Original Article

Construction, validity and reliability of online teaching satisfaction model in virtual course professors

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Abstract
The purpose of this research was to establish, validate and trust the online model among the professors of virtual courses. For this purpose, it should be designed based on the model of Bolliger and Vasilik (2009) to evaluate the satisfaction of professors' online presentation. To make such a questionnaire, the literature related to satisfaction with online teaching was carefully reviewed. Finally, the definitions and concept of satisfaction from online teaching were designed in the form of 30 questions with 5 options using the "Likert scoring" method in the form of measuring satisfaction from online presentation. The reliability of the questionnaire was examined through Cronbach's alpha and retest and construct validity through confirmatory factor analysis. The face and question validity was investigated by asking the opinions of 19 professors, and its reliability was calculated on 50 professors of online courses using the "retest" method and at a time interval of 5 weeks, 0.72. became. Then the questionnaire was implemented on 350 professors of Payam Noor University's virtual courses, and by using factor analysis with "rotational" method of "Varimax" type, 3 factors with characteristic value higher than 5 were determined as follows: "Satisfaction" with the organization., "student satisfaction" and "self satisfaction". Therefore, the reliability coefficients were between 0.68 and 0.89 for all sub-accounts and 0.78 for the whole questionnaire by the test-retest method. The internal similarity coefficient for all sub-words is between 0.62 and 0.75 and for the whole letter is 0.93. In general, the reliability and validity coefficient obtained for the questionnaire was satisfactory.

Keywords
online teaching satisfaction questionnaire, construction, accreditation, trust assessment, online professors.

Introduction
At first, the emergence of distance education was based on traditional learning theory (behaviorism, cognitiveism and structuralism). With the entry into the 21st century and the dominance of three common learning theories, it was thought that the sum of these approaches that had influenced the educational system of the 20th century will continue to influence the educational system of the 21st century and will have the same effect on life. It continues on its own (Al-Habib and Roli, 2018). Improving and expanding educational services has always been one of the most important concerns of officials and thinkers. Entering the information

age and the emergence of new technologies such as the Internet, educational institutions have faced various challenges. Electronic teaching and learning has been able to revolutionize the field of education with the optimal use of new communication and information technologies and emerge as a new school in the field of education (Baroudi and Shaya, 2022).

Distance education based on communication theory creates an environment based on individual control (Siemens, Alsos, Stange, Seaborn and Donner, 2010). In relationalism, knowledge and cognition are considered to be distributed at the level of a network of people and technology, and learning is the process of communication, growth and discovery of these networks. In simpler words, creating nodes, connecting nodes with each other and forming a network of nodes and connections create learning (Siemens, Smith, Fisher, Siroff, and Kilian, 2015). The growth of information and communication technology, the continuous change and obsolescence of science and knowledge in less than a few years, the desire and preference of people for lifelong learning are among the factors that make online and distance education one of the most important environments. It has become educational and has attracted many universities and educational institutions to this type of education (Ashrafi and Haideranjad, 1400). On the other hand, during the quarantine period of the corona virus, the number of learners who take online courses has increased tremendously (Hong, Lee and Yeh, 2021). The rapid growth of Internet technology has made e-learning one of the most common educational approaches in relevant institutions. This system is called instead of replacing or supplementing traditional education (Ovi, Iyahad, Madar and Rahim, 2012). The use of information and communication technology (ICT), especially the Internet, has promoted the acceptance of global electronic learning practices. This problem has led to the growth of online learning as a new method in education. Electronic learning includes education through electronic media such as the Internet, intranet, extranet, video audio tapes, satellite broadcasting, television, and CDs (Vahedi, 2019). Electronic teaching in the form of acquiring knowledge through electronic media such as computers or other devices

Internet capability is defined (Derin, 2021). The purpose of electronic learning or the use of electronic education systems is to reduce the amount of traffic, save time, money, and also learn better, faster and easier.

A significant part of life's challenges is related to the environment in which a person studies. In a general classification, the learning environment is divided into real learning environment and offline learning environment. Adaptation and adaptability to the opportunities and challenges in the online learning environment has been the focus of various researchers. One of the most basic issues that people in online educational environments are involved with is the satisfaction of online teaching (Siemens et al., 2015).

Entering the information age and the emergence, growth and development of technologies such as the Internet made the institution of education undergo many changes, and in the meantime, electronic education was able to emerge as a new paradigm by taking advantage of this opportunity, so that many institutions and Educational centers quickly wanted to use it (Iom, Van and Achille, 2006). The success and optimal use of the online educational space requires having the level of interest and motivation for teaching and learning in the online space (Arbaug, 2000), which requires reaching an optimal level of satisfaction with online teaching (Arbaug and Durai, 2002).

Satisfaction with online teaching is defined as meeting the perceived needs and expectations of professors after participating in these types of classes (Arbaugh and Durai, 2002). Studies have shown that a large number of professors who participate in virtual courses do not want to continue and complete the teaching process (Bolliger and Vasilik, 2009). The question that is raised here is, what is the problem in the education system that makes it not work well? Examining and answering this question led researchers to evaluate and evaluate the success of these educational systems and provide optimal solutions (Al-Shami, Taha, Abu

Zaid, Saravanan, Al-Kawas and Abdullah, 2021). According to the stated contents, the purpose of the present study is to construct, validate and find the reliability of the online teaching satisfaction model among the professors of virtual courses.

Research background
Considering the importance of the concept of "satisfaction of online teaching", many researches have been conducted on its constituent factors and this is still ongoing; However, there is still no complete agreement on the number of factors.

• Some studies show that in the field of online teaching, increasing the level of interactions between professors and students increases the level of professors' satisfaction with online teaching (Arbaugh, 2000; Arbaugh and Durai, 2002; Iom, Van and Achille, 2006; Lea, 2008).

• Bolliger and Vasilik (2009) in their article titled "factors affecting professors' satisfaction with online teaching and learning in higher education" concluded that three factors: 1) professors' satisfaction with the organization, 2) professors' satisfaction with students, and 3) professors' satisfaction with themselves. They are considered as the three main components of satisfaction with online teaching among professors.

• Among the studies and research done about online education systems, the technology acceptance model (Davis, 1989) has played the most important role in evaluating the success and effectiveness of these systems and also measuring the satisfaction of their users. This model shows that people's beliefs and attitudes towards technological tools play a decisive role in accepting and using technology. It has also been shown in Davis's model (1989) that variables such as attitude, level of interest, level of interactions, and level of expertise and technical knowledge have a greater impact on the satisfaction level of online teaching than how to use online educational technology.

• Davis, Bagzi and Warshaw (1998) showed in their study that the level of interest and beliefs of online teaching users has a positive and favorable effect on their satisfaction with online teaching and the optimal use of virtual space to achieve educational goals. has it.

• Salim (2007) showed in his study that the effective and efficient use of online educational technology is extremely important for the satisfaction of online teaching and its acceptance by professors.

• Also, studies have shown that the degree of mastery of the professors on the educational content as well as the use of new methods in the field of online teaching has a positive and favorable effect directly on the level of satisfaction of professors and students with online teaching (Hermans, Haitko, Mott -Sternson, 2009).

• In the study of Eyum, Van and Ashil (2006), it was shown that the interaction between professors with each other, professors with students, and students with each other has a positive and favorable effect on the satisfaction level of online teaching.

• In the model presented by Wu, Tennyson and Hasia (2010), it was shown that computer self-efficacy, content mastery, performance expectations, system functionality, interaction between professors and students, and content characteristics as primary and important influencing factors. They are based on the satisfaction of online teaching.

• In the model of Arbaug (2000), which is one of the most important models regarding user satisfaction with online education, it was shown that the flexibility of media tools and the ability to create positive and favorable interaction in the online space by the professor as the most important factors affecting professors' satisfaction with online teaching.

• Ketabchi et al. (2008) evaluated users' satisfaction with virtual education in Tehran University based on Wang's model in a case study. They have their parameters in four categories; Content-related parameters, communication factors, evaluation factors and learning management system factors were divided.

• Yodo, Bagchi and Kaires (2011) designed a questionnaire to measure educational

services in the online space, in which the four dimensions of assurance, empathy, responsiveness and website content are important and effective factors on virtual students' satisfaction with online teaching. were considered

• Son, Tsai, Finger, Chen and Yeh (2008) presented a more integrated and comprehensive model in the study of the factors affecting students' satisfaction with online teaching, in which the six dimensions of students, professors, educational units, technology, design and environment were recognized as the main factors of the model. Also, Son et al. (2008) suggested that when using online space for teaching and learning, the attitude of professors towards computers, the flexibility of virtual courses, the quality of educational units, perceived usefulness and ease of using online space, as well as the variety of methods should be taken into account. Evaluations should be considered as important and influential factors on the satisfaction of online teaching.

On the other hand, in the field of satisfaction with online teaching, tools have been created, some of which are mentioned below: Questionnaire of satisfaction with the effectiveness of online education: this questionnaire was created by Khorasani and Dosti (2013). In this questionnaire, four factors 1) type of technology used and support services 2) content of electronic courses 3) instructor of electronic courses and 4) quality and learning methods in electronic courses as important and effective factors on satisfaction with online education were considered. The validity and reliability of this questionnaire has been confirmed by its creators.

Questionnaire of students' satisfaction with online teaching: This questionnaire was created by Q, Walker, Eschwarder and Biland (2014). In this questionnaire, which was created by Q and colleagues (2014) in order to investigate and predict the factors affecting the satisfaction of teaching in students.

was designed online, it has been shown that four factors 1) satisfaction with learner-instructor interaction 2) satisfaction with content 3) satisfaction with Internet self-efficacy and 4) satisfaction with self-regulation as predictors of student satisfaction in training courses are considered online. The formal and content validity of this questionnaire has been confirmed by experts and the reliability of this questionnaire has been confirmed by Cronbach's alpha method and retest method by its creators.

Questionnaire for measuring students' satisfaction with electronic educational systems: Questionnaire for measuring students' satisfaction with electronic educational systems was designed by Outarkhani and Delavari (2013) to check the level of satisfaction of students of virtual courses of Tehran University with online education systems. Based on the results of qualitative and quantitative surveys and after analyzing the obtained data, it was determined that 4 factors: 1) flexibility of educational units, 2) quality of internet and technology, 3) usefulness and ease of use, and 4) university support services. They have been identified as the main and basic factors and components of satisfaction with online teaching of the virtual students of Tehran University.

Academic Satisfaction Questionnaire of Online Students: The academic satisfaction questionnaire was designed by Farsi et al. (1400) to investigate the degree of satisfaction of nursing students with online teaching during the Corona pandemic period. Based on the results of qualitative and quantitative surveys and after analyzing the obtained data, it was determined that four factors: 1) satisfaction with resources and course materials, 2) satisfaction with the amount of content, 3) satisfaction with evaluation, and 4) satisfaction with goals and The necessary standards have been identified as the main and basic factors and components of satisfaction with online teaching.

Despite this, although there are studies that have investigated the factors affecting the level of satisfaction of online education users, there are still many deficiencies in empirical

research; Especially, there are many deficiencies in the field of detailed examination of service provision and users' satisfaction with online education. On the other hand, there are many defects in this field, why some professors do not want to continue teaching online after the initial experience of teaching online? Also, there are many defects in this field, why are some professors with good interest and persistence not trying to provide an optimal education and teaching in the online space?

On the other hand, it should be noted that in addition to keeping pace with global changes and the speed of technological change, in critical situations such as air pollution, the spread of dangerous infectious diseases, natural disasters, etc., which lead to the closure of schools, information and communication technology tools They can help with education, but this assistance will be helpful when the relevant authorities, especially teachers, have the ability to use them effectively and efficiently. Considering the significant expansion of online education in the world, including Iran, and the increasing use of this method during the epidemic of the Covid-19 disease in Iranian universities, and also considering the pivotal role of professors in educational systems, the necessity of further study In relation to the level of satisfaction of teaching, it is clear on the line. Although it is obvious that online teaching techniques have known benefits, its successful implementation depends on several factors, including the acceptance and satisfaction of professors in using this method. Therefore, according to the flaws and deficiencies that exist in the field of investigating the causes and why of professors' desire to teach online, it prompted researchers to investigate and identify factors affecting the satisfaction of online professors and create Provide a comprehensive tool to measure it. Therefore, according to the above-mentioned contents, the aim of the current research is to establish the validity and reliability of the online teaching satisfaction model among the professors of virtual courses.

research methodology
Subjects and sampling method
The statistical population used to validate the final questionnaire consisted of all the professors of Payam Noor University in the academic year 1402-1401 who participated in one or more online training courses. To validate the models that use the factor analysis method, common sampling formulas are not used, but the theoretical rules provided by experts are the basis of the work (Klein, 2010). There is no consensus among the experts regarding the sample size required for factor analysis; For example, Guilford suggests a minimum sample size of 200 people, Cass and Tensley (1980) 300 people as a suitable figure for factor analysis. On the other hand, Arindel and Vandreind (cited by Klein, 2010) believe that the ratio of 20 subjects to each question is the most desirable sample size. Considering the mentioned recommendations, the minimum sample size of 1200 people (the ratio of 30 subjects for each question) was determined; However, due to the wideness of the statistical population and its dispersion, a much larger number (500) of questionnaires were distributed among the professors, and in the end, 350 questionnaires were completed and collected without defects and became the basis for data analysis.

How to design a questionnaire?
In this article, based on a detailed and comprehensive review of the research literature, many categories were identified. For this purpose, the factors and indicators of the model of satisfaction with online teaching were used by Bolliger and Vasilik (2009). Each category was then converted into one or more practical behaviors. Finally, these behaviors were designed in the form of questions in the form of a "satisfaction with online teaching" questionnaire of the professors of Payam Noor University's online courses. In the next step, categories and behaviors that overlapped and had the same meaning were expressed as one

category or behavior. In total, about 340 propositions were proposed. In the next step, the existing categories were presented as practical examples of "satisfaction with online teaching" behavior. In order to evaluate the constructed model, experts in psychology, educational sciences, and professors of Payam-Noor University, who had a detailed and deep familiarity with the concept of "satisfaction with online teaching", were requested to evaluate the questions of the questionnaire and give their suggestions. transfer The main purpose of this section, which was carried out in the form of qualitative and content analysis, was to examine the comprehensiveness of the "satisfaction with online teaching" model and evaluate its categories and behaviors. Fortunately, this scientific consultation improved the quality and clarity of the questions and confirmed the mentioned model. In the next stage, all the collected categories and propositions were categorized based on their commonalities and finally divided into three main elements or components which are referred to in this section:

• Satisfaction factor with the organization: It shows the level of satisfaction of the professors of the online courses with the way of treatment and provision of educational facilities for teaching by the relevant authorities in Payam-Noor University and consists of four indicators 1- Satisfaction with the behavior and attitude of the officials 2- satisfaction with the level of service provision and 3- satisfaction with the manner of service provision, 4- satisfaction with the level of access to resources and facilities related to online teaching.

• Student satisfaction factor: This category refers to the satisfaction of online course professors with the responsibility and participation of Payam Noor University students in online courses and consists of five indicators 1- The level of student participation 2- How students interact with each other 3- The level of students' mastery of online teaching technologies. 4- The level of students' interest in online teaching. 5- The level of students' access to resources and facilities related to online teaching.

• Self-satisfaction factor: This factor refers to the degree of personal satisfaction of online course professors with the manner and level of presentation of materials in the field of online teaching and consists of six indicators 1- Satisfaction with the level of expertise and mastery of educational content 2- Satisfaction with the level Scientific and practical effort and perseverance 3- Satisfaction with the way of interaction with students 4- Satisfaction with the way of interaction and cooperation with other professors 5- Satisfaction with the level of motivation and attitude in online teaching 6- Satisfaction with the level of self-efficacy in presenting materials.

The initial version of the questionnaire had 30 items and was based on the Likert scale, and the subjects had to choose one of the 5 available options. The questions are scored on a 5-point Likert scale (very high satisfaction=5; high satisfaction=4; moderate satisfaction=3; low satisfaction=2; no satisfaction=1). In the third stage, the initial form of the questionnaire was administered among 350 professors of Payam-Noori who had participated in one or more online courses according to their own statements, and they were asked to express their opinions regarding the meaning of the expressions. After collecting the answer sheets and analyzing them, corrections were made in the initial form of the phrases, so that the writing structure and sentence structure of some of them were changed. In the fourth stage, using the information obtained from the analysis of the initial form of the questionnaire, the middle form of the questionnaire was designed and by distributing them among the final sample, the validation stage of the questionnaire began. Table 1 lists the components and elements of the "satisfaction with online teaching" questionnaire, their definitions and examples of questions in each category.

Table 1. Comprehensive pattern of "satisfaction with online teaching" of online course professors

elements	Definition	sample question
Satisfaction with the organization	shows the degree of satisfaction of the professors of online courses with the way they deal with and provide educational facilities for teaching by the relevant authorities in Payam-Noor University	How satisfied are you with the university's educational facilities for attending congresses and internal and external conferences?
Student satisfaction	refers to the satisfaction of online course professors with the responsibility and participation of Payam-Noor University students in online courses	How satisfied are you with the cooperation of students in online teaching?
Self-satisfaction	refers to the degree of personal satisfaction of online course professors with the way and level of presentation of materials in the field of online teaching	How much is it in the context of issuing notifications, etc.?

Procedure:
This research was descriptive and of the type of psychometric studies. In order to carry out the process of distribution, completion and collection of the final questionnaire correctly and appropriately, in addition to preparing the necessary guide, the questionnaires were distributed nationwide and collected after completion. The method of implementing the questionnaire was that after sampling, the questionnaires were provided to the respondents virtually through email and software such as WhatsApp and Telegram. No explanation about the questionnaire was given to the respondents, because the necessary explanations were included at the beginning of the questionnaire. Also, there was no time limit for completing the questionnaire. After removing distorted questionnaires and questionnaires that had no answers, the number of questionnaires that were statistically analyzed was 345 questionnaires and the statistical data were analyzed using SPSS software package with version 24 and AMOS software. 24 copies were analyzed.

Research findings
Since there is no single method for building and evaluating models such as satisfaction with online teaching by professors, in the present article, the model of satisfaction with online teaching by Bolliger and Vasilik (2009) was used to evaluate the validity of the questionnaire of satisfaction with online teaching by professors.

Internal similarity
Cronbach's alpha method was used to determine the similarity and homogeneity of each questionnaire factor; Because the questionnaire did not have a right or wrong answer and the respondent had to determine his level of satisfaction in a five-point spectrum. Before calculating the final similarity coefficient, in order to develop a small conceptual model that has the lowest amount of indices, it was decided that three indices were kept in each factor and other indices that had a low clean coefficient (less than 0.25) be removed from the agent. In other words, we tried to make the final model and, as a result, the final questionnaire, as short as possible while maintaining its reliability and validity to the desired and satisfactory level; Because, some professors of online courses do not have enough motivation, patience and opportunity to complete the questionnaires (Russell, Pepella and Ferguson, 1978),

therefore, while maintaining the reliability of a scale at the desired level, shortening the questionnaire will increase its efficiency. add Therefore, out of the 15 indicators designed for all factors, 2 indicators of satisfaction with the treatment of officials and the level of students' participation due to their low homogeneity with the set of indicators were removed from the model.

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standard deviation was 0.1.

Table 2. CVI and CVR results of questionnaire questions

Dimensions	question number	CVR	CVI
Satisfaction with the organization	2	٠/٨٨	٠/٧٧
	3	٠/٩٩	١
	4	٠/٩١	٠/٢٢
	5	٠/٩٠	٠/٩٩
	9	٠/٥٥	٠/٥٥
	11	٠/٩٣	٠/٨٨
	13	٠/٩٩	٠/٤٤
	15	٠/٥٥	١
	16	٠/٤٤	٠/٩٣
	19	٠/٨٨	٠/٦٦
	20	٠/٩٠	٠/٥٥
	21	٠/٧٧	٠/٨١
	22	٠/٦٦	٠/٥٥
	26	٠/٩٩	٠/٨٨
Student satisfaction	7	٠/٩١	١
	10	٠/٤٤	٠/٢٢
	14	٠/٩١	٠/٩٩
	18	٠/٦٦	٠/٥٥
	23	٠/٦٦	١
	28	٠/٥٥	٠/٩١
	30	٠/٩٩	٠/٨٨
self-satisfaction	1	٠/٩	٠/٤٤
	6	٠/٨٨	٠/٥٥
	8	٠/٤٤	٠/٢٢
	12	٠/٨٨	٠/٦٦
	17	٠/٦٦	٠/٩٩
	24	٠/٥٥	٠/٩١
	25	٠/٩٩	٠/٩٩
	27	٠/٥٥	٠/٥٥
	29	٠/٤٤	٠/٩٩

The results of CVI and CVR indices show that 30 items are suitable for measuring the level of satisfaction of online teaching by experts. These two tests, in fact, determine the necessity of each index, and all the items obtained acceptable coefficients and can be included in the questionnaire. In the next step, exploratory factor analysis was performed.

Table 3. Presuppositions of exploratory factor analysis of professors' online teaching satisfaction questionnaire

Statistics	index values
KMO test	./89
Bartlett's test	27893/678
Significance level	./001

Questionnaire items must be correlated with each other to a certain extent, and excessive correlation causes multiple collinearity, which prevents the extraction of independent factors. To investigate this issue, Bartlett's sphericity test was performed. The significance of Bartlett's sphericity test shows that there is enough correlation in the matrix of materials to

continue the analysis as a test of 3 factors. KMO (Sample Size Adequacy) was used for the appropriateness of the sample size, and a coefficient higher than 0.7 indicates the level of sample adequacy. This questionnaire was checked with 3 factors and as shown in the table below, in total, 47.97% of the questionnaire is explained by these 3 factors.

Table 4. The percentage of explained variance of each factor after varimax rotation

	special value	The percentage of variance explanation	The cumulative percentage of variance	The percentage of shared variance explanation
Factor 1	۱۰/۶۱	۱۹/۹۸	۱۹/۹۸	۹۸/۲۹
Factor 2	۸/۷۸	۱۵/۴۵	۳۵/۴۳	۱۹/۲۳
Factor 3	۶/۷۱	۱۲/۵۴	۴۷/۹۷	۸۱/۱۸

The results of Table 4 show that 47.97% of the items in the professors' online teaching satisfaction questionnaire are explained by these 3 factors. Also, the model is executed in SPSS software and no error occurs. As a result, it can be claimed that the terminal coefficients of the matrix are very close to zero and indicate a strong relationship between the variables and the desirability of factor analysis. In the first column, that is, the specific value of the factor load of each dimension on the main variable, that is, it shows the satisfaction of online teaching of the professors, and in the second column, that is, the percentage of variance explained, the percentage that each dimension can explain of the main variable. to give Therefore, the first factor shows 19.98% and the third factor 12.54% of the total amount of changes in the main variable, i.e., the satisfaction of online teaching by professors, and finally, the third column with the name of the cumulative percentage of the variance of the sum of the variances indicates the percentages of the explanation of the variance of the different dimensions. and as it can be seen, the sum of the percentages of explanation of the first to third factors is 47.97. Also, based on the results of Table 4, the percentage of common variance explanation of the online teaching satisfaction variable for the first factor is 98.29, for the second factor is 19.23, and for the third factor is 81.18.

Test-retest reliability
Magnusson (1356), one of the prominent experts in the field of the basics of creating a questionnaire, believes that the retesting method is the best approach to estimate reliability; Because it can determine the accuracy and stability of the real scores of the subject over time. For this reason, in addition to calculating reliability using the internal consistency method, this method was also used. To do this, the final version of the questionnaire was administered on two occasions with an interval of 2 weeks between 60 professors of Payam-Noor University who, according to their statements, participated in one or more online education courses, and then the Pearson correlation coefficient between the scores obtained from each Two runs were calculated to estimate reliability. The obtained correlation coefficients are, respectively, satisfaction with the organization 0.78, satisfaction with the student 0.75 and self-satisfaction 0.68, and the reliability of the whole questionnaire is 0.82, and all the correlation coefficients obtained at the alpha level of 0.01 0 are significant.

Validity of the questionnaire
Factor validity
Factor validity is a form of construct validity that is performed through factor analysis, and through it, it becomes possible to identify the main factors or constructs of an instrument (Allen and Yen, 2014). The basic assumption in using this method is the existence of an underlying pattern or a special model in determining the relationship between variables,

which appears in the form of a factor in this hypothetical model, and the correlations between variables are related to the instruments that reflect them. , is attributed. Therefore, to accept the validity of a model and as a result the validity of the variables of that construct, it is necessary to show that there is coordination and alignment between these variables (for example, questions or sub-factors). Among the various methods that exist to study the internal structure of a set of variables, confirmatory factor analysis is the most useful method that deals with parameter estimation and hypothesis testing, according to the number of underlying factors of the relationships between the set of variables. To determine the appropriateness of the model by confirmatory factor analysis, the correlation matrix of the questionnaire items (3-factor model) was calculated and in the data analysis, 3 free variables and the rest of the variables were defined for each of the 3 factors. Because based on the designed model, each factor has 5 indicators. In the next step, the maximum likelihood method was used to estimate the parameters of the indicators and factors of the model. The estimated factor weights indicated that all indicators have a significant correlation with their factors and can measure their factors well. It is necessary to explain that the factor weight of most of the questionnaire items was higher than 0.34 and this point shows that all indicators have been successful in measuring their factors. It is worth noting that confirmatory factor analysis yields several goodness of fit statistics to determine how well the models fit the data or how well it explains the covariance between the variables. These statistics test all parameters at the same time to determine which predetermined model best describes the relationships between the observed and latent variables.

Table 5. The goodness of fit statistics of the model and questionnaire "Questionnaire of satisfaction with online teaching of professors"

Indicator	Index	Amounts
Chi-square fit index	Minimum Fit Function Chi – Square.	٦٦٦٦
The average square root index of balances	Root Mean Square Residual.	٠/٠٨
The root mean square index of the standardized balances	Standardized RMR	٠/٠٨
goodness of fit index	Goodness of Fit Index.	٠/٩٩
Modified goodness of fit index	Adjusted Goodness of Fit Index	٠/٧٧
Smoothed fit index	Normed Fit Index	٠/٩١
Unsmoothed index of fit	Non – Normed Fit Index	٠/٩٣
Increasing fit index	Incremental Fit Index	٠/٤٤
Comparative fit index	Comparative Fit Index	٠/٤٤
Abbreviated smoothed goodness-of-fit index	Parsimony Normed Fit Index	٠/٩١
The root mean square error of approximation	Root Mean Square Error of Approximation	٠/٠٢٢

In the following, the description of these indicators and the interpretation of the results obtained in this research will be discussed:

1. Chi-square fit index: The value of chi-square is an index for the null hypothesis of the acceptability of the model in society. A significant chi-square indicates that the model is not acceptable for the data of the society, so large values of chi-square indicate a bad fit and small values of chi-square indicate a good fit of the model. The chi-square fit index is affected by the sample size, so that if the sample size is larger, the chi-square easily reaches a significant level and as a result the model is rejected, and if the sample size is small, it is possible that models that are actually completely contrary to the data are accepted. Therefore, when the sample size is equal to 65 to 300, the chi-square value is a reasonable measure for goodness-of-fit, and for models with a larger sample size, the chi-square is almost always statistically

significant, and considering this issue that Confirmatory analysis of a sample with a large volume is recommended, it is contradictory. Therefore, it is suggested to use the Khedo goodness-of-fit index as a guide and to examine the real differences between the implied and observed correlations in all cases (Klein, 2010). In the present study, the chi-square fit index calculated by Imus is equal to 8546.

2. The root mean square index of the residuals: this index is the square root of the mean squared differences of implied and observed correlations. For this index point, which fluctuates between zero and one, there is no cutoff, so this number should be as small as possible (Klein, 1994). In the current study, the index of the root mean square of the residuals is equal to 0.08.

3. The root mean square index of the standardized residuals: The root mean square index of the residuals has more meaning when the measures are standardized, because in this case it has a common scale and their residuals are almost the same. will be meaningful. The root mean square index of the standardized residuals is equal to the average difference between the predicted and observed variances and covariances in the model based on the standardized residuals, and its value is equal to zero when the model fits perfectly. was found Because it is almost rarely possible to achieve zero in practice, this index should be as close to zero as possible. In the present study, this index is equal to 0.08.

4. Goodness of fit index: This index is equal to the ratio of the sum of the squares of the differences to the observed variances. This index can be considered as a characteristic similar to the square of the correlation coefficient in multivariate regression. For this index, whose value fluctuates between zero and one, there is no statistical test, and the closer it is to one, the better the fit and the model fits the data better (Klein, 2010). In the present study, the calculated value is equal to 0.89.

5. Modified goodness of fit index: The value of this index is the same as the goodness of fit index between zero and one, and the higher its value, the better the fit of the model, which in the present study is equal to 0.87.

6. Smoothed fit index: If the value of this index is between 0.90 and 0.95, it is acceptable and values higher than 0.95 are excellent. The disadvantage of this index is that it is affected by the parameters of the model, and therefore, the more parameters are added to the model, the larger the index will be, and in the present study, its value is equal to 0.91.

7. Unsmoothed fit index: In fact, it is the unsmoothed fit index and is interpreted the same as the softened fit index, and if its value is between 0.90 and 0.95, it will be acceptable. In the present study, its value is equal to 0.94.

8. Increasing fitness index: It is similar to the softened fitness index. In the present study, its value is equal to 0.94.

9. Comparative fit index: This index actually compares the fit of the existing model with the zero model in which it is assumed that the latent variables in the model are uncorrelated with each other. In the present study, its value is equal to 0.94.

10. Softened short fit index: This value, like the adaptive fit index and incremental fit index, should be close to one to accept the desired model. In the present study, its value is equal to 0.91.

11. The root mean square error of approximation: for models that have a good fit, it is less than 0.05, and higher values up to 0.08 indicate reasonable errors for approximation in the community of variables. The models whose value of the root of the estimated variance of the approximation error is 0.1 or more have a poor fit. As a cut-off point, a value smaller than or equal to 0.06 is accepted for the suitability of the model. This index is less affected by the sample size and in this sense more It should be noted that in the present study its value is equal to 0.052.

conclusion

In the age of information, online education has been able to create a fundamental transformation in education by using advanced tools in the field of information technology. Therefore, many educational institutions and centers have turned to using this system to increase the success rate and improve the quality of services. One of the most important advantages of this method is the provision of educational services based on the needs of students and professors, which has made it possible for people to easily benefit from this teaching method regardless of time and place limitations. Therefore, gaining the satisfaction of professors and students in this teaching system is one of the priorities of the managers and designers of this system and is considered one of the most important factors of its success. which includes two types of satisfaction from the point of view of two separate groups, one from the student's point of view and the other from the teacher's point of view. Horvath et al. (2015) and Naveh et al. (2012), believe that satisfaction with online teaching has been emphasized by the American Distance Education Consortium (ADEC) as the most important element determining the success of online learning of learners with online experience. It is considered as one of the five elements for evaluating the quality of online learning identified by the Online Education Consortium. Some studies show that in the field of online teaching, increasing the level of interaction between professors and students increases the level of professors' satisfaction with online teaching (Arbaugh, 2000; Arbaugh and Durai, 2002; Iom, Van and Achille, 2006; Lia, 2008). Boliger and Vasilik (2009) proposed three factors of professors' satisfaction with the organization, professors' satisfaction with students, and professors' satisfaction with themselves as the three main components of satisfaction with online teaching among professors.

In relation to the coefficient of internal similarity of each factor of the questionnaire, it can be concluded that considering the minimum number of materials (3 materials) for each factor, the obtained coefficients are significant; So, Heyer believes that an alpha coefficient above 0.6 will be satisfactory and accepted for the scales that are going through the stages of their evolution. Of course, we should also point out that the amount of internal similarity coefficient is affected by the number of questions and with their increase, the amount of the coefficient also increases (Sharifi, 2017). Therefore, based on the obtained findings, it is concluded that the set of materials of each factor has an acceptable internal similarity. Also, the findings of the research showed that the reliability of the questionnaire in the retest method is also satisfactory. The results obtained from the factor validity also show that all the appropriateness statistics of the questionnaire materials are in a favorable condition and the present questionnaire is saturated with 3 factors and 30 questions and all its questions have a significant factor load in Where they were predicted, they have. The designed questionnaire is distinguished from other questionnaires in the field of online teaching satisfaction for two reasons. First, this questionnaire covers areas of satisfaction that are related to organizational, student, and self-satisfaction. Second, each of its questions is derived from a defined index, and this issue makes the professors' "satisfaction with online teaching" based on a theoretical framework. Finally, it can be said that according to the reliability and validity results, this questionnaire is a relatively suitable tool for measuring the threshold of "satisfaction with online teaching" of online course professors at Payam Noor University. Obviously, building a scale to measure an existing structure is extremely difficult and time-consuming if done correctly; For example, the study of the history of the formation of well-known tests in the world, which have a very favorable reliability and validity, shows that their formation lasted for more than a decade, while the evolution process They continue.

Offers and Limitations

This research, like other researches, faced some limitations, such as the fact that self-reporting tools were used in the current research, it is possible that people did not use full honesty and accuracy in expressing their problems and answering the questionnaires. Due to

the influence of human factors, there have been some limitations in the research results in this regard. Another limitation of the present study is that this study was conducted on the professors of Payam-Noor University's online courses, so the results obtained cannot be generalized to other samples or should be done with caution. Also, it should be kept in mind that the present research was conducted in Iran, and if people in other countries want to use this questionnaire, they must check its authenticity and validity. Another major limitation was that this questionnaire is dependent on the culture of the Islamic Republic of Iran and the professors of Payam-Noor University, and the questions of the questionnaire were compiled and adjusted accordingly.

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