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Assessment Of Effective Factors In E-Learning at Islamic Azad University

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ABSTRACT

The rapid growth of information and communication technology has brought significant changes to the performance of education globally through the use of learning management systems facilitated by e-learning in higher education institutions. Despite perceived advantages such as flexible and widespread access, e-learning still faces challenges like identifying the needs of students, faculty, and staff, as well as delivering quality courses. Furthermore, there is a lack of assessment of existing e-learning initiatives and the determination of critical success factors for quality. This necessitates further research into e-learning practices to fill the identified gaps. This study presents a model for assessing the quality of e-learning systems by modifying and expanding existing frameworks for quality learning with other models and frameworks. A descriptive and exploratory research approach was employed using a cross-sectional survey of 180 respondents from Islamic Azad University, Science and Research Branch. Data were collected through questionnaires and interviews using stratified sampling methods. The validity of the conceptual model was assessed using structural equation modeling and regression analysis. This study revealed that course design, content support, administrative support, user characteristics, organizational factors, and social support impact quality. This research has contributed to the body of knowledge from theoretical, methodological, and practical perspectives.

Introduction

One of the most important factors in development programs in any society is the training of specialized and efficient human resources so that they can keep pace with modern developments and be prepared to achieve the anticipated goals and attain success. Therefore, human resources are one of the most fundamental factors influencing the economic, social, and cultural development of any country. Equipping human resources with the necessary job and professional skills is one of the most important ways to achieve the desired development goals. In this context, the methods of training and evaluating this human resource education present challenges and problems for thinkers in the field of education. In recent years, due to technological advancements and changes in people's lifestyles and society, distance education or e-learning has become more prominent (Ghanbari *et al*., 2021). On the other hand, during the years 2019-2021, with the onset of the COVID-19 pandemic in the world and Iran, the education sector shifted towards e-learning, and this trend continues even in 2022. It can be said that over 95% of classes and training are conducted virtually, and the Science and Research Branch of Islamic Azad University is no exception, as nearly all of its courses are conducted online. Therefore, there is a need to evaluate distance education at this time and to consider what model can be proposed for it. E-learning generally refers to the use of electronic systems, such as computers, the internet, electronic storage devices, electronic publications, virtual newsletters, and similar tools, aimed at reducing commuting, saving time and costs, and facilitating better and easier learning. Of course, the systems that account for e-learning and enable distance learning are diverse, but what is crucial at first is the awareness of interested individuals regarding the types of systems and the correct selection and proper usage of them. These systems can sometimes replace in-person classes. At the same time, for diligent and interested individuals, they can complement books and classes. In summary, e-learning can be described as bringing learning to people instead of bringing people to learning (Tomczyk *et al*., 2022). In recent years, virtual education has emerged as one of the important applications of new information and communication technologies worldwide, leading to extensive activities in this direction. Given the rapid changes occurring in the surrounding environment (Maleki Marasht *et al*., 2020), the implementation of virtual systems for providing services and new technologies in teaching and learning has become a fundamental necessity. Virtual education is the most significant application of information technology, presented in various forms such as computer-based learning, network-based learning, and online education. However, if the infrastructure for this type of education is not provided, its implementation becomes impossible. On the other hand, if this education is not evaluated, it certainly cannot demonstrate its productivity, or in other words, its efficiency and performance cannot be shown, which is one of the fundamental challenges in this type of education, namely distance education (Hadullo *et al*., 2022). E-learning has a broad scope and can be categorized into several types depending on the usage and facilities: web-based education, computer-based education, education through mobile digital devices, and education via mobile phones. One of the topics of interest in educational literature is the success of e-learning. A review of the literature indicates the existence of various factors that influence the success of virtual education. Additionally, at the dawn of the highly complex world of the third millennium, the changing nature of the economy and job market, the increasing diversity of educational needs, the explosive growth of science and technology, and the need for retraining and lifelong learning due to the explosion of expectations, along with the limitations of resources compared to the rapidly growing population and the increasing demand for more flexible educational opportunities due to the inability to attend physical and traditional classes regularly, have made the expansion of educational opportunities one of the main concerns of organizations (Dargahi *et al*., 2022). In previous research, the factors for evaluating distance education, according to the study (Lim *et al*., 2021), include user satisfaction, teaching techniques of instructors, learner support (social,

networking), assessment, course development (information quality, infrastructure quality), system quality, facilitating factors, instructor quality, interaction between instructor and student, user willingness, and the success of virtual education. These factors will also be considered in the current research at the Science and Research Branch of Islamic Azad University. Furthermore, considering the mentioned problems regarding the evaluation of distance education at the Science and Research Branch, the researcher's question and concern is: What is the evaluation model for e-learning at the Electronic Unit of the Science and Research Branch of Islamic Azad University? The continuation of the article is organized as follows: Section 2 provides a brief review of related studies. Section 3 describes a model that uses structural equations and regression to demonstrate how it can be employed to evaluate the effective factors in e-learning. Section 4 explains how to implement the model. Section 5 presents the empirical results that assess the performance of the proposed model, and finally, Section 6 presents our conclusions and offers suggestions for future research.

Research Background

In their study on presenting an evaluation model for e-learning at the Electronic Unit of the Islamic Azad University, Qanbari *et al*. (2021) demonstrated that the highest path coefficient is related to the facilitating factors component, followed by the interaction between the instructor and the student, and user willingness. They also showed the highest level of correlation between the facilitating factors and instructor quality with a correlation coefficient of 0.79, followed by the facilitating factors and the success of virtual education with a correlation coefficient of 0.78. Additionally, the correlation between system quality and the success of virtual education was 0.76, and the quality of information and content with the success of virtual education was in the fourth position.

Shahmohammadi *et al*. (2020) in their research on designing and validating an evaluation model in the distance education system at Payame Noor University, presented a comprehensive evaluation model with 7 dimensions: learner organization, teacher organization, learner organization, pedagogical foundations, theories and generations of technology, educational materials and content, teaching methods and approaches, and time and place of education, with 15 relevant evaluation indicators.

Ismaeili *et al*. (2021) in their study on evaluating the status of e-learning at the virtual education unit of Sistan and Baluchestan University showed that the status of e-learning is desirable in terms of individual learner characteristics and infrastructure and technology, relatively desirable in terms of support, but undesirable in terms of educational content, assessment, and evaluation. They also identified a negative gap between the performance and importance of each dimension and component of e-learning.

In their study on evaluating a new e-learning platform compared to e-learning experience and self-assessment in digital literature, Tomczyk *et al*. (2022) demonstrated that in the new platform, quality components (system and information), quality of instructors, and user orientation towards e-learning are prioritized in the evaluation factors, followed by other factors.

The study by Valverde-Berrocoso *et al*. (2020) on trends in educational research towards e-learning in a systematic review showed that in previous research, the components of system quality, information quality, facilitating factors, success of virtual education, and the interaction between instructors and students can be considered among the most important factors for evaluating e-learning.

The research by Hadullo *et al*. (2021) on a model for evaluating e-learning systems in high schools

in developing countries indicated that user satisfaction, instructor teaching techniques, learner support, assessment, course development (information quality, infrastructure quality), social support, and networking are components of the evaluation of e-learning systems.

In higher education, distance education through e-learning courses has become the most important and common mode of learning in the past decade. This article evaluates the quality of introducing distance education principles into the university teaching and learning process. The study involved 1,250 students enrolled at Kazan Federal University. This survey helped identify the main barriers to effectively implementing distance learning technologies in the university teaching and learning process: lack of preparedness among teachers and parents, absence of necessary skills for using computer-based online learning systems, inability to communicate with instructors and teachers, and insufficient availability of online academic advisors. Additionally, this article examines internal issues: limited resources, unallocated marketing advantages, inappropriate administrative structure, and lack of innovative physical facilities. The article allows for the organization of the identified problems by introducing a phased distance education model suitable for each university, regardless of its specialty (Chawinga *et al*., 2020).

The COVID-19 pandemic has disrupted normal activities worldwide, including learning and education. The shift towards online education during the COVID-19 pandemic has led many studies to focus on perceived learning outcomes and student satisfaction in this new learning environment. This study aimed to examine the determinants of student learning outcomes and their impact on student satisfaction. Data were collected from undergraduate students in South Korea and India for an international study. The study found that factors such as classroom interaction, student motivation, course structure, instructor knowledge, and facilitation positively impact students' perceived learning outcomes and satisfaction. There was no significant difference in students' learning outcomes and satisfaction between the two countries. This study will be useful for teachers and academics in identifying factors that enhance student learning outcomes and their satisfaction in online classes during the COVID-19 pandemic (Al-Azawei *et al*., 2021).

The coronavirus has forced higher education institutions worldwide to transition from traditional classes to online classes. Eötvös Loránd University (ELTE) was no exception to this rule. The institution had previously developed limited strategies for distance education, but these web-based platforms were only available to students with special needs. Due to the pandemic, all ELTE students were required to use the online platforms provided by the university, such as Microsoft Teams and Zoom, to resume their studies. This study aims to evaluate students' initial experiences using these new platforms. It also examines the effects of distance education on students' satisfaction and attitudes towards their studies. Using a quantitative approach, students' attitudes towards e-learning and their access to technological platforms, as well as the use of these platforms and satisfaction with online courses, are processed and analyzed through a statistical package for social sciences. The results of this study indicate that distance education is still in a developmental phase, and although traditional classes seem unnecessary, the positive attitude and willingness of most students to participate in distance education classes during the post-COVID-19 pandemic suggest a potential future for educational platforms in higher education institutions. The distance learning method is the only way institutions worldwide are resuming their studies during the COVID-19 pandemic. Students have faced feelings of confusion, loneliness, and uncertainty about what to expect in classes, exams, graduation, and other important activities, irrespective of their daily challenges with access to electronic learning tools and potential personal health issues affecting their studies. This assessment serves as a roadmap for tracking and improving the organizational and educational shortcomings of institutions.

Research Methodology:

The research method involves collecting, analyzing, and utilizing data related to a phenomenon to develop knowledge. This study will also utilize the onion research method, where the research process development will be studied. The onion research includes the research philosophy, research approaches, research strategies, choices, time horizons, data collection and analysis, research design, and sampling techniques. Identifying the research philosophy is located in the outer layer of the research. The four main sections of research include pragmatism, positivism, realism, and interpretivism. Some researchers believe that pragmatism recognizes that there are different ways to interpret the world and conduct research, and no single perspective can provide a complete picture, as there may be multiple realities. A pragmatic philosophy also uses both inductive and deductive approaches to develop a theory or confirm a hypothesis and can work with descriptive and exploratory research. Additionally, pragmatism works with both quantitative and qualitative data. Pragmatic philosophy was chosen because it is compatible with the research design.

Research Design:

Due to the need for a comprehensive description of factors influencing the quality of e-learning, the research design for this study will be descriptive and exploratory in nature. Instead of longitudinal examination, a cross-sectional survey will be used as this study is designed to collect data at a single point in time, eliminating the need for multiple observations over a period on similar subjects. The study will commence with a systematic literature review followed by a qualitative pre-study to identify the determinants of quality. A case study strategy involving a survey of 180 students, faculty, and staff using questionnaires and interviews for data collection was employed. Due to ease of implementation and time constraints in achieving study objectives, a survey research design was chosen. Survey research is a type of research where a group of individuals or items is studied by collecting and analyzing data from only a few individuals or cases that are considered representative of the entire group. A sample is a subset of a larger population. In quantitative research, the sample size and its selection method can be used to validate the reliability of research results. In qualitative research, sample characteristics are also important, although much smaller samples are used. The sample size indicates the number of respondents selected from the total population for the study. Sampling techniques are methods through which an appropriate sample size is selected for a broader study. Sampling can be simple, random, or stratified. A random sample represents individuals in a larger population who are randomly selected. However, this can lead to random distribution, which may result in significant deviation due to the random nature of sample selection. In this research, stratified sampling will be used to ensure that the population representatives in the sample reflect important population characteristics, such as ensuring that demographic characteristics like age and gender are reflected.

Sample Size:

This study was conducted at the Islamic Azad University, Science and Research Branch, between September and November months of the year 1400. This center admits students twice a year, in September and February months. Applicants are accepted into certificate, diploma, bachelor's, and master's programs. Although the number of e-learning students will include all students at different levels due to the COVID-19 pandemic, this study specifically targeted 315 master's students. The rest will include faculty, staff, and managers of e-learning. The total target population is 350 individuals. Considering that SEM studies should use sample sizes between 100 and 200, based on a 95% confidence level, the sample size is calculated for a population of 350 using Table 1. A sample size of 180 is chosen as a higher value to minimize false positive and false negative errors. Stratified sampling was used to obtain 180 respondents from the total population of 350 by creating

eleven strata as presented in Table 1.

Table 1: Target selection and sample size

R.	Type of population	The total number of people in question	Sample size
1	Master's students in Biomedical Engineering	50	25
2	Master's students in Basic Sciences	45	22
3	Master's students in Business Management	60	30
4	Master's students in Industrial Engineering	50	25
5	Master's students in Humanities	40	21
6	Master's students in Mechanical Engineering	40	21
7	Master's students in Information Technology	30	17
8	Faculty Members	29	16
9	Staff or Employees	5	3
10	Managers of E-Learning	1	1
11	Total Number	350	180

Data Collection Method:

This study identified several constructs (including 10 constructs) that guided the data collection process. Some researchers recommend at least three indicators (observed variables) to measure each construct and have stated that data can be collected via email surveys, telephone surveys, questionnaires, or personal interviews. Based on this insight, due to ease of implementation, questionnaires and interviews were used, with each construct having at least three indicators. The tools included a student questionnaire, a faculty questionnaire, a student interview topic, a faculty interview topic, and a staff interview topic.

The questionnaire comprises three main sections:

1. The first section collects biographical data such as gender, education level, and general guidelines.
2. The second section is designed to gather data on the ten constructs identified in this study. Respondents' perceptions will be measured based on various indicators related to the specific construct.
3. The final section of the questionnaire is used to collect qualitative data about the research.

To ensure the consistency of the questions in the tools and cover all relevant topics, a pilot study consisting of 22 respondents (15 male students, 5 female students, and 2 faculty members) was conducted at the E-Learning Center of the Islamic Azad University, Science and Research Branch. Both tools were evaluated on a small number of respondents who are the same type of individuals that will later be tested in the main method.

The tools were distributed and collected by the students and their instructors during the first semester of the 1400-1401 academic year. Data factors were used to coordinate the distribution and collection of data over two weeks. Eight interviews were conducted, each taking approximately 40 minutes to perform and record. Both qualitative and quantitative data were coded on a scale of 1 to 5, representing a Likert scale from 1 to 5 (1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree). Qualitative data were initially placed into formats and categories to derive inferences relevant to the study's objectives.

For hypothesis testing and assessing moderating effects, structural equation modeling (SEM) and regression analysis will be utilized. SEM has become an essential and widely-used research tool for testing theory and development in social sciences, as well as in studies examining technology adoption, acceptance, and success within organizations. On the other hand, regression analysis is

the most appropriate method for testing moderating effects. Since the aim of this study was to generate hypotheses based on an existing theory, a deductive approach is used. For generalizing the findings to other contexts, an inductive approach will be employed. Figure 2 shows the overall research design.

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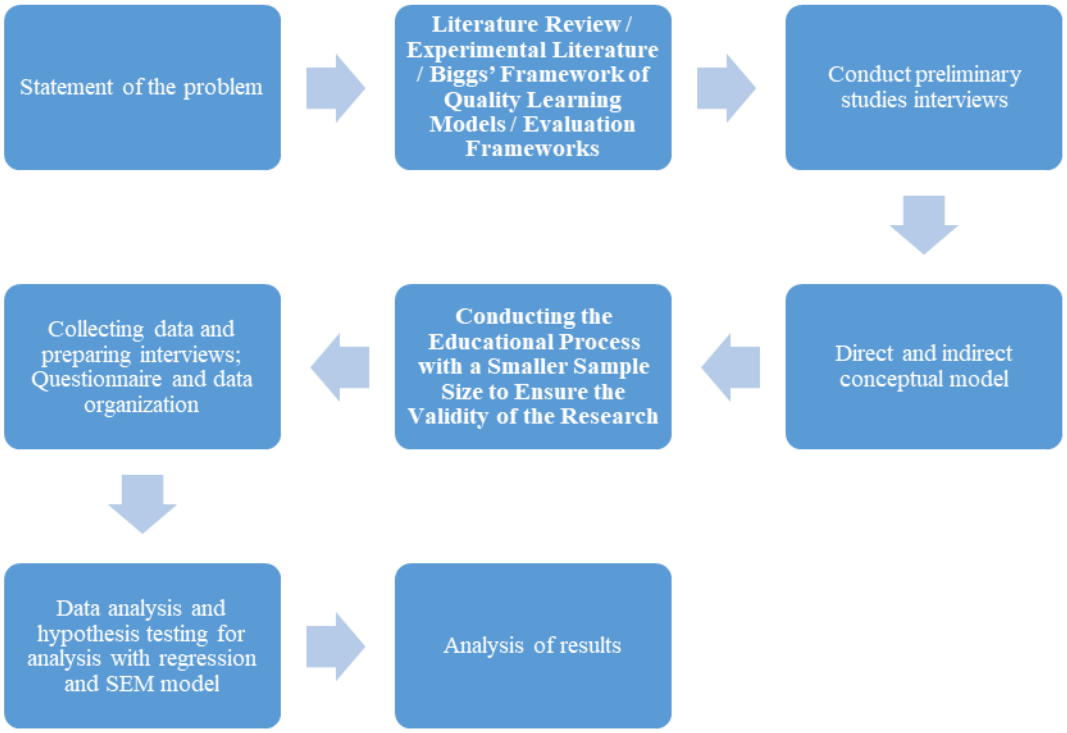

Figure-2: Target selection and sample size.

SEM Modeling:

The Structural Equation Modeling (SEM) technique utilizes two sub-models: the inner model, which specifies the relationships between independent and dependent latent variables, and the outer model, which specifies the relationships between latent variables and their observed indicators. SEM also employs two types of variables: exogenous and endogenous. An exogenous variable has path arrows pointing outward and none leading into it, whereas an endogenous variable has at least one path leading into it, indicating the effects of other variable(s).

Some researchers have indicated that SEM can be used to call a measurement model, which defines latent variables using one or more observed variables, and a structural model, which attributes relationships between latent variables. The conceptual model of this research, using SEM modeling, includes one inner model and two outer models, six exogenous variables, one endogenous variable, and twenty-two indicators. This model is illustrated in Figure 2. Moderator variables appear in the diagram as they were analyzed separately using regression analysis.

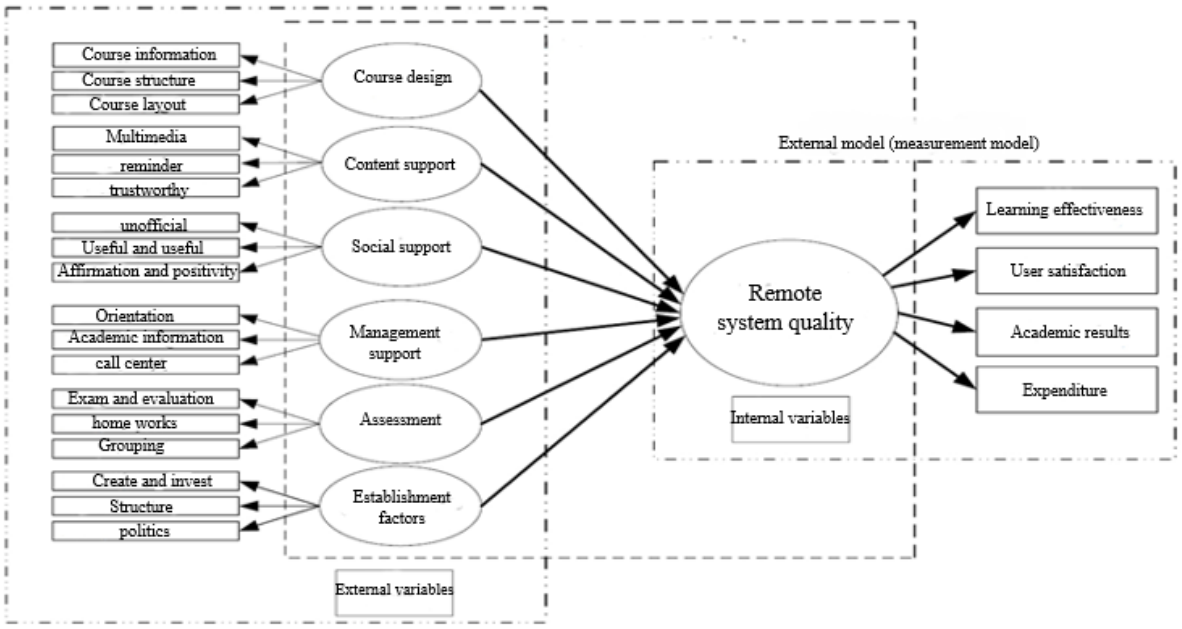

Figure 2: SEM modeling technique.

Data Organization:

Data organization encompasses all processes that screen and test data for any issues before conducting SEM model analysis. Other aspects include identifying sample size, measurement scale, and range limitations in data values. Screening and testing for missing data, outliers, non-linearity, and abnormality in data will be conducted using statistical characteristics. The following section details how to achieve these aspects:

Missing Data: Statistical analysis of data is affected by missing values in the variables. This means that each subject may not have a real value for each variable in the dataset, as some values may be absent. In statistical packages, having default values to manage missing values is common. Some research has shown that different SEM software manages missing data differently and offers various options for replacing missing data values, such as deleting subjects with missing data in any variable, deleting subjects with missing data in any pair of variables used, or replacing with the mean for missing values.

Outliers: Outliers in statistical analyses are extreme values that do not seem to conform to the majority of a dataset. If not removed, these extreme values can have a significant impact on any conclusions that may be drawn from the relevant data. Outliers can arise from observational errors, data entry errors, instrument errors based on design or instructions, or actual extreme values from self-reported data. Outliers will be identified and removed using the Explore function to find extreme scores (analysis, descriptive statistics, and exploration). This function will generate a stem-and-leaf plot and a box plot to identify outliers.

Data Distribution: This study also examined whether the sample data selected for the study is normally distributed. In a normal distribution, a bell-shaped density curve is formed, characterized by its mean and standard deviation. Variables should be approximately, but not exactly, normally distributed, and the measures of central tendency (mean, median, and mode) should all lie near the center. The standard deviation will be used to measure the variations present in the distributions. Approximately 34% of the scores should fall between the mean. About 68% of the scores should fall between the first standard deviation and less than the second standard deviation from the mean. Approximately 95% of the scores should fall between the mean and less than the third standard deviation. These explanations are illustrated in Figure 3.

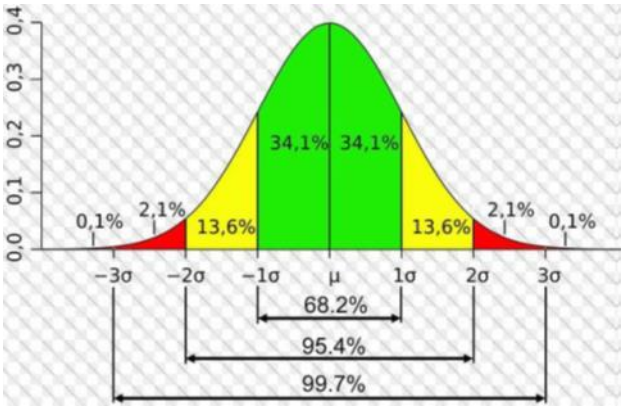

Figure 3: Normal distribution curve.

Normality Testing: Normality tests are used to determine whether a dataset is modeled for a normal or approximately normal distribution. This study utilized skewness and kurtosis to test the normality of the data. The skewness value can be positive, negative, or even undefined. If skewness is zero, the data is perfectly symmetric; if skewness is less than -1 or greater than 1, the distribution is highly skewed. If skewness is between -1 and -0.5 or between 0.5 and 1, the distribution has moderate skewness. If skewness is between -0.5 and 0.5, the distribution is approximately symmetric. For examining this, it is preferable to use skewness and kurtosis values of ±2 and ±4, respectively, with a significance level of 0.05, as reference values for determining significant abnormality for samples of medium size, which range from 50 to 300.

Linearity of Data: SEM modeling assumes that variables are linearly related to each other. Therefore, a standard method for visualizing pairs of coordinates of data points from two continuous variables is to plot the data in a scatter plot. These bivariate plots indicate whether the data are increasing or decreasing linearly. The presence of curved data can reduce the magnitude of the Pearson correlation coefficient and may even lead to a zero correlation. Non-linearity of the data was examined using scatter plots without identifying outliers.

Assessment Tools:

Once all data have been coded in SPSS software, the assessment tool will be evaluated to determine whether it demonstrates sufficient reliability and validity. The reliability test conducted to confirm internal consistency should be measured using Cronbach's alpha, with a minimum threshold of 0.7. The validity test will be conducted using construct validity. Convergent validity (CV) will be measured using a minimum factor loading threshold of 0.4, an average variance extracted (AVE) threshold of at least 0.5, and a composite reliability threshold of at least 0.7.

Result:

Descriptive Statistics:

A total of 180 responses from questionnaires and interviews were collected in this research. This includes master's degree students in the fields of biomedical engineering, basic sciences, business administration, industrial engineering, humanities, mechanical engineering, and information technology, totaling 160 individuals. The remaining 20 individuals comprised faculty members (16), staff and employees (3), and the e-learning manager (1). The sample size of 180 meets the threshold required for analysis in SEM studies, thus facilitating the commencement of the analysis. Table 1 in the previous chapter summarizes the sample distribution based on the program. This study collected data regarding the quality status of the e-learning system at Islamic Azad University, Science and Research Branch, from a sample size of 180 master's students who fully utilize the online e-learning facilities. The remainder included faculty members, staff, employees, and the e-

learning manager.

Based on the definitions of skewness and kurtosis, it is evident that the distribution shown in Table 2 is normal. Further evidence of normality is presented in Figures 4 and 5, which illustrate the distribution of the course design and content support variable indices as close to normal. These two variables represent the distribution of several other variables in the study.

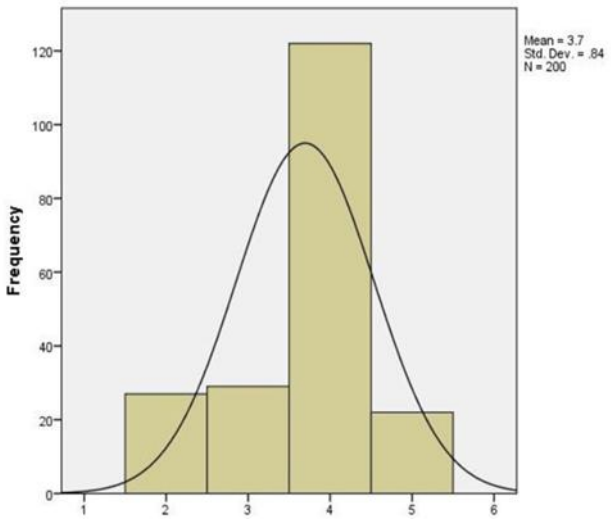

Figure 4: Normal distribution variable of course design.

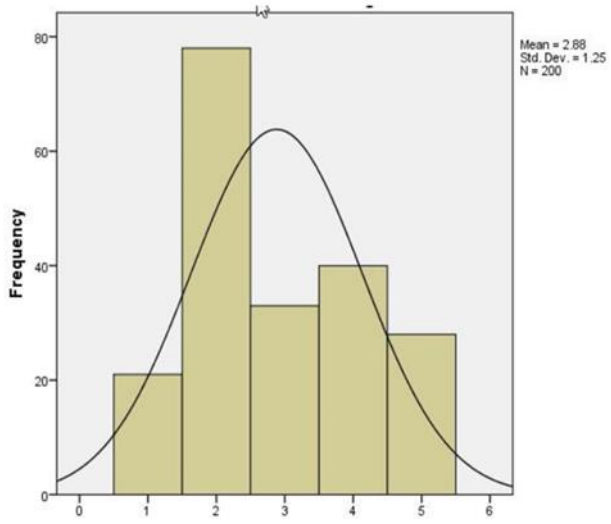

Figure 5: Normal content distribution support variable.

Three different sets of variables (dependent and independent) were randomly tested to examine the existence of a linear relationship between them through linear regression testing. In each case, the scatter plot indicated a positive correlation between the variables, confirming that there were no curved data points and establishing that the data were linear. Before conducting the data analysis, it was necessary to determine the reliability of 134 measurement indices across the entire questionnaire. The measurements yielded an alpha value of 0.846, and since this value is above 0.7, it can be considered that the questionnaire items have good internal consistency, thus indicating their reliability. Secondly, the reliability of individual constructs was tested, each providing an alpha value greater than 0.7, which again confirms the consistency of the constructs.

Quality of the E-Learning System : The quality status of the e-learning system as expressed by respondents at Islamic Azad University, Science and Research Branch, was obtained through frequency statistics based on the constructs and indices of the study. These results are shown in Tables 2 to 11.

Course Design : The results in Table 2 indicate that more than 54% of students were satisfied with the course information provided and the course layout. However, 60% did not like the course structure, while 56% were dissatisfied with the organization of the course.

Table 2: Course design components that determine the quality of e-learning.

	Totally Agree	Agree	no comment	Opposite	Totally Opposite
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Course information	29(18%)	92(58%)	15(9%)	20(3%)	5(13%)
Course structure	32(20%)	18(11%)	14(9%)	88(3%)	9(54%)
Course layout	9(6%)	77(48%)	20(13%)	5(3%)	30(17%)
Organization of the course	18(11%)	28(17%)	23(14%)	5(3%)	58(36%)

Content Support : The results in Table 3 indicate that over 50% of individuals were pleased with the provision of announcements and reminders through various means such as email, social networks, and others during their courses. However, more than 53% expressed dissatisfaction with the lack of constructive feedback and insufficient use of multimedia.

Table 3: Content support components that determine the quality of e-learning.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Notices	42(26%)	61(38%)	14(9%)	26(16%)	18(11%)
reminder	27(17%)	56(35%)	26(16%)	81(25%)	11(7%)
Multimedia	14(9%)	37(23%)	19(12%)	51(32%)	40(21%)
Constructive feedback	17(11%)	31(19%)	23(14%)	53(33%)	37(23%)

Social Support : The results in Table 4 indicate that only the usefulness and benefit aspect scored over 45%, suggesting that students heavily rely on the online library for social support. Most students emphasized that social interaction is challenging, as both students and instructors rarely use the course discussion forum and chat features.

Table 4: Social support components that determine the quality of e-learning.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Information support from peers	29(18%)	27(18%)	13(8%)	53(33%)	39(24%)
Useful and useful	20(32%)	45(28%)	26(16%)	23(14%)	35(22%)
emotional support	14(9%)	26(16%)	22(14%)	52(32%)	47(29%)
Acknowledgment and positive	13(8%)	36(22%)	18(11%)	60(37%)	34(21%)

Guidance Support : The results in Table 5 indicate that nearly 60% of students appreciated the support they received during their studies at the university, including course registration and academic advice when joining the course. However, 56% complained about the difficulties encountered when trying to establish phone contact with the e-learning department.

Table 5: Leadership support components that determine the quality of e-learning.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Course registration	29(18%)	70(44%)	21(13%)	32(20%)	9(5%)
Academic advice	33(21%)	60(37%)	23(14%)	27(17%)	18(11%)
Notices	40(25%)	55(34%)	29(18%)	26(16%)	11(7%)
call center	18(11%)	31(19%)	24(15%)	50(31%)	38(24%)

Course Evaluation: The results in Table 6 indicate that 56% of students agree that the content taught is sufficient for taking exams and assessments. Additionally, 47% do not have an issue with the lack of feedback on assignment evaluations. Only 30% of students supported the claim that losing points or misplacement is a problem.

.Table 6: Course evaluation components that determine the quality of e-learning

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
scores	37(23%)	49(31%)	26(16%)	27(17%)	21(13%)
Exam and evaluation	32(20%)	58(36%)	24(15%)	32(20%)	15(9%)
home works	34(21%)	42(26%)	23(14%)	40(25%)	22(14%)
Grouping	32(20%)	50(31%)	17(11%)	20(13%)	42(26%)

Establishment Factors: The results in Table 7 indicate that 41% of respondents are satisfied with the establishment and investment in this area, while 47% do not accept this issue. The majority (52%) also accepted the e-learning policy, while over 50% expressed regret about the inappropriate systematic approach, and approximately 48% deemed its structure unsuitable.

Table 7: Establishment characteristics that determine the quality of e-learning.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Creation and investment	18(11%)	48(30%)	19(13%)	47(29%)	29(18%)
Structure	18(11%)	52(32%)	13(8%)	44(27%)	34(21%)
politics	39(24%)	45(28%)	17(11%)	34(21%)	26(16%)
Systemization	13(9%)	40(25%)	21(13%)	50(31%)	37(23%)

Factors of E-Learning System Quality: The results in Table 8 indicate that 60% of respondents are satisfied with e-learning, 53% believe that e-learning is relatively cheaper than in-person education, and 41% feel that their performance has improved, while another 41% share this belief.

Table 8: Quality factors of e-learning system.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Effectiveness	40(25%)	50(31%)	32(20%)	10(6%)	29(18%)
User satisfaction	61(33%)	49(27%)	16(10%)	29(16%)	25(14%)
Academic results	20(12%)	47(29)	32(20%)	35(23%)	27(17%)
Cost	47(29%)	38(24%)	34(21%)	24(15%)	18(11%)

Characteristics of Instructors: The results in Table 9 indicate that more than 50% of respondents are not satisfied with the training in the area of course development. Additionally, over 50% were dissatisfied with participating in e-learning workshops or seminars, as well as with incentives at the workplace.

Table 9: Characteristics of professors that determine the quality of e-learning.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Training	3(15%)	3(15%)	3(19%)	7(31%)	4(20%)
Educational development	3(15%)	5(25%)	2(10%)	6(30%)	5(25%)
Incentives	2(10%)	3(15%)	-	8(8%)	7(35%)
Training seminar	3(15%)	4(20%)	3(15%)	6(30%)	4(20%)

Characteristics of Staff and Employees: The results in Table 10 indicate that 55% of staff and employees are not satisfied with the training, utilization, and customization. Additionally, more than 15% were dissatisfied with participating in workshops or seminars on e-learning, as well as with incentives at the workplace.

Table 10: Characteristics of staff or employees determining the quality of e-learning.

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Training	3(15%)	4(20%)	1(5%)	6(30%)	6(30%)
Educational development	3(15%)	7(35%)	1(5%)	5(25%)	4(20%)
Incentives	2(10%)	5(25%)	2(20%)	6(30%)	5(25%)
Training seminar	2(10%)	2(10%)	1(5%)	8(40%)	7(35%)

Institutional Factors: The results in Table 11 indicate that 55% of respondents stated that the university lacks the budget, infrastructure, and policies for managing e-learning. Additionally, 65% further noted that the university culture does not support e-learning.

Table 11: Institutional Factors Determining the Quality of E-Learning

	Completely agree	Agree	No comment	Against	Completely opposed
	number (percentage)	number (percentage)	number (percentage)	number (percentage)	number (percentage)
Funds	3(13%)	5(26%)	1(5%)	6(30%)	5(25%)
Infrastructure	4(20%)	4(20%)	3(5%)	5(25%)	4(20%)
Culture	2(10%)	4(20%)	1(20%)	7(30%)	6(30%)
politics	6(25%)	5(25%)	-	5(40%)	5(25%)

Measurement Model Results:

The specified measurement model for the study was used with SPSS-AMOS to test whether the collected data for the study aligns with the model itself. This model identifies the relationships between the measured variables underlying the latent variables. The current model consists of seven distinct measurement sub-models, including Course Design (CD), Content Support (CS), Social Support (SS), Administrative Support (AS), Course Assessment (CA), Institutional Factors (IF), and E-Learning System Quality (ESQ). For example, consider the sub-model CD: the scores of the four sub-tests CD1, CD2, CD3, and CD4 are assumed to depend on a single latent variable, CD, which is not directly observable. According to the model, the scores of the four sub-tests may still differ from each other due to the influence of errors 1, error 2, error 3, and error 4, which represent measurement errors in the four sub-tests. CD1, CD2, CD3, and CD4 are referred to as indicators of the latent variable CD. This study also assumes covariance or correlation among the constructs as indicated in the measurement model. Figure 6 illustrates the proposed measurement model.

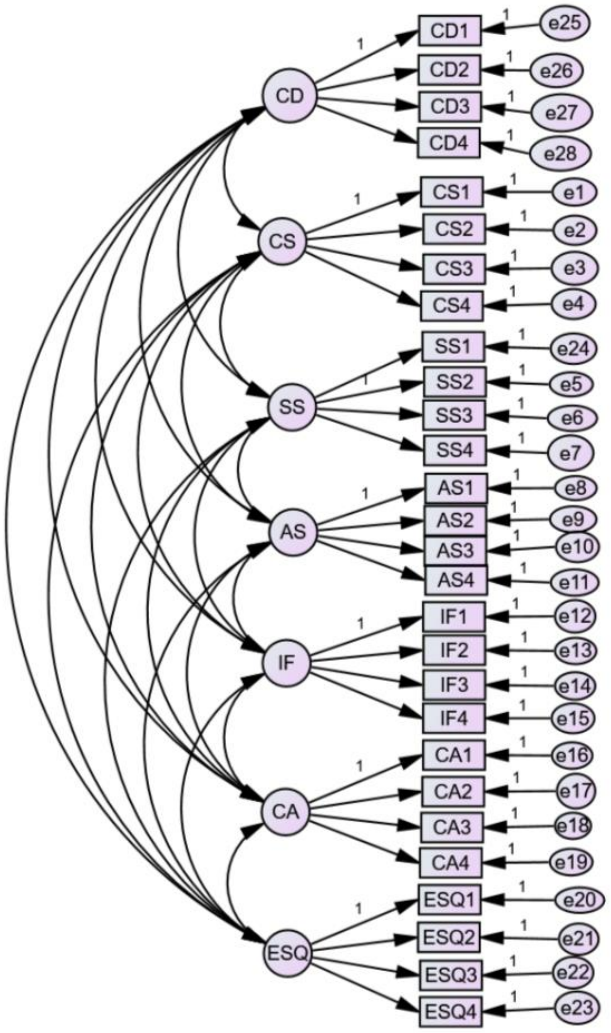

Figure 6: Proposed measurement model.

The SEM model was validated using Confirmatory Factor Analysis (CFA) through the validity and reliability of the latent constructs. The researcher conducted CFA for all latent constructs involved in the study before modeling their interrelationships in a structural model. However, unidimensional assessment was performed prior to evaluating validity and reliability. CFA for the measurement model can be conducted separately for each model or aggregated at once (all measurement models). However, CFA for composite measurement models is more efficient and highly recommended. Therefore, this method (Pooled-CFA) was used to assess the measurement model of the latent constructs. The results of the convergent validity assessment for each test are as follows. The values of FL, AVE, and CR for each construct were determined using SPSS-AMOS and Microsoft Excel. The obtained results are shown in Table 12. These results confirm that all constructs have convergent validity.

Table 12: Calculation of the degree of freedom measurement model.

R.	Structure	Attributes	Cronbach's alpha	Mean	CR	Convergent validity
1	Course Development	CD1, CD2, CD3, CD4	0.909	0.728	0.914	OK
2	Course Support	CS1, CS2, CS3, CS4	0.909	0.728	0.914	OK
3	Social Support	SS1, SS2, SS3, SS4	0.928	0.815	0.930	OK
4	Administrative Support	AS1, AS2, AS3, AS7	0.881	0.727	0.889	OK

5	Course Assessment	CA1, CA2, CA3, CA4	0.745	0.789	0.831	OK
6	Institutional Factors	IF1, IF2, IF3, IF4	0.839	0.729	0.843	OK
7	Student Characteristics	LC1, LC2, LC3, LC4	0.770	0.743	0.760	OK
8	Characteristics of professors	IC1, IC2, IC3, IC4	0.743	0.801	0.865	OK
9	Staff characteristics	TC1, TC2, TC3, TC4	0.725	0.814	0.852	OK
10	Quality of e-learning system	ESQ1, ESQ2, ESQ3, ESQ4	0.870	0.745	0.877	OK

The moderation model was initially created by generating three z-scores for each of the three moderating factors: Learner Characteristics (LC), Instructor Characteristics (IC), and Staff Characteristics (TC). A fourth score, referred to as the moderating coefficient, was established by obtaining the average of the three z-scores. Using linear regression analysis, the outcome variable was treated as the dependent variable, while the three z-scores plus the moderating coefficient were added as independent variables. The model was estimated, and the resulting outputs for the hypotheses were noted and observed as follows:

H7: The effect of course design on the quality of the e-learning system is moderated by the characteristics of students, instructors, and staff.

H8: The effect of content support on the quality of the e-learning system is moderated by the characteristics of students, instructors, and staff.

H9: The effect of social support on the quality of the e-learning system is moderated by the characteristics of students, instructors, and staff.

H10: The effect of administrative support on the quality of the e-learning system is moderated by the characteristics of students, instructors, and staff.

H11: The effect of course assessment on the quality of the e-learning system is moderated by the characteristics of students, instructors, and staff.

H12: The effect of institutional factors on the quality of the e-learning system is moderated by the characteristics of students, instructors, and staff.

Discussion and Conclusion

Given the many common features among higher education institutions that implement e-learning worldwide, particularly in Iran, it is evident that the expansion of the Biggs framework for evaluating e-learning models in both developing and developed countries is necessary. Creating a new model that is suitable for the Islamic Azad University of Science and Research demonstrates the practicality and applicability of this new model for other universities engaged in e-learning. This study revealed that key factors responsible for determining the quality of e-learning systems include course design, content support, course facilitation, social support, administrative guidance, and characteristics of students, instructors, and staff. The determining factors of quality led to the development of a quality assessment tool for e-learning based on the Biggs quality framework.

Although this study was conducted at a single university (Islamic Azad University of Science and Research), the results are largely generalizable to other institutions that undertake e-learning. The entire research employed a method that ensured the validity and reliability of the study's findings. By surveying 180 sampled students using SEM and regression analysis, the validity and reliability of the results were achieved, and the measurement model conformed well to the collected data, albeit after some minor adjustments. Therefore, based on the model fit indices, we can conclude

that the developed model in this study is suitable for use by other e-learning institutions. Although the conceptual model suggested that course assessment significantly impacts the quality of an e-learning system, this hypothesis was rejected based on the study's results. A review of the literature indicates that this hypothesis should have been supported. Thus, there is a need for further detailed investigation to determine whether this hypothesis is supported in various e-learning institutions or at different levels of study. This study recommends researching to examine how the classifications of assessments, assignments, and examinations of fully online e-learning students are implemented.

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