Alalwan, N. (2018). E-learning continuance satisfaction in higher education :a unified perspective from instructors and students. *Studies in higher education*, 43 (11), 2003-2019.
- Altarawneh, M. (2013). Factors Affecting the Adoption of E-learning :Jordanian Universities Case Study. *Computer Engineering and Intelligent Systems*, 4 (3). 32-40.
- Anderson, T. (2004). Towards a theory of online learning. *Theory and practice of online learning*, 2, 109-119.
- Arkorful, V., & Abaidoo, N. (2015). The role of E-learning, advantages, and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning*, 12 (1), 29-42.
- Asoodar, M., Vaezi, S., & Izanloo, B. (2016). A framework to improve e-learner satisfaction and further strengthen E-learning implementation. *Computers in Human Behavior*, 63, 704-716.
- Attwell, G. (2006). Evaluating E-learning :A Guide to the Evaluation of E-learning. *Evaluate Europe Handbook Series*, 2, 1610-0875.
- Balyk, N., Oleksiuk, V., & Shmyger, G. (2017). Development of the E-learning Quality Assessment Model in Pedagogical University. *ICTERI 2017 ICT in education, research and industrial applications. Integration, harmonization and knowledge transfer-2017*, 440-450.
- Bauer, P. (2004). E-learning for a better understanding of power quality problems and compensators. In *11th International Power Electronics and Motion Control Conference, EPE-PEMC'2004, 2-4 September, Riga, Latvia*.

- Castle, S. R., & McGuire, C. J. (2010). An analysis of student self-assessment of online, blended, and face-to-face learning environments: Implications for sustainable education delivery. *International Education Studies*, 3 (3), 36-40.
- Cheawjindakarn, B., Suwannathachote, P., & Theeraroungchaisri, A. (2013). Critical success factors for online distance learning in higher education :A review of the literature. *Creative Education*, 3 (08), 61-66.
- Chiu, H., Sheng, C. and Chen, A. (2008). Modeling agent-based performance evaluation for e-learning systems. *The Electronic Library*, 26 (3), 345-362.
- Chopra, G., Madan, P., Jaisingh, P., & Bhaskar, P. (2019). Effectiveness of the e-learning portal from the students 'perspective. *Interactive Technology and Smart Education*. 16 (2), 94-116.
- Divjak, B., & Begicevic, N. (2006). Imaginative acquisition of knowledge-strategic planning of E-learning. In *28th International Conference on Information Technology Interfaces*, (pp. 47-52). IEEE.
- Doherty, I. (2006). E-Places :Creating a Space for Exemplary Teaching and Learning. In *E-Learn: World Conference on E-learning in Corporate, Government, Healthcare, and Higher Education* (pp. 1157-1164). Association for the Advancement of Computing in Education (AACE).
- Dominici, G., & Palumbo, F. (2013). How to build an E-learning product :Factors for student/customer satisfaction. *Business Horizons*, 56 (1), 87-96.
- Ejaffe, R., Moir, E., Swanson, E., & Wheeler, G. (2006). E-mentoring for Student Success :Online mentoring and professional development for new science teachers. *Online professional development for teachers :Emerging models and methods*, Cambridge, Mass. Harvard Education Press.
- Farid, S., Qadir, M., Ahmed, M. U., & Khattak, M. D. (2018). Critical Success Factors of E-learning Systems: A Quality Perspective. *Pakistan Journal of Distance & Online Learning*, 1, 1-20.
- Gamage, D., Fernando, S., & Perera, I. (2014). Factors affecting effective eLearning: Learners Perspective. *Scientific Research Journal (SCIRJ)*, 2 (5), 42-48.
- Garavand, A. (2019). *Evaluating the Effectiveness of E-learning at Tehran University*. (master's thesis), University of Tehran.
- Garrison, D. R. (2011). *E-learning in the 21st century :A framework for research and practice*. Routledge.
- Guri-Rosenblit, S. (2005). 'Distance education' and 'E-learning' :'Not the same thing. *Higher education*, 49 (4), 467-493.
- Hand, A. (2012). Evaluating the suitability of current Authoring Tools for developing E-learning Resources. Dissertation submitted as part of the requirements for the award of the degree of MSc in Information Technology (Business).
- Islam, M. A., Chittithaworn, C., Rozali, A. Z., & Liang, H. (2010). Factors Affecting E-learning Effectiveness in a Higher Learning Institution in Malaysia. *Jurnal Pendidikan Malaysia (Malaysian Journal of Education)*, 35 (2), 51-60.
- Kay, R. (2011). Evaluating learning, design, and engagement in web-based learning tools (WBLTs): The WBLT Evaluation Scale. *Computers in Human Behavior*, 27 (5), 1849-1856.

- Kelly, B., Phipps, L., & Swift, E. (2004). Developing a holistic approach to E-learning accessibility. *Canadian Journal of Learning and Technology/La revue Canadienne de l'apprentissage et de la Technologie*, 30 (3).
- Kheyrandish, M. (2015). Explaining the model of affecting factors on E-learning effectiveness in postgraduate courses. *Journal of Information Technology Management*, 6 (4), 629-648.
- Levy, Y. (2007). Comparing dropouts and persistence in e-learning courses. *Computers & Education*, 48 (2), 185-204.
- Liaw, S. S. (2008). Investigating students 'perceived satisfaction, behavioral intention, and effectiveness of e-learning: a case study of the blackboard system, *Computers & Education*, 51 (2), 864-873.
- Liu, Y., & Wang, H. (2009). A comparative study on e-learning technologies and products: from the East to the West. *Systems Research and Behavioral Science .The Official Journal of the International Federation for Systems Research*, 26 (2), 191-209.
- Martinez-Argüelles, M., Castán, J., & Juan, A. (2009). How do students measure service quality in E-learning? A case study regarding an internet-based university. In *Proceedings of the European Conference on E-learning* (366-373).
- Mbarek, R., & El Gharbi, J. E. (2013). A Meta-analysis of E-learning effectiveness antecedent. *International Journal of Innovation and Applied Studies*, 3 (1), 48-58.
- Mothibi, G. (2015). A Meta-Analysis of the Relationship between E-learning and Students' Academic Achievement in Higher Education. *Journal of Education and Practice*, 6 (9), 6-9.
- Naidu, S. (2013). Instructional design models for optimal learning. *Handbook of distance education*, 3, 268-281.
- Nichols, M. (2008). Institutionnel perspectives :The challenges of e-learning diffusion. *British journal of educational technology*, 39 (4), 598-609.
- Noesgaard, S. S., & Ørngreen, R. (2015). The Effectiveness of E-learning :An Explorative and Integrative Review of the Definitions, Methodologies, and Factors That Promote E-learning Effectiveness. *Electronic Journal of E-learning*, 13 (4), 278-290.
- Ozkan, S., & Koseler, R. (2009). Multi-dimensional students 'evaluation of e-learning systems in the higher education context :An empirical investigation. *Computers & Education*, 53 (4), 1285-1296.
- Persico, D., Manca, S., & Pozzi, F. (2014). Adapting the technology acceptance model to evaluate the innovative potential of E-learning systems. *Computers in Human Behavior*, 30, 614-622.
- Phillips, R. A. (2004) The design dimensions of E-learning, In R. Atkinson and C. McBeath and D. Jonas-Dwyer and R. Phillips (Eds.), *Proceedings of the 21st Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*. Perth :Australasian Society for Computers in Learning in Tertiary Education. [Online] Available from: <http://www.ascilite.org.au/conferences/perth04/> ./Accessed 28/8/2008]
- Salloum, S. A., Al-Emran, M., Shaalan, K., & Tarhini, A. (2019). Factors affecting the E-learning acceptance :A case study from UAE. *Education and Information Technologies*, 24 (1), 509-530.

- Sfenrianto, S., Tantrisna, E., Akbar, H., & Wahyudi, M. (2018). E-learning Effectiveness Analysis in Developing Countries :East Nusa Tenggara, Indonesia Perspective. *Bulletin of Electrical Engineering and Informatics*, 7 (3), 417-424.
- Shopova, T. (2014). Digital literacy of students and its improvement at the university. *Journal on Efficiency and Responsibility in Education and Science*, 7 (2), 26-32.
- Sridharan, B., Deng, H., Kirk, J., & Corbitt, B. (2010). Structural Equation Modeling for evaluating the user perceptions of E-learning effectiveness in Higher Education. *18th European Conference on Information Systems*.
- Stockley, D. (2003). E-learning definition and explanation (Elearning, online training, online learning). Retrieved March 15, 2010.
- Trakru, M., & Jha, T. K. (2019). E-learning Effectiveness in Higher Education. *International Research Journal of Engineering and Technology (IRJET)*. 6 (5), 96-101.
- Tseng, M. L., Lin, R. J., & Chen, H. P. (2011). Evaluating the effectiveness of the e -learning system in uncertainty. *Industrial Management & Data Systems*. 11 (6), 869-889.
- Upadhyaya, A., Jindal, S., & Gupta, A. (2019). Assessment of Critical Factors Affecting E-learning Education. *Journal of the Gujarat Research Society*, 21 (15), 53-66.
- Uppal, M. A., Ali, S., & Gulliver, S. R. (2018). Factors determining e -learning service quality. *British Journal of Educational Technology*, 49 (3), 412-426.
- Urdan, T. A. (2000), Corporate E-learning :Exploring a New Frontier, W. R. Hambrecht, San Francisco, CA.
- Venkataraman, S., & Sivakumar, S. (2015). Engaging students in Group-based Learning through E-learning techniques in Higher Education System. *International Journal of Emerging Trends in Science and Technology*, 2 (01), 1741-1746.
- Vivekananthamoorthy, N., Naganathan, E. R., & Rajkumar, R. (2014). Critical success factors for enhancing the effectiveness of the E-learning framework. *International Journal of Research and Scientific Innovation (IJRSI)*, 1 (1), 12-21.
- Wang, M. Y. (2003). The strategic role of digital libraries :issues in E-learning environments. *Library Review*, 52 (3), 111-116.
- Welsh, E. T., Wanberg, C. R., Brown, K. G., & Simmering, M. J. (2003). E -learning :emerging uses, empirical results and future directions. *International Journal of Training and Development*, 7 (4), 245-258.
- Wu, W., & Hwang, L. Y. (2010). The effectiveness of e-learning for blended courses in colleges :a multi-level empirical study. *International Journal of Electronic Business Management*, 8 (4), 322-312.
- Yazdani, F., Ebrahimzadeh, E., Zandi, B., Alipour, A., Zare, H. (2012). Recognizing of Fundamental Factors in Effectiveness of E-learning Systems. *Journal of Information Processing and Management*, 27 (2): 385-411.
- Yunus, Y., & Salim, J. (2013). E-learning evaluation in the Malaysian public sector from the pedagogical perspective :Towards E-learning effectiveness. *Journal of Theoretical and Applied Information Technology*, 51 (2), 201-210.

- Yuwono, K. T., & Sujono, H. D. (2018, December). The Effectiveness of E-learning :A Meta-Analysis. In *Journal of Physics :Conference Series*. 1140 (1). IOP Publishing.
- Zammel, I. B., Najjar, T., & Belghith, A. (2018, May). Determinants of E-learning Effectiveness :The Case of Tunisian Virtual School of Post Office. In *International Conference on Digital Economy* (pp. 165-172). Springer, Cham.
- Zhang, W., & Cheng, Y. L. (2012). Quality assurance in E-learning :PDPP evaluation model and its application. *The International Review of Research in Open and Distributed Learning*, 13 (3), 66-82.

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