Presenting a Model for the Evaluation of the Quality of e-learning at Payam Noor University of Arak

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Abstract: The current study aims to design a quality evaluation model of the electronic education system at Payam Noor University by applying a mixed methodology. The statistical population of the qualitative section includes twelve professors, researchers, and experts in the field of e-learning, who were selected by selective sampling. The conceptual model of the research was collected after conducting in-depth semi-structured interviews. The quantitative data based on a questionnaire designed by the researcher was collected from 274 professors and students with experience teaching or studying in the electronic education system of Payam Noor University. The data was analyzed using the structural equation modeling method in PLS3 software. The research results show that quality is a concept consisting of four categories behavioral, scientific, cognitive ability, and virtual learning experience. The study' findings also reveal that cultural, pedagogical, learner, communication, infrastructural, and institutional factors affect the quality of Payam Noor University's electronic education system. Also, the results show that these characteristics will help universities achieve the four outcomes of competitiveness, job opportunities, economy, and reputation by establishing a quality education system. The ideal model for evaluating the quality of e-learning at Payam Noor University is a process approach in which the three dimensions of factors, quality indicators, and outputs are examined and measured. In other words, electronic education is successful when it can create a valuable experience of virtual education while empowering the learners scientifically, behaviorally, and cognitively to let all the stakeholders of higher education benefit from a valuable electronic education.

Keywords: e-learning, educational quality, educational evaluation, electronic education, virtual education.

1. Introduction

1.1 The Background of Study

The technological revolution affects human life daily, and we witness the dominance of information and communication technology in all aspects of human society. In today's era, there is a direct and strong relationship between technological developments and economic and social growth, and this has caused an increase in the demand for education and pressure on university institutions to respond to the growing needs of society. As a result, the educational system has turned to new educational methods, including electronic education to respond to this wide range of demands and overcome the limitations of traditional education (Shams Nosrati & Moazzami, 2022). In electronic education, a wide range of electronic systems and tools such as computers, mobile phones, electronic memories, web pages, and scientific databases are used to transfer knowledge and education to learners (Ghanbari et al., 2018). E-learning has many advantages, including extensive interactions (Gary & Terry, 2003), easy use (Bauer & Fedak, 2004), intensive training, cost, time efficiency (Arkurful, 2015; Zakeri, 2023), and promoting the educational level of learners (Mothibi, 2015). Balancing the demand for development and the capacity of universities has provided a change of approach from theoretical education to real learning (Castle & McGuire, 2010). However, there are still some criticisms such as the weakening of communication and social skills, weakness in teamwork, the challenges of correct evaluation, and quality validation (Arkurful, 2015; Abdoli &

Mohammad Hasani, 2015; Momen Moghadam et al., 2023). This research focuses on the challenge of educational quality assessment and aims to explore this field of study in more depth.

In the literature reviewed, validation is often used as the equivalent of quality assessment and assurance. Farasatkhah (2009) considered accreditation to be compatible with protecting the interests of a university's stakeholders, including its applicants, consumers, and customers (Abbaspour & Mojtabazadeh, 2022; Zarei Saroukolaei et al. 2021). Scholars consider evaluation to be the process of investigating, collecting, and analyzing data to determine the value, merit, size, and importance of the quality of a phenomenon (Javadi Bora et al., 2011). Quality assessment and accreditation is an inevitable necessity for any educational institution. With this method, educational institutions gain self-awareness of the level of achievement of goals, educational programs, and the quality of outputs, and if deviations are observed, they put corrective programs on their agenda (Khan et al., 2019). This continuous improvement of quality, while increasing the reputation due to obtaining higher international and national credit ratings, will increase the demand for applicants, attract higher quality academic staff, and achieve a more skilled, more committed, and motivated human resource (Alkhateeb & Romanowski, 2021; Budiharso & Tarman, 2020). Therefore, in recent years, the implementation of educational system quality assessment programs has been widely welcomed by many countries, including Iran (Kim, 2021). Although the history of this in Iran dates to 1375, it has always faced ups and downs and encountered continuous qualitative improvement that was not proportional to the quantitative expansion of universities and its effects on the unbalanced qualitative growth of Iran's educational system against its quantitative growth (Abili et al., 2021). The issue of quality assessment of e-learning and its problems has been emphasized in many studies, and because of these studies, various models and methods have been presented for measuring and evaluating e-learning courses. Because of different educational goals of universities, various research approaches, numerous infrastructural, cultural and educational platforms, the educational management experts are localizing and providing evaluation models that are suitable for the conditions of the target educational system and the researchers of the field (Abili et al., 2021; Abdoli and Mohammad Hasani, 2015; Can, 2016; Jafarzadeh et al., 2016; Mohammadi et al., 2015; Mosavei Salehi et al., 2019; Roshni Ali Banehsi et al., 2016; Zarei Sarukolai et al., 2021).

1.2. Purpose of Study

This research aims to provide a subjective and comprehensive model for the qualitative evaluation of this electronic education system based on the previous findings considering the cultural, social, and educational aspects. The study focused on research questions exploring the constituent factors of the local pattern of quality assessment of the e-learning system of Payam Noor University, and the ideal model for quality assessment of the e-learning system of Payam Noor University.

The speed of quantitative development of virtual education has always dominated its qualitative development and this imbalance will have adverse consequences. Therefore, to ensure the quality of electronic education, we need an accurate and reliable evaluation framework, and the failure to apply valid scientific methods in educational evaluation will lead to inefficiency of intellectual capital and poor policymaking in the field of higher education (Lien & Kao, 2008; Ibrahim, 2015). The history of evaluation in Iran dates to the establishment of the Ministry of Education in 1989 and 1990. In 1999, Boali University of Hamedan launched the field of educational measurement and evaluation at the master's level for the first time. Iran's educational evaluation system was restructured after the revolution in 1361 (1982) in the form of a high council of evaluation and supervision under the headquarters of the cultural revolution, and despite the efforts made, it did not achieve much success until 1375 (1996). In 2016, six educational groups in the branch of medical sciences completed educational quality assessment, and it led to Tehran University becoming a pioneer in internal evaluation in non-medical groups. After these achievements and since 1379 (2000), there has been evidence of the formation of the cultural and scientific monitoring and evaluation board in the

Supreme Council of the Cultural Revolution and the Educational Monitoring and Evaluation Council in the Ministry of Culture and Education. Since then, the Organization of Assessment and Education of the country has become the trustee of the development and establishment of the new quality assessment system for the country's higher education institutions (Abbaspour & Mojtabazadeh, 2022; Asheqi et al., 2020).

Different models have been used to evaluate the higher education system. SERVQUAL (Parasuraman et al., 1988) and SERVPERF (Cronin, 1994) models which were designed to measure the quality of services in the public division, are among the first models that have been welcomed in many organizations over the years, including health and educational centers. Gradually, special models for quality validation of higher education centers were presented by researchers, with CPQ (Powel, 1995), SEEQ (Marsh,1982), and HETQMEX (Ho et al., 1996) among them. The criticism of the mentioned models is that although they examine the quality of services in the higher education system, they do not evaluate the electronic component of it. This criticism goes to some other similar models too, such as HEDPERF (Abdallah, 2005), and HiEduQual (Subrahmanyam et al, 2014). According to the criticism received from the beginning of the 90s, a group of researchers focused on quality assessment in electronic education systems. The first decade of the 21st century witnessed the peak of these models (Shahhoseini et al., 2014). A summary of the most important of these models and their evaluation criteria is provided in Table 1. The review of the literature also shows that in addition to the application and validation of the presented standard models, researchers have conducted independent studies to provide solutions and models that match the conditions and characteristics of the studied institution. According to these researchers, the use of existing standard models without considering these differences will not yield reliable results.

Table 1. Summary of the Most Important Service Quality in Electronic Education System (Shahhoseini et al., 2014)

Row	Model	Researcher (s)	Dimensions under consideration
1	SiteQual	Webb & Webb(2004)	Ease of use, aesthetic design, processing speed and security
2	E-News-Qual	Mirghafoori et al.(2013)	Access to the site information, citizen support, reliability, presentation, attractiveness and impartiality
3	ELS	Wang(2003)	User interface, learning communication, content, personalization
4	Friesen	Friesen (2009)	Organization, technology, professors, education, structure design ,educational
5	DLSQUAL	Chiu et al. (2007)	Reliability responsiveness, assurance, empathy, competence, politeness, accessibility, efficiency, security, flexibility, communication
6	Martínez-Torres	Martínez-Torres et al. (2011)	Learning processes, administrative processes, teaching resources, user interaction, communication with the global network, price, cost,
7	E-GovQual	Papadomichelaki & Mentzas (2012)	Ease of use, interactive functionality, trust, content, citizenship support
8	Mills model	Hassanzadeh et al. (2012)	User satisfaction ,technical quality of the system, quality of education, quality of information and calls, intention to use, benefits of using the system, quality of service, use of the system, loyalty to the system, achievement of goals
9	Integrated model of quality of electronic services	Ahmady et al. (2019)	Human resources ,operational capabilities, service process, information requirements, management system, curriculum development, course materials, instructional design, instructional process, tracking and navigation, instructional media, support, technology, and assessment.
10	Saputra	Saputra et al. (2023)	Information quality and system quality
11	Ola Ibrahim	Ola Ibrahim (2015)	Management, support, learning objectives

2. Literature Review

Literature review on the quality of instruction in higher education is very rich. Some recent ones on the quality of education during the COVID-19 pandemic expressed the lower quality of education than face-to-face, and that the students had accepted the format to cooperate with universities (Kelly & Columbus, 2020). Moawad in his qualitative research expressed that stress is one of the most importantfactors in the quality of e-learning (2020). He divided this stress into six groups including stress from the exam in terms of time and manner, assignments in terms of their type and volume, presentation and lecture time, not having some facilities needed for online education, like computers and space limitations at home, online platforms, and the uncertainty of the end time of the classified course. The results of this research have been very effective in the field of educational performance. In their research, Maatuk and colleagues in 2021, examined the views of professors and students regarding virtual education during the Pandemic and stated that students have evaluated electronic learning as a suitable alternative to face-to-face learning while maintaining academic standards. Although there were challenges of infrastructural weaknesses of the Internet or when the workload of professors was shifted to students. From the faculty members' point of view, e-learning was beneficial and helped students develop their technological skills. According to them, the most important challenge in this style of learning was financial issues and their high costs.

In recent years, considerable research has been done on the topic of qualitative evaluation of universities in the country, and some of research in this area are dedicated to Payame Noor University's educational system. Enayati Novin Fard and colleagues in 2012, mentioned the evaluation of the quality of educational services of Payam Noor University in Hamedan; Using the SERVQUAL model, these researchers examined the educational services of this university from the students' point of view and the results showed that there is a significant negative difference between the perceptions and expectations of the students regarding the quality of the education of this university, although this perception gap is less responsive. Moinikia and Zahidbablan (2012) in their research applying SERVQUAL model examined the quality of electronic services of Payam Noor University in the centre of Ardabil and the research results showed that the quality level of the services provided was significantly lower than the students' expectations. Shokri and colleagues (2019) in research using a mixed and combined method of the Strauss-Corbin Foundation data and structural equation modeling identified the indicators for measuring the quality of education in the applied scientific centres of Kurdistan province. In the input section, these researchers introduced components related to students, lecturers, financial resources and curriculum, which affect quality structures, i.e. two educational and research processes.

The outputs of this system are learners' performance and capability, organizational and environmental achievements, and feedback and evaluation systems. Also, according to the findings of this group, goals, missions and activity platforms are the foundations of the model, which affect three groups of input, process and output factors. Ahmadi et al. (2020) conducted research using the Fuzzy Delphi Method (FDM) to provide a model for the electronic education system of higher education institutions, and it was found that eight indicators of communication, learner, interaction, teacher's attitude toward students, teacher's technical competence, content, attitude towards education, and experience would effect on country's electronic education system. Asheqi and colleagues (2022) identified the functional components of the higher education system using theme analysis. According to these researchers, the functional system of higher education should be divided into three dimensions: 1- educational, including matching the courses with the needs of the job market, the scientific mastery of the professors, the effectiveness of the teaching style, creating the motivation for students and the skill level of graduates; 2- research, including the quantity and quality of research, the number of articles in decent journals, books published in reputable publications, national and international ratings and awards, national and international projects, and 3- cultural, including independence, justice and morality. Masouminia and colleagues (2023) in research conducted in a mixed method found that the evaluation of these organizations should be

done in two structural and social axes. The researchers, design, implementation and evaluation are the key factors that affect these axes at the national and organizational level. Also, the results of this research showed that the two factors of organizational level and environment are effective on the micro and macro strategies of research organizations, research institutes, and the attention should be paid to the individual, organizational, and extra-organizational levels.

3. Research Methodology

This research was conducted with a mixed approach, in which a combination of quantitative and qualitative methods is applied in a predetermined strategy. The qualitative part includes library studies and field surveys. The steps of conducting qualitative research include searching and selecting valid and relevant articles, coding findings, obtaining confirmation of the effectiveness of previous findings in the society under study, interviews with professors, their implementation, coding, matching the findings of the library review stage with the field research, and finally presentation of the model. The literature review focused on Persian and English articles published in the last five years (2018 to 2023) in reliable scientific databases. In the interview phase, to select participants with appropriate experience and knowledge for interviewing the target community, the following conditions have been defined: 1- having scientific research or executive experience in the field of designing or implementing an educational quality assessment system or a history of publishing scientific research articles in quality assessment in the university system, especially in Payam Noor University, or having at least 5 years of teaching experience in virtual education courses, and 2- having at least a doctorate and the rank of assistant professor in the university. The sample was selected from the target population using the selective sampling method and theoretical saturation was achieved by conducting 12 interviews.

To evaluate the quality and accuracy of coding, an unbiased coding method and Kappa coefficient test were used, and to test the reliability of quantitative findings, sample proportionality techniques, participant review, and research colleagues' approval were used applying SPSS software.

In the quantitative stage, with the aim of validating the model, structural equation modeling has been used applying PLS3 software. The statistical population of this part of the research included professors, lecturers and students who have completed at least 4 academic semesters in electronic higher education courses of the university.

3.1 Data collection

In the first stage, the target articles were searched in the target databases and the original ones with high thematic similarity were selected. At the first phase, 14 Farsi and 32 English articles have been selected. Then the selected articles were examined and carefully read and coded using the content analysis method. Finally, 52 important frequently used concepts from internal and external statistics articles and in four categories of organizational factors with 10 concepts, management factors with 7 concepts; educational factors with 20 concepts and infrastructure factors with 15 concepts were coded and categorized. The concepts identified in this section before starting the interview process were included in a questionnaire to analyze the following hypotheses presented in Table 2 and Figure 2 as well.

H 0: The identified factor (component) is effective on the quality of e-learning at Payam Noor University.

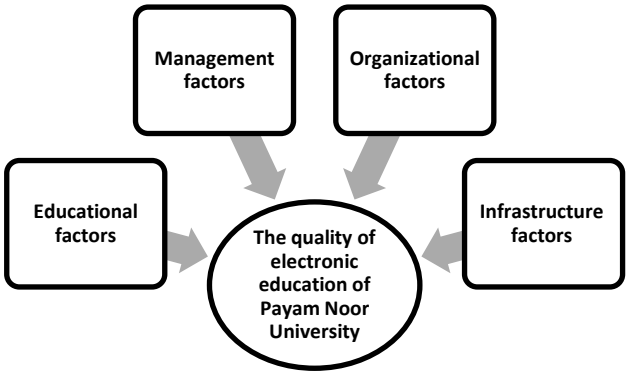
H1: The identified factor (component) is not effective on the quality of e-learning in Payam Noor University.

Table 2. Search Results of Scientific Research Articles Searched in Reliable Scientific Databases

Main Article	Subcategory (Number)	Concepts	Test Ratio	Observed Ratio	Significant Level	Test Result
Factors affecting the quality of e-learning in higher education system	organizational factors (10)	Mission, values, goals, vision, investment , staff readiness, financial resources, appropriate structure and organization, clear policies in the field of e-learning, staff to student ratio.	0.6	1/00	0	H0 confirmation
	Management factors(7)	Leadership, educational processes ,entrepreneurship support, industry and university connection, national and international cooperation, management commitment, expert human resources.	0.6	1/00	0	H0 confirmation
	Educational agents (20)	Educational needs assessment, educational resources, assessment and evaluation, teaching style, academic staff, student support, curriculum, course design, course presentation, online teaching skills, attention to individual differences, entrepreneurship education ,professors' experience, professor-student ratio, The duration of the student's study period, the quality of study, students' motivation ,professors' satisfaction with the course, professors' and students' attitude to virtual education, teacher's and student's digital literacy.	0.6	1/00	0	H0 confirmation
	infrastructure factors (15)	educational software, platforms, social networks , online support for professors and students, internet speed ,bandwidth, equipment and facilities, servers, software updates , security ,ease of use of systems , errors and system outages, Multimedia software , fraud prevention, documentation capability.	0.6	1/00	0	H0 confirmation

It should be mentioned that the ratio test has been applied for all identified components separately and the observed ratio of all components is higher than the test ratio (0.6) and their effect on the quality of electronic education in Payam Noor University has been confirmed.

Figure 1. The Initial Model of the Quality Assessment of the e-learning System at Payam Noor University (Based on Library Research)



In the interview stage, the coding method was used to analyse the data. The phenomenon of quality has been the first component investigated in the exploratory interview section. In this section, the following two questions are raised:

• How do you define the concept of quality in the electronic education system of Payam Noor University?

• What are the representative indicators of this definition of quality?

From the total answers provided accordingly, 14 open codes were extracted, and in the stage of combining the four categories of scientific ability with 5 codes, cognitive ability with 2 codes,

behavioral ability with 3 codes, and quality of education experience with 4 codes have formed the main dimensions of the concept of quality in the electronic education system as presented in Table 3.

Table 3. Assigning Open Codes Extracted from the Interviews to the Categories of the Concept of Quality

Row	**Compliance with Document Analysis**	**Extractive Open Code (abundance)**	**Axial Code**	**Selected Code**
1	*	Ability to solve problems(9)	scientific ability	**Quality**
2	*	The ability to graduate in science(10)		
3	*	Knowledge of the latest scientific methods(6)		
4	*	Published scientific articles(7)		
5	*	Patents and new inventions registered(4)		
6	*	ideation(7)	cognitive ability	
7	*	critical thinking(6)		
8	*	No need for new training for employment(5)	Behavioral ability	
9	*	Ability to scientific learned knowledge(8)		
10	*	Compliance with professional ethics(4)		
11	*	The number of failed and probationary students(6)	Virtual learning experience	
12	The duration of the student's study period	Retention rate (duration of attendance at the university) (6)		
13	*	Interest in continuing education in additional courses(4)		
14	The attitude of professors and students to virtual education	Perception of the usefulness of the virtual course(7)		

*The sign * indicates the new concepts identified about the stage of library research.*

To identify the influencing factors on the quality of e-learning in Payam Noor University, the following questions were asked, and the results are presented in Table 4.

- What factors can play an important role in realizing this type of quality in Payam Noor University's electronic education system in your idea?
- What are the identifying components of each of these factors in your idea?

Table 4. Assigning Open Codes Extracted from the Interviews to the Categories of Factors Affecting Quality

Row	**Compliance with Library findings**	**Extractive open code (abundance)**	**Axial Code**	**Selected Code**
1	Educational needs assessment	educational needs assessment(12)	Pedagogical factors	**Factors affecting quality**
2	Curriculum and course design	planning(12)		
3	teaching style	educational style(10)		
4	Educational resources	Educational content(12)		
5	Online teaching skills and course delivery and professors' experience	teaching skills(8)		
6	Measurement and evaluation	continuous monitoring(11)		
7	Staff readiness	Employee commitment(6)	Institutional factors	
8	The ratio of professors to student and academic staff	Proportion of teacher and student(8)		
9	Investment and financial resources	investment(10)		
10	*	Providing facilities for purchasing new equipment to users (teachers and students)(3)		
11	Industry and university connection	Industry and university connection(5)		
12	Clear policies in the field of e-learning	policies and programs(9)		
13	*	entrance exam(10)		
14	Active participation	active participation(12)	Learners' factors	
15	Active learning	active learning(10)		

16	Students' motivation	Enthusiasm for education(12)		
17	*	The desire to improve skills (personal development) (7)		
18	security	Security in cyber space(11)	Infrastructure factors	
19	Bandwidth	Capacity and bandwidth(11)		
20	software updates	Up-to-date technological equipment(12)		
21	Platforms, educational software and multimedia software	Specialized platforms(8)	Infrastructure factors	
22	*	plugins(4)		
23	Documentation capability	Ability to document(11)		
24	Prevention of fraud	The possibility of preventing fraud and forgery(11)		
25	Ease of use of the systems	User-friendliness(10)		
26	Errors and system outages	Prevention of system errors and outages (12)		
27	Online support for professors and students	Fast online support(12)		
28	Attention to individual differences	Attention to individual differences(8)	Cultural factors	
29	Privacy protection	Privacy(9)		
30	*	Ethics in cyber space(6)		
31	Copyright compliance	Copyright compliance(5)		
32	*	Access to scientific databases(10)		
33	*	Access to the digital library(12)		
34	*	Access to specialized software(7)		
35	*	Access to the cloud(2)		
36	Social networks	Access to social networks(12)		
37	Internet speed	High-speed Internet access(12)		
38	*	Access to university accounts(11)		
39	Digital literacy of teacher and student	digital literacy(7)		

*The sign * indicates the new concepts identified about the stage of library research.*

4. Research Findings

In this section, 44 primary concepts were identified, 5 of which were used as categories, and the remaining 39 in the main categories are 1- pedagogical (with 6 concepts), 2- institutional (with 7 concepts), 3- learners (with 4 concepts), 5- communication (with 8 concepts), 6- cultural (with 4 concepts) and 7- infrastructure (with 10 concepts). Ten new concepts were identified by adapting the concepts of the two parts of interviews and library study. Finally, there will be the stage of identifying the outputs of establishing such a system. The following results summarized in Table 5 explored these questions:

- What outcomes will be achieved by implementing this educational system?
- What indicators would measure these outcomes?

In this part, 10 open codes were extracted from the total given answers regarding the outputs of the quality electronic education system in Payam Noor University, in four categories: competitiveness with 4 codes, job creation with 2 codes, economics with 1 code, and reputation with 4 integrated codes with quality outputs form the electronic education system of this university.

Table 5. Assigning Open Codes Extracted from the Interviews to the Categories of the Output for the Quality of Electronic Education System

Row	Compliance with Document Analysis	Extractive Open Code (abundance)	Axial Code	Selected Code
1	*	Recruiting more students(12)	Competitiveness	

2	stronger academic staff	Recruiting stronger faculty(12)		**Quality outputs**
3	Scientific growth	Scientific growth(10)		
4	*	Higher percentage of employment of graduates(10)	Job creation	
5	*	Entrepreneurship of graduates(7)		
6	income generation	income generation(12)	economic	
7	*	development(8)	fame	
8	*	University credit(12)		
9	National and - international cooperation	National and international scientific collaborations(8)		
10	*	Positive view and community support(6)		

*The sign * indicates the new concepts identified about the stage of library research.*

Eleven categories were designed out of the document analysis, which after allocating them with the findings of the research field and examining the narratives provided by the participants, an ideal model for the evaluation of the education system was offered to be implemented electronically at Payam Noor University.

Table 6. Allocation of Remaining Concepts from Library Studies to Categories Identified in Research

Row	**The residual concept of library study**	**Allocation category**	**Role in the Model**
1	Mission, values, goals and visions (upstream documents)	Institutional	Factors affecting quality
2	Structure and organization	Institutional	Factors affecting quality
3	leadership	Institutional	Factors affecting quality
4	Educational processes	Pedagogical	Factors affecting quality
5	Support for entrepreneurship	Institutional	Factors affecting quality
6	Management commitment	Institutional	Factors affecting quality
7	Expert manpower	Institutional	Factors affecting quality
8	Support the learner	Pedagogical	Factors affecting quality
9	Entrepreneurship training	Institutional	Factors affecting quality
10	Professors' satisfaction with the course	Pedagogical	Factors affecting quality
11	Staff to student ratio	Institutional	Factors affecting quality

A neutral coding method has been used to check the accuracy of data coding. For this purpose, the text of the searched articles and the text of the interviews implemented at each stage were presented to an educational management professor outside the research, and he was asked to code them based on his perception. To check the agreement between the two codes, the Kappa coefficient was calculated using SPSS software. According to Flies (1981), if this coefficient is higher than 0.6 in meaningful conditions, it is good, and if it is more than 0.75, it indicates excellent agreement between the coders. The results summarized in Table 7 indicate that the quality of the coding done in this research has very good accuracy.

Table 7. Kappa Coefficient Calculated in Evaluating the Quality and Accuracy of Data Coding

kappa coefficient	**Number of valid items**	**Deviation from the standard**	**significant number**
0.751	120	0.064	0

Also to check the reliability of research findings, the revision strategy was applied at the time of coding through detailed and multiple revisions. The data, interpretations, and implications of this study were also compared to the previous studies in this field. In the quantitative part of the study,

the structural equation modeling method was used to validate the obtained conceptual model. Then, the designed model was tested in two sections of measurement model and the structural model as presented in Table 8. Also to check the reliability of research findings the revision strategy was applied at the time of coding through detailed and multiple revisions.

Table 8. The Results of Significant Factors Identified in the Conceptual Model

Endogenous Variables	**Components of Endogenous Variables**	**Factor Load with Variable**	**Measured Indicators**	**Operational Burden with the Component**	**Result**
Factors Affecting the Quality of Electronic Education at Payam Noor University	Cultural Factors	0.15	Copyright compliance	0.739	confirmation
			Ethics in cyberspace	0.719	confirmation
			Privacy protection	0.832	confirmation
			Attention to individual differences	0.717	confirmation
	Learners Factors	0.19	Active participation	0.952	confirmation
			Active learning	0.951	confirmation
			Enthusiasm for education	0.816	confirmation
			Desire to improve skills	0.947	confirmation
	Pedagogical Factors	0.19	Educational needs assessment	0.666	confirmation
			Curriculum planning	0.685	confirmation
			Educational style	0.746	confirmation
			Educational content	0.712	confirmation
			Teaching skills	0.757	confirmation
			Continuous monitoring	0.667	confirmation
			Educational processes	0.741	confirmation
			Support the learner	0.746	confirmation
			Professors 'satisfaction with the course	0.645	confirmation
	Communication Factors	0.15	Access to scientific databases	0.792	confirmation
			Access to the digital library	0.774	confirmation
			Access to specialized software	0.729	confirmation
			Access to the cloud	0.873	confirmation
			Access to social networks	0.852	confirmation
			High speed internet access	0.623	confirmation
			Access to university accounts	0.751	confirmation
			Digital literacy	0.671	confirmation
	Infrastructure Factors	0.33	Security in cyberspace	0.668	confirmation
			Capacity and bandwidth	0.663	confirmation
			Date technological equipment	0.691	confirmation
			Specialized platforms	0.602	confirmation
			Specialized plugins	0.83	confirmation
			Ability to document	0.687	confirmation
			The possibility of preventing fraud and forgery	0.621	confirmation
			User friendliness	0.874	confirmation
			Prevention of system errors and outages	0.672	confirmation
			Fast online support	0.745	confirmation
	Institutional Factors	0.3	Employee commitment	0.656	confirmation
			Proportion of teacher and student	0.803	confirmation
			Clear policies and plans	0.647	confirmation
			entrance exam	0.708	confirmation

			upstream documents	0.738	confirmation
			High investment	0.54	confirmation
			Providing new equipment purchase facilities to users	0.555	confirmation
			Structure and organization	0.701	confirmation
			Support for entrepreneurship	0.655	confirmation
			leadership	0.645	confirmation
			Management commitment	0.624	confirmation
			Industry and university connection	0.586	confirmation
			Expert manpower	0.757	confirmation
			Entrepreneurship training	0.738	confirmation
			Staff to student ratio	0.763	confirmation
	Scientific Ability	0.9	Ability to solve problems	0.855	confirmation
The Concept of Quality in Virtual Education			Ability to graduate	0.856	confirmation
			Knowledge of the latest scientific methods	0.829	confirmation
			Published scientific articles	0.784	confirmation
			Inventions and new inventions registered	0.799	confirmation
	Cognitive ability	0.9	ideation	0.889	confirmation
			Critical thinking	0.882	confirmation
	Behavioral ability	0.9	No need for new training for employment	0.86	confirmation
			The power of signification of learned knowledge	0.824	confirmation
			professional ethics	0.826	confirmation
	Virtual learning experience	0.924	The number of failed and probationary students	0.811	confirmation
			Retention rate (duration of attendance at the university)	0.844	confirmation
			Interest in continuing education in the supplementary courses	0.853	confirmation
			Perception of the usefulness of the virtual course	0.799	confirmation
Consequences	Competitiveness	0.9	Attracting more students	0.881	confirmation
			stronger academic staff	0.836	confirmation
			Scientific growth	0.802	confirmation
	Occupation	0.6	Higher percentage of graduate employment	0.89	confirmation
			Entrepreneurship of graduates	0.886	confirmation
	Economic	0.601	income generation	1	confirmation
	Fame	0.5	Development	0.795	confirmation
			University credit	0.858	confirmation
			National and international - scientific cooperation	0.857	confirmation
			Positive view and community support	0.84	confirmation

Examining the results of Table 8 confirms the relationships defined in the conceptual model of the research. After confirming the measurement model, the obtained relationships should be tested to answer the main research questions, and the structural model should be validated. For this

purpose, the main hidden variables in the conceptual model of the research were examined in terms of the critical value and its significance test was carried out as presented in Figure 2 and Table 9.

Figure 2. Structural model of the quality evaluation model of Payam Noor University's e-learning system

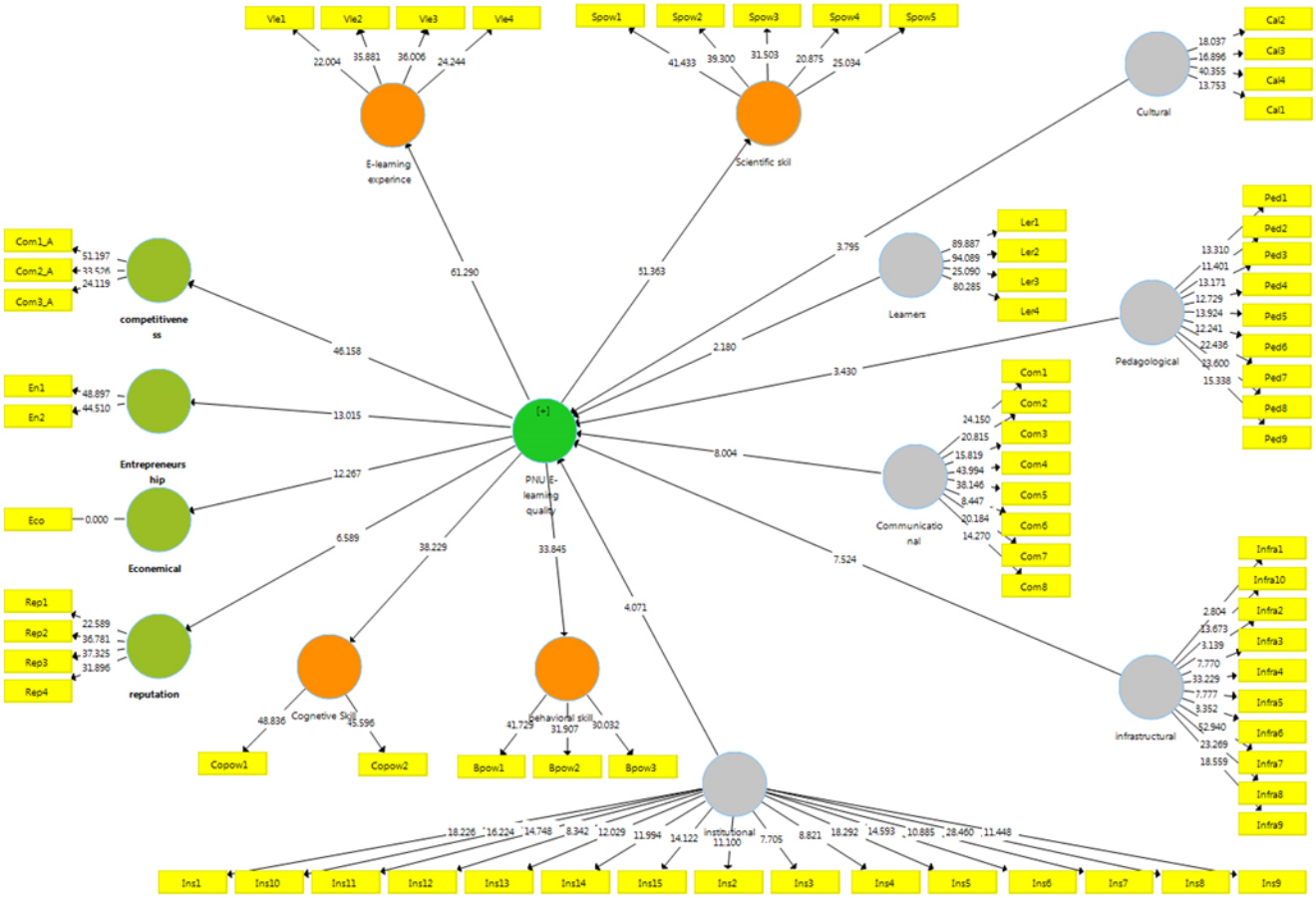


Table 9. The Results of the Significance Test of the Structural Model of the Research

The investigated variable and the direction of the relationship	Significant Number	Critical Value	The Result
Cultural factor → the quality of e-learning	3.795	1.96	confirmation
Communication factor → the quality of e-learning	8.004	1.96	confirmation
The factor of learners → the quality of e-learning	2.18	1.96	confirmation
Pedagogical factor → the quality of e-learning	3.43	1.96	confirmation
Infrastructural factor → the quality of e-learning	7.524	1.96	confirmation
Institutional factors → the quality of e-learning	4.071	1.96	confirmation
The quality of e-learning → scientific ability	61.363	1.96	confirmation
The quality of e-learning → cognitive ability	48.836	1.96	confirmation
The quality of e-learning → behavioral ability	33.895	1.96	confirmation
The quality of e-learning → virtual learning experience	61.29	1.96	confirmation
The quality of e-learning → competitiveness	46.158	1.96	confirmation
The quality of e-learning → employment generation	13.015	1.96	confirmation
The quality of e-learning → economic	12.267	1.96	confirmation
The quality of e-learning → reputation	6.589	1.96	confirmation

According to the results listed in Table 9, the t value corresponding to the main factor of the examined indicators is significant at the 95% confidence level that while confirming the relationships in the model, it can be said that the identified variables are suitable descriptors for evaluating the quality in the electronic education system.

In using the structural equation modeling method, one of the most important things is to check the reliability and convergent and divergent validity of the model. To evaluate the reliability of the evaluation, Cronbach's alpha, rho-A and composite reliability (CR) were applied and AVE is an indicator of convergent validity. The critical value in the reliability index is 0.7 and in the convergent validity index is 0.5. Therefore, if the calculated value of each index is higher than the critical value, it can be concluded that the model has been approved in that index. The evaluation results of these indicators are presented in Table 10.

Table 10. The Results of Significant Factors Identified in the Conceptual Model

Variable Title	**Cronbach's alpha**	**rho_A**	**CR**	**AVE**	**The Result**
Cultural factor	0.745	0.757	0.839	0.567	confirmation
Agent of learners	0.937	0.936	0.956	0.884	confirmation
Pedagogical factor	0.882	0.891	0.9	0.502	confirmation
Communication agent	0.895	0.903	0.916	0.581	confirmation
Infrastructural factor	0.845	0.885	0.878	0.54	confirmation
Institutional agent	0.915	0.919	0.927	0.561	confirmation
The quality of e-learning	0.941	0.942	0.948	0.568	confirmation
Scientific ability	0.882	0.884	0.914	0.681	confirmation
Cognitive ability	0.727	0.729	0.741	0.748	confirmation
Behavioral ability	0.786	0.789	0.805	0.7	confirmation
Virtual learning experience	0.846	0.847	0.896	0.684	confirmation
Competitiveness	0.791	0.796	0.875	0.706	confirmation
Job creation	0.732	0.732	0.882	0.788	confirmation
Economic	1	1	1	1	confirmation
Fame	0.858	0.86	0.904	0.702	confirmation

The results show that the values of all variables are higher than the critical value and the research model has acceptable reliability and convergent validity aligned with the Fornell-Larcker criterion for the divergent validity section. The results also indicate that each construct in the research model interacts more with its indicators than other constructs. Finally, based on the obtained results, the reliability, convergent validity and divergent validity of the research are confirmed meaning the research measurement model is appropriate.

The last step to test the validity of the structural equation modeling approach is the model fit test. For this purpose, the Goodness of Fit (GOF) method has been used in this research. GOF is the most complete index to check the efficiency of the model (Chen et al., 2015).

Table 11. The Results of the Goodness of Fit of the Research Model

Model fitting power	**GOF**	**AverageR^2**	**Average shared values**
strong	0.712	0.860	0.589

The results of examining the fit of the overall research model indicate that the model obtained in this research has a strong and acceptable fit.

5. Discussions and Findings

A review of the research literature shows that most of the domestic and foreign studies have investigated the factors affecting quality; therefore, there is more evidence between the findings of

the significant factors section and the findings of other research. In the current study, the cultural factor was identified as one of the effective elements in the quality of electronic education at Payam Noor University with an impact factor of 0.154 and a significant number of 3.795. Paying attention to individual differences, maintaining privacy, ethics in cyberspace, and concerning copyright are the structures of this factor (Sony, 2020; Cham Asemani & Ehtsham, 2021).

The pedagogical factor is the second most effective factor on the quality of electronic education in Payam Noor University. According to the findings of the study (impact factor of 0.193 and significant number of 3.430), this factor is very importance and considerable on the quality of education both in the traditional education system and in the electronic education system aligned with the findings of other researchers (Ahmadi et al., 2020; Chik et al., 2011; Soni, 2020; Yasini et al., 2017).

The third influential factor identified in the model is the learner factor. This factor with four components of active participation, active learning, desire to study, and desire to improve skills with a significant number of 2.180 has an impact factor of 0.191% on the quality of electronic education at Payam Noor University. The findings of this section are consistent with the results of the research of Barkhoda & Ezzatpour (2022), Khury et al. (2011), Davari & Rezazadeh (2013), Coppola (2002), and Tan & Chang (2015).

The communication factor is the fourth factor affecting the quality of e-learning at Payam Noor University. This factor has eight constituent structures, five of which are newly identified. Most of these structures are among those that seem to have been out of priority for provision in the country's universities due to reasons such as sanctions, management policies, costs, access to scientific databases, access to digital libraries, access to software, access to cloud space (computing and storage), and access to university accounts aligned with the findings of Ahmadi et al. (2020), Khan et al. (2019), Martin et al. (2014), Zamani et al. (2022).

The topics of technologies affecting the quality of electronic education at Payam Noor University have been categorized based on the infrastructure factor. The findings of this section are consistent with the findings of other scholars including Ahmadi et al. (2020), Chik et al. (2011), Cham Asemani & Ehtsham (2021), Loiacono et al. (2002), Soni (2020). According to the experts participating in this research, it is necessary to have a component called specialized plugins that were not present in the previous research. According to these experts, in some fields, especially technical and engineering fields and basic sciences, the teacher needs to use symbols, formulas, and tools specific to field to transfer knowledge, which must be available in the form of plugins in the applied platform which is mostly not available in the country. Also, the findings of the path analysis section show that the infrastructure factor with a path coefficient of 0.329 and a significant number of 7.524 has the greatest impact on the quality of electronic education at Payam Noor University.

The last identified factor affecting the quality of e-learning at Payam Noor University is related to management and strategic issues, which are named institutional factors. In this field, fifteen components have been obtained that are related to Payam Noor University's macro-management affairs and shape relevant policies on virtual education. The components identified in this section have confirming evidence in the research of Ho and Wearn (1996), Khodadad Hoseiny & Zabihi (2013), and Subrahmanyam et al. (2014). A category with the same title or organizational factors is classified providing facilities for purchasing new equipment to users (teachers and students) and entrance exams are among the newly identified components of this factor. This factor is included in the model with a path coefficient of 0.323% and a significant number of 4.071.

Based on the findings of the research, from the perspective of the community participating in the research, quality in Payam Noor University's electronic education system is a concept that consists of four constructs: academic ability with a path coefficient of 0.925, cognitive ability with a path coefficient of 0.924, behavioral ability with a path coefficient of 0.852, and virtual learning experience. It is formed with a path coefficient of 0.865 and the value of path analysis coefficients shows that quality with these elements has a stable, rich, and reliable concept. Also, the research

shows that, although evidence of the two concepts of retention rate and attitude towards the virtual course can be found in the research findings of Bakker (2009) and Shilova et al. (2014), other components of the new concepts identified are in the field of quality concept. In the output section, we reach four valuable achievements of competition, job creation, economy and reputation. The strongest relationship is between the quality of the e-learning system and the competition output with a path coefficient of 0.886, and the other outcomes include job creation with 0.696, economy with 0.601, and reputation with 0.513 based on the effectiveness of the quality e-learning system which confirm the research findings of Arkorful & Abaidoo (2015), de Freitas et al. (2005), and Subrahmanyam et al. (2014).

6. Conclusion and Recommendations

6.1. Conclusion

By examining the e-learning quality evaluation model in this research, it can be concluded that the optimal e-learning quality evaluation model at Payam Noor University has a process approach in which factors, quality indicators, and outputs are assessed and evaluated. This process will be successful while creating a valuable experience of virtual education and forming a change in the audience to benefit from electronic education in employment and entrepreneurship. With electronic education, the universities also triumph opportunities for development, income, qualified human resources, and social support. The possibility of scientific growth for faculty members in national and international collaboration will be provided. Also, by focusing on the constituent elements of the quality concept, it can be concluded that educational experts place great emphasis on practicality and application of the scholarly science, and sometimes need to consider virtual education at Payam Noor University as a high-quality platform, which creates intellectual and skill-building capacities in learners.

6.2. Recommendations

According to the model obtained from the research, six categories of factors are effective in achieving quality with the stated characteristics, which should be examined in the evaluation of their situation. One of the differences between this model compared to other educational system quality evaluation models is the attention to the subsequent effects of quality. In other words, if we assume the short-term goal of the e-learning system at Payam Noor University is to educate students with desirable behavioral, cognitive, and scientific characteristics in a standard and valuable course, then according to the obtained model, the longer-term role of this social product should also be considered. Noteworthy, some aspects of quality based on the response to society's needs, can be evaluated in the post-university phase, for example, the high percentage of graduates' employment or their entrepreneurship in long term.

Universities will gain recognition by responding to society's expectations for future development, credibility, and opportunities for national and international cooperation by applying quality education. As the demand to higher education is increasing in all majors, the university will find the opportunity to attract more quality students and professors. Increasing the quality of education will trigger cooperation between the industry and the university and there would be the possibility of recruiting non-profit organizations. Awareness of the benefits of quality education and its short and long-term outcomes will affect the process of education as well.

In the process approach, with the internal evaluation of the quality structures and its external manifestations (quality outputs), valuable feedback for the correction and improvement of the educational system can be earned. In the reverse production approach, the future vision is clear, and we need a constructive plan to manage and allocate resources and design processes to achieve that vision, meaning that strategic management of the electronic education system becomes necessary. The first step in this management is to pay attention to institutional factors in which demanding documents, vision, policies, human capital, investments, and input quality are formed and placed

under the leadership of educational system managers. University management will be successful in establishing quality when these macro platforms are aligned with the depicted perspectives. Some other elements affecting quality are infrastructural, communication, pedagogical, cultural factors, and learners.

In the field of infrastructural factors, the existing capabilities are not on par with global systems which the same facilities and services can be provided. Some of the special features of the model, pedagogical factors and quality, can be considered as a form of educational needs assessment, and curriculum designers will have a clearer prospect in formulating educational content, educational planning, and related resources. For example, based on the research model, the use of skill- oriented and practical teaching style is very important in the quality of the electronic education system, while many educational texts and teaching style in Payam Noor University are based on theoretical education, which the basis of the results of this research needs to be revised. Also, with the courses becoming skill-oriented, it seems that the ratio of the presence of the professor in the role of the instructor has increased, and the evaluation system during the semester and at the end of the semester should focus on aspects such as project implementation and teamwork so that it relates to other components such as participation and active learning and the desire to improve skills in the field of learner factors.

It is also very important to formulate and teach cultural issues, including how to be in cyberspace, respect for citizenship rights, media literacy, and compliance with copyright laws in the pre-university training courses. Electronic education competence should be taught in the first semester so that the learners can get acquainted with the culture of virtual education and its requirements at the beginning of their studies.

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