Apuntes 91, 149-176
ISSN: 0252-1865
eISSN: 2223-1757
doi: 10.21678/apuntes.91.1318

Article received on June 25, 2020
Article approved for publication on September 2, 2021

Proposal, development, and validation of the Distance Higher Education Service Quality (DIHESQ) scale

LUIS ARAYA-CASTILLO
Facultad de Economía y Negocios, Universidad Andrés Bello
luis.araya@unab.cl

MERCÈ BERNARDO
Facultad de Economía y Empresa, Universidad de Barcelona
merce.bernardo@ub.edu

FRANCISCO A. GANGA CONTRERAS.
Facultad de Educación y Humanidades, Universidad de Tarapacá
franciscoganga@uta.cl

NICOLÁS BARRIENTOS ORADINI
Escuela de Administración y Negocios, Universidad Miguel de Cervantes
nbarrientos@corp.umc.cl

Abstract. Higher education sectors have reached high levels of competition. Some universities are now offering study in non-traditional modalities such as distance learning. Various scales have been proposed to measure service quality in higher education, but few focus on the distance modality (non-traditional modality). This study is intended to fill this gap. It focuses on the proposal, development, and validation of a scale of service quality measurement in distance higher education, called Distance Higher Education Service Quality (DIHESQ). A three-stage methodology is applied. First, the DIHESQ measurement scale is proposed, assuring content validity; later a unidimensionality analysis is conducted; and finally, the scale's psychometric properties are analyzed. It is concluded that the DIHESQ model is second order, reflective, and multidimensional, and is composed of the following dimensions: (a) teachers and teaching; (b) curriculum plan and study material; (c) evaluation and feedback; (d) administration and organization; (e) functional platform; (f) emotional platform; (g) institution support; and (i) social and labor.

Keywords: Distance education, service quality, model, proposal, development, validation.

1. Introduction

Institutions that offer distance higher education serve different groups of students (Delgado-Almonte, Bustos, & Pedraja-Rejas, 2010). Consequently, factors such as space and time, occupation, or level of the participants do not condition the process of teaching–learning (Moreira, Reis-Monteiro, & Machado, 2017; Gil Villa, Urchaga Litago, & Sánchez Fernández, 2020; Tejedor et al., 2020). This mode of learning broadens the perspectives of the universities themselves in terms of expenses and generation of resources (Ganga-Contreras, Díaz-Barrios, & Borjas, 2020) thanks to developments in education that stem from innovative use of social networks (Caldevilla-Domínguez, Barrientos-Báez, & Padilla-Castillo, 2021; Gonzálvez-Vallés et al., 2021; Martínez-González, Parra-López, & Barientos-Báez, 2021), all of which leads to the so-called "society of infoxication" (Barrientos-Báez et al., 2021).

Despite these very positive realities and projections, distance education has received criticism over several perceived disadvantages: that the level of academic quality is lower, that learning depends on how responsible the students are, and that there are problems related to interaction (for example, Salmerón-Pérez, Rodríguez-Fernández, & Gutiérrez-Braojos, 2010; Buil et al., 2012; Sena Rivas et al., 2019). Nevertheless, in the Chilean case, the number of such programs on offer from accredited institutions has increased. This has lowered the cost of tuition and, consequently, opened up access to higher education for more students (Barrientos Oradini & Araya-Castillo, 2018).

In these circumstances, levels of accreditation—directly related to the quality measured—are useful for the actors involved since they allow for evaluation of differences between institutions (Jiménez-Bucarey, Araya-Castillo, & Rojas-Vallejos, 2020). For this reason, accreditation is a factor that influences educational institutions' decision-making and emphasizes the continual improvement of academic offerings and the quality of service provided (Barrientos Oradini & Araya-Castillo, 2018).

In order to deal with these weaknesses, various authors propose improvements to deal with the challenges of distance higher education, such as the use of transformative educational strategies or the incorporation of discussion forums or other information technologies (Keegan, 2011; Buil et al., 2012). Nevertheless, the proposed improvements to distance education are not based on analysis of students' perceptions regarding the quality of the services offered (Martínez-Argüelles, Blanco, & Castán, 2013).

This state of affairs has strategic repercussions in that distance education programs require adequate quality of service evaluations because given ongoing technological, global, social, and regulatory changes as well as the

increasing competition between participating institutions (Araya-Castillo & Rivera-Arroyo, 2021). This is important since there is recognition in the literature that the conception of quality in higher education should be applicable to and required of all modalities of learning, though it should be differentiated according to each (Jung, 2011).

Service provided in the virtual learning environment has two notable characteristics (Martínez-Argüelles et al., 2013): 1) pure service, which is not manifested in specific transactions, but rather in prolonged interaction over time; and b) complex service, including teaching and other complementary services.

At the same time, in distance education, technological mediation is important since it allows the teaching–learning process to take place without taking into account the limitations that can be created by place, time, and space (Bersin, 2004). In addition, in distance education, the main actor is the student and not the professor, since the teaching methodology is based on self-learning (Grow, 1991).

There are different models for measuring service quality in virtual contexts but these have rarely been applied to the field of higher education (Martínez-Argüelles, Castán, & Juan, 2010; Martínez-Argüelles et al., 2013; Araya-Castillo & Bernardo, 2019). This is relevant since universities that offer programs in non-traditional formats need to find out which criteria students use to evaluate them and determine their relative importance to them (Nath & Zheng, 2004). However, to be able to do this, university governance needs to be rethought in line with new organizational optics that focus on these issues (Brunner, Ganga-Contreras, & Rodríguez, 2018; Brunner et al., 2019; Ganga-Contreras et al., 2019; Castillo & Ganga-Contreras, 2020).

Martínez-Argüelles et al. (2010) and Martínez-Argüelles et al. (2013) study service quality in distance higher education. However, their findings are not generalizable because they only take into account students from one Spanish university, the Universitat Oberta de Catalunya.

Other scales that measure service quality in higher education (in-person or distance) can be found in the literature, but these are limited to specific university services such as the library (O'Neill & Palmer, 2003) or the quality of virtual learning in an online course (De Lange, Suwardy, & Mavondo, 2003; Udo, Bagchi, & Kirs, 2011). Other studies are exploratory (for example, LaBay & Comm, 2003; Ehlers, 2004; Greasley & Bennett, 2004). Some studies propose their own scales that analyze satisfaction with specific services, but they do not always enable identification of the construct dimensions (Martínez-Argüelles et al., 2013).

Keeping in mind the limitations of previous research, this study concentrates on proposing, developing, and validating a measurement scale for distance higher education. This endeavor is relevant for Chile, a country that has responded to changes in the global economy through an export-driven model of development (López & Yadav, 2010; O'Ryan et al., 2010) and its higher education sector recognized the need to diversify its academic offerings and its student body (Brunner & Uribe, 2007).

The results obtained here will be of interest beyond Chile, since higher education currently displays similar dynamics in various countries (Larraín & Zurita, 2008). This is particularly important given that of all services, higher education is arguably the most directly related to societal growth and socioeconomic development (Senthilkumar & Arulraj, 2011) because the creation of knowledge is a central element in improving quality of life and accelerating progress (Sebastián, 2007).

2. Methodology

2.1 Structural equation models

Structural equation models (SEMs) analyze causal and noncausal relationships between variables chosen as indicators of constructs, excluding measurement errors from the analysis (Batista-Foguet & Coenders, 2000). These models are from a family of multivariant statistical models that make it possible to estimate the effect of and the relations between multiple variables (Kahn, 2006; Ruiz, Pardo, & San Martín, 2010). Nevertheless, unlike other multivariant techniques, structural equation models can estimate and evaluate the relationship between non-observable constructs, generally referred to as "latent variables" (Cupani, 2012).

In the literature, structural equation models are sometimes known by other names (Ruiz et al., 2010; Escobedo Portillo et al., 2016): multiple regression with multicollinearity; confirmatory factorial analysis; complete causal models with latent variables; multilevel models; multigroup models; ANOVA, ANCOVA, MANOVA, and MANCOVA models; analysis of covariance structures; and LISREL analysis.

This study employs confirmatory factorial analysis (CFA) since this technique can be used to verify the existence of a theory or a hypothesis, established a priori through the formalization of a measurement model that is tested (Fernández Pulido, 2008). This done, CFA allows for correction or corroboration of the deficiencies on exploratory factorial analysis (EFA), should these exist, leading to improved comparison of the specified hypotheses. In addition, CFA analyses the matrix of covariance instead of

correlations, which helps to confirm whether the indicators are equivalent (Escobedo Portillo et al., 2016).

2.2 Methodological tools

Numerous articles and books explain how a scale is constructed (for example, Deng & Dart, 1994; Nunnally & Bernstein, 1994; Haynes, Nelson, & Blaine, 1999; Netemeyer, Bearden, & Sughash, 2003). The recommended steps and procedures vary from author to author, according to the measurement objectives and goals, although most studies share a set of instructions for creating a scale. To assure a DIHESQ scale that has sufficient validity and reliability, we employed a variety of methodologies at the different stages, each of which are supported by the literature (for example, Jöreskog & Sorbom, 1993; Deng & Dart, 1994; Batista-Foguet & Coenders, 1998; Hair et al., 2005). The first stage entailed the construction of a measurement scale intended to assure the validity of the content so as to then prepare the questionnaire and collect data from a representative sample (Deng & Dart, 1994). In the second stage, the data obtained were used to verify that each of the constructs presented sufficient degrees of unidimensionality (Hair et al., 2005). The third stage involved an analysis of the psychometric properties of the measurement scale. At this stage, the model's overall goodness of fit of the model was analyzed and then an effort was made to improve statistical significance through the application of various indicators (Jöreskog & Sorbom, 1993; Batista-Foguet & Coenders, 1998). The Mplus (version 7.4) statistical modeling program was used for analysis of the data. The advantage of Mplus is that models can include latent continuous variables, latent categorical variables, or a combination of both.

2.3 Design and model selection

This is a cross-sectional study with a causal conclusion (Malhotra, 2004). The fieldwork was carried out between March 2014 and February 2015. Non-probability convenience sampling was used (Malhotra, 2004) but the sample is representative in terms of geographic area, gender, type of institutions, and type and area of study. A structured questionnaire was administered to 688 distance higher education students in Chile whose programs used e-learning, blended learning, and distance learning modalities. The questionnaires were administered through the Survey Monkey platform. Of the total 688 surveys, 622 were valid.

Of those surveyed, 54.8% were male, the average age was 38.1, and 27.3% lived in the Santiago Metropolitan Region. The students were enrolled in the following programs: Master's degrees (58.2%), Bachelor's degrees (17.5%), professional degrees (9.8%), diploma programs (4.0%),

second professional degrees (3.5%), continuing education (2.9%), specialization (1.6%), postgraduate (1.4%), and training courses (1.1%). The breakdown by subject area is as follows: economics and business (54.2%), education (31.3%), social sciences (4.7%), medicine (3.9%), public policy (3.5%), and engineering (2.4%). The minimum size required for the sample was defined using the criteria recommended in Hair et al. (2005). This consists of an equivalent of five observations per estimation parameter—the ideal is to reach 10 observations per parameter. From this perspective, the sample obtained is larger than the optimum size, with 12.4 observations per parameter. None of the variables had missing values of more than 3% and these were randomly distributed among the cases without any pattern (Olinsky, Chen, & Harlow, 2003).

The questionnaire was administrated at eight Chilean universities that provide distance education. These universities are located in the north, central, and south regions of the country as well as the Santiago Metropolitan Region. They are public, wholly private, or private universities that receive government funding.

A pretest was conducted with a random sample of 80 students. Using this data, an exploratory factorial analysis of the principal components with varimax rotation was carried out (Hair *et al.*, 2005) in order to verify that each of the dimensions exhibit sufficient levels of unidimensionality, which means that they measure only a single construct.

2.4 Validity and reliability

A correct model adequately predicts reality; that is, it leads to reduced and random differences among observed variances and covariances and those implied by the model (Batista Foguet & Coenders, 2000). To verify whether a model is correct, it is necessary to analyze its indicators of validity and reliability.

The test for a model's reliability analyzes whether it is free of random errors and, consequently, provides stable and consistent results (Sarabia, 1999). Reliability is a necessary but not sufficient condition for the validity of a measure. This is the case because validity analyzes the degree to which an instrument measures the concept studied (Bohrnstedt, 1976).

This study uses Nunnally's (1978, 1987) classification of validity, whereby validation has three characteristics:

- Content validity, which refers to the degree to which the measure captures the content of the concept and topic studied.
- Construct validity, which evaluates the degree to which the instrument reflects the theory of the phenomenon or the concept being

measured (here, convergent validity signifies that the same phenomenon measured in various ways produces similar results; in turn, discriminatory validity, or divergent validity, measures the degree to which the instrument can distinguish between the individuals or populations that are expected to be different).

- Criterion validity, which refers to the level of efficacy with which a variable can be predicted through the measure used; this type of validity explores whether the construct measured by proposed indicators is related to other predictable theoretical concepts (concurrent or predictive).

3. Results

3.1 Model proposed

An exhaustive literature review was conducted before preparing the proposed DIHESQ model. The scale that was prepared on the basis of the literature review and was then refined using the exhaustive analysis recommended by De Wulf and Odekerken-Schroder (2003). A semi-structured questionnaire was administered to 80 individuals who were studying via distance education. It was a non-probabilistic convenience sample (Malhotra, 2004) and was made up of students (and former students) from different universities and types and fields of study. In this questionnaire, students were asked to write down the 20 factors that they considered most relevant for evaluation of the service quality of distance education. At the same time, qualitative tools were used to analyze the phenomenon in more depth than is possible when using quantitative tools (Denzin & Lincoln, 2000). Twenty-two in depth interviews were conducted as well as four focus groups (made up of five individuals each). The purpose was to discover how students perceived the concept of "service quality" and the factors they considered relevant for evaluating it. The number of interviews and focus groups was based on saturation of the category (Denzin & Lincoln, 2000).

Eight experts in distance higher education were also consulted. They were asked to fill out a semi-structured questionnaire, stating what factors they thought the students considered important when evaluating service quality. This information was used to validate the results obtained from the semi-structured questionnaire administered to students. In addition, detailed interviews were carried out with four of the experts in order to better understand the perspectives of the universities. The DIHESQ model was prepared using all the input gathered and was based on the assumption that service quality in distance higher education is a multidimensional construct.

The model is configured by the following dimensions: "professors and teaching" (for example, Tan & Kek, 2004; Torres & Araya-Castillo, 2010; Icli & Anil, 2014); "curriculum plan and study materials" (for example, Entwistle & Tait, 1990; Capelleras & Veciana, 2004; Jain, Sahney, & Sinha, 2013); "evaluation and feedback" (for example, Hill, 1995; Casanueva, Periáñez, & Rufino, 1997; Douglas, McClelland, & Davies, 2008); "administration and organization" (for example, Morales & Calderón, 1999; Holdford & Patkar, 2003; Sultan & Wong, 2011); "functional platform" (for example, Martínez-Argüelles et al., 2010; Udo et al., 2011; Akbariyeh, 2012); "emotional platform" (for example, Childers et al., 2001; Song & Zhinkan, 2008; Bernardo, Marimon, & Alonso-Almeida, 2012); "institutional support" (for example, Hampton, 1993; Martensen et al., 2000; Gruber et al., 2010); and "social and labor" (for example, Pereda, Airey, & Bennett, 2009; Sutarso & Suharmadi, 2011; Martínez-Argüelles et al., 2013).

The DIHESQ scale is composed of 50 indicators. All the questions were written as affirmations and those surveyed had to respond based on the Likert scale of 1 (strongly disagree) to 5 (strongly agree). The concept of service quality is measured from the perspective proposed by Cronin and Taylor (1992) in their SERVPERF scale. This scale measures service quality by taking into account only the perception of the consumer and not expectations (see Table 1).

Table 1
The measuring scale of the DIHESQ model

Questionnaire	Items
Professors and teaching (PROF)	
Professors respond rapidly to students' questions	Prof1
Professors maintain ongoing communication with students	Prof2
Professors respond clearly to students' questions	Prof3
Professors are respectful when responding to students' questions	Prof4
Professors have sufficient knowledge of the course content	Prof5
Professors encourage students to participate by asking them questions	Prof6
Professors are concerned about students' learning process	Prof7
Curriculum plan and study material (PCME)	
The study material is written clearly	Pcme1
The course materials contain up-to-date knowledge	Pcme2
The course material includes knowledge that can be applied in the professional sphere	Pcme3
The study plan (curriculum) is excellent	Pcme4

The program of study has broad relevance to the employment sphere extensive employment potential	Pcme5
The program of study is sufficiently long	Pcme6
The study plan (curriculum) meets the requirements of the labor market	Pcme7
Evaluation and feedback (EFEED)	
Grades are provided quickly	Efeed1
The feedback provided with grades is excellent	Efeed2
The level of difficulty of tests is appropriate	Efeed3
The tests deal with the content of the materials studied	Efeed4
The workload in the various courses is appropriate	Efeed5
The format of the questions in the tests adequately measures knowledge of the subject	Efeed6
Administration y organization (AORG)	
The various activities in the program of study are duly planned	Aorg1
The dates set for the various activities in the program of study are always fulfilled	Aorg2
Administrative staff respond quickly to student inquiries	Aorg3
Administrative staff stay in constant contact with students	Aorg4
Administrative staff are respectful when responding to students' inquiries	Aorg5
Administrative staff are concerned about the problems of students	Aorg6
Administrative staff resolve students' needs efficiently	Aorg7
Functional platform (PFUN)	
The virtual platform is easy to use	Pfun1
The virtual platform never poses problems when downloading study material	Pfun2
The virtual platform has an attractive design	Pfun3
The virtual platform is always available (with a connection)	Pfun4
The virtual platform facilitates communication between students and professors	Pfun5
The virtual platform provides up-to-date information about the dates of activities and tests	Pfun6
Emotional platform (PEMO)	
I enjoy using the virtual platform	Pemo1
When I use the virtual platform, I lose track of time	Pemo2
I feel confident that my personal information (for example, home address and telephone numbers) is not shared with other platform users	Pemo3
I feel relaxed when I use the virtual platform	Pemo4
I feel good when I interact with classmates on the virtual platform	Pemo5
I like it better when professors and students participate simultaneously in discussion forums	Pemo6
Institutional support (AINS)	
The orientation program organized by the program administrators is excellent	Ains1

The program administrators give appropriate advice to students about how they should go about studying on distance programs	Ains2
The availability of different evaluation options (for example, examinations that can be taken on different dates, assignments taken into account in the final grade, etc.) benefit students	Ains3
The cost of the program of study is appropriate	Ains4
The availability of different program payment options helps students.	Ains5
Sending course materials to the students' homes is a good thing	Ains6
Social and work (SOLAB)	
The provision of group classroom activities is a good thing	Solab1
The university's employment office has information that is up-to-date and useful to students	Solab2
The information published by the program administration about former students is interesting	Solab3
The reputation of the university at which I study is excellent	Solab4
The reputation of the program of study is excellent	Solab5

Source: Prepared by authors.

The process outlined above corresponds to the steps followed in the preparation of theoretical models, because content validity is important at the stage of formulating a measuring instrument (Deng & Dart, 1994).

3.2 Analysis of model unidimensionality

Table 2 demonstrates that the scale has a high level of unidimensionality, since none of the items loaded on the second factor (Hair et al., 2005), the Kaiser-Meyer-Olkin (KMO) are greater than or equal to 0.5 (Malhotra, 2004), the factors have eigenvalue values higher than 1 (Malhotra, 2004), the variance values explained are over 60% (Hair et al., 1998), the indicators present higher factor loading than the minimum required of 0.4 (Larwood et al., 1995), and common variance values with the component (extraction communality) are equal or superior to 0.5 (Hair et al., 1998).

Table 2
Unidimensionality statistics for the DIHESQ model

Dimensions	Items	Factor load	Communality of extraction	Indicators
Professors and teaching (PROF)	Prof1	0.804	0.646	KMO = 0.925
	Prof2	0.878	0.771	Eigenvalue = 5.004
	Prof3	0.885	0.783	Exp.
	Prof4	0.808	0.652	variance (%)
	Prof5	0.806	0.649	= 71.48
	Prof6	0.844	0.713	
	Prof7	0.888	0.789	

Curriculum plan and study material (PCME)	Pcme1	0.847	0.717	KMO = 0.909
	Pcme2	0.774	0.600	Eigenvalue = 4.866
	Pcme3	0.884	0.782	Exp. variance (%)
	Pcme4	0.865	0.748	= 69.52
	Pcme5	0.770	0.593	
	Pcme6	0.787	0.620	
	Pcme7	0.898	0.806	
Evaluation and feedback (EFEED)	Efeed1	0.726	0.527	KMO = 0.880
	Efeed2	0.806	0.650	Eigenvalue = 3.967
	Efeed3	0.859	0.738	Exp. variance (%)
	Efeed4	0.827	0.683	= 66.12
	Efeed5	0.792	0.628	
	Efeed6	0.861	0.741	
Administration and organization (AORG)	Aorg1	0.764	0.584	KMO = 0.917
	Aorg2	0.760	0.578	Eigenvalue = 4.876
	Aorg3	0.870	0.757	Exp. variance (%)
	Aorg4	0.829	0.688	= 69.66
	Aorg5	0.849	0.721	
	Aorg6	0.853	0.727	
	Aorg7	0.906	0.821	
Functional platform (PFUN)	Pfun1	0.803	0.645	KMO = 0.882
	Pfun2	0.758	0.575	Eigenvalue = 3.714
	Pfun3	0.774	0.600	Exp. variance (%)
	Pfun4	0.799	0.639	= 61.90
	Pfun5	0.817	0.667	
	Pfun6	0.767	0.588	
Emotional platform (PEMO)	Pemo1	0.859	0.737	KMO = 0.878
	Pemo2	0.687	0.472	Eigenvalue = 3.717
	Pemo3	0.710	0.504	Exp. variance (%)
	Pemo4	0.848	0.718	= 61.95
	Pemo5	0.812	0.659	
	Pemo6	0.791	0.626	
Institutional Support (AINS)	Ains1	0.844	0.712	KMO = 0.890
	Ains2	0.850	0.722	Eigenvalue = 3.840
	Ains3	0.797	0.635	Variance expl. (%) =
	Ains4	0.771	0.595	63.999
	Ains5	0.790	0.623	
	Ains6	0.744	0.553	
Social and labor (SOLAB)	Solab1	0.825	0.681	KMO = 0.827
	Solab2	0.797	0.635	Eigenvalue = 3.423
	Solab3	0.841	0.708	Variance expl. (%) =
	Solab4	0.801	0.642	68.463
	Solab5	0.870	0.757	

Source: Prepared by authors.

This procedure made it possible to confirm the accuracy of the measurement instrument and verify that it was not necessary to eliminate any indicators.

3.3 Psychometric validation of the model

During the first stage, the adjustment of the DIHESQ model is evaluated. Table 3 demonstrates that the DIHESQ model has adequate levels of overall fit; therefore, the estimated indices fulfill the rules for statistical significance (Orgaz, 2008).

Table 3
Global adjustment statistics of the DIHESQ model

Indices	General rule for acceptance of fit if data are continuous	Statistical result of model	Overall model fit
Chi-squared (χ^2)	Ratio of χ^2 to gl ≤ 2 or 3	1357.117 / 1.070 = 1.268	Yes
Comparative fit index (CFI)	≥ 0.95	0.983	Yes
Tucker-Lewis index (TLI)	≥ 0.95 can be 0 > TLI > 1	0.982	Yes
Root mean square Error of approximation (RMSEA)	< 0.06 to 0.08 with confidence interval	0.060	Yes
Weighted root mean square residual (WRMR)	< 0.90	0.874	Yes

Source: Prepared by authors.

After analyzing the overall fit of the model, the behavior of all the indicators making up the eight dimensions of the DIHESQ model was studied. All the indicators in Table 4 should be part of the model since the factor loadings (standardized coefficients) are significant at a 99% level of confidence (two-tailed p-value).

Taking into account the different latent variables that represent the DIHESQ construct, an improvement process was carried out through a model development strategy (Hair et al., 2005), which involves eliminating the least relevant indicators or variables in order to achieve goodness of fit (Ding, Velicer, & Harlow, 1995). Table 4 shows the results of this process. Three of the criteria proposed by Jöreskog and Sörbom (1993) are taken into account. The first consists of eliminating those indicators that do not show a high level of convergence with their corresponding latent variable (Student's t of less than 2.58). In the second, those indicators with standardized coefficients (λ) of less than 0.5 are eliminated. Finally, indicators that have a linear R^2 of less than 0.3 are eliminated. During the goodness-of-fit process for the model, the variables Prof4 and Aorg1 were eliminated since they had an R^2 of less than 0.3.

Table 4
Statistical indicators of the DIHESQ model

Constructs	Standardized coefficients (λ)	Standard Error	Student's T	Two-tailed p-value	R squared (R^2)
PROF					
Prof1	0.760	0.052	14.553	0.000	0.577
Prof2	0.945	0.017	55.818	0.000	0.894
Prof3	0.938	0.018	52.683	0.000	0.880
Prof5	0.935	0.025	37.643	0.000	0.874
Prof6	0.944	0.020	47.120	0.000	0.891
Prof7	0.955	0.016	60.897	0.000	0.912
PCME					
Pcme1	0.899	0.029	30.993	0.000	0.809
Pcme2	0.824	0.041	20.271	0.000	0.680
Pcme3	0.908	0.027	33.033	0.000	0.824
Pcme4	0.931	0.028	32.704	0.000	0.867
Pcme5	0.825	0.046	18.107	0.000	0.681
Pcme6	0.887	0.039	22.993	0.000	0.787
Pcme7	0.907	0.031	29.412	0.000	0.822
EFEED					
Efeed1	0.895	0.029	30.492	0.000	0.800
Efeed2	0.924	0.024	37.892	0.000	0.854
Efeed3	0.977	0.013	74.507	0.000	0.954
Efeed4	0.839	0.041	20.285	0.000	0.704
Efeed5	0.915	0.025	36.526	0.000	0.837
Efeed6	0.906	0.027	33.571	0.000	0.820
AORG					
Aorg2	0.952	0.028	34.295	0.000	0.907
Aorg3	0.874	0.033	26.294	0.000	0.763
Aorg4	0.866	0.034	25.277	0.000	0.750
Aorg5	0.923	0.025	37.544	0.000	0.852
Aorg6	0.977	0.014	69.233	0.000	0.955
Aorg7	0.953	0.013	71.218	0.000	0.909
PFUN					
Pfun1	0.911	0.026	34.534	0.000	0.829
Pfun2	0.848	0.036	23.573	0.000	0.719
Pfun3	0.825	0.048	17.243	0.000	0.680

Pfun4	0.852	0.037	23.071	0.000	0.727
Pfun5	0.963	0.023	41.679	0.000	0.928
Pfun6	0.860	0.039	22.055	0.000	0.739
PEMO					
Pemo1	0.916	0.024	37.860	0.000	0.839
Pemo2	0.762	0.055	13.734	0.000	0.581
Pemo3	0.816	0.041	19.671	0.000	0.666
Pemo4	0.886	0.028	31.194	0.000	0.785
Pemo5	0.876	0.034	25.784	0.000	0.767
Pemo6	0.913	0.034	26.559	0.000	0.834
AINS					
Ains1	0.916	0.025	36.075	0.000	0.840
Ains2	0.860	0.035	24.679	0.000	0.739
Ains3	0.920	0.029	32.046	0.000	0.846
Ains4	0.768	0.052	14.795	0.000	0.590
Ains5	0.643	0.064	10.032	0.000	0.414
Ains6	0.605	0.065	9.314	0.000	0.366
SOLAB					
Solab1	0.853	0.039	21.961	0.000	0.728
Solab2	0.600	0.075	8.011	0.000	0.360
Solab3	0.756	0.050	15.172	0.000	0.572
Solab4	0.773	0.059	13.194	0.000	0.597
Solab5	0.942	0.026	36.331	0.000	0.887

Source: Prepared by authors.

Table 5 shows that the DIHESQ model is second order, reflexive, and multidimensional (MacKenzie, Podsakoff, & Podsakoff, 2011), and is broken down into the following dimensions: (a) professors and teaching (PROF); (b) curriculum plan and study material (PCME); (c) evaluation and feedback (EFEED); (d) administration and organization (AORG); (e) functional platform (PFUN); emotional platform (PEMO); (g) institutional support (AINS); and (h) social and work (SOLAB).

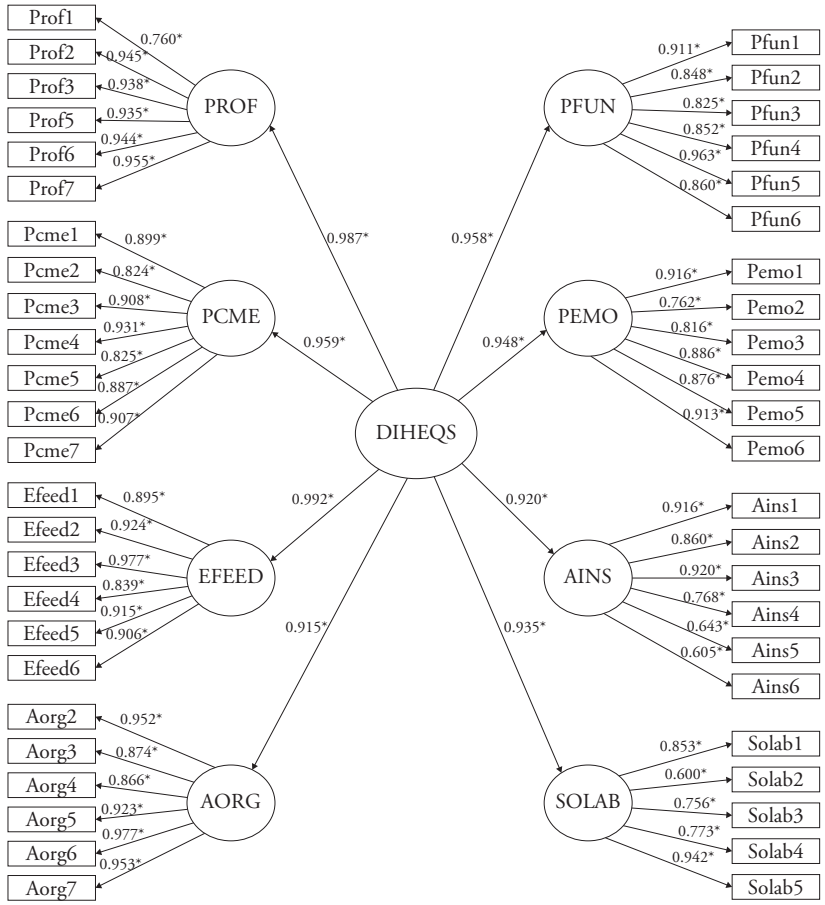
Table 5
Statistics of DIHESQ model dimensions

DIHESQ for	Standardized coefficients (λ)	Standard error	Student's T	Two-tailed p-value
PROF	0.987	0.007	132.508	0.000
PCME	0.959	0.012	78.936	0.000
EFEED	0.992	0.007	147.199	0.000
AORG	0.915	0.021	43.933	0.000
PFUN	0.958	0.012	81.910	0.000
PEMO	0.948	0.013	73.034	0.000
AINS	0.920	0.022	42.379	0.000
SOLAB	0.935	0.020	46.831	0.000

Source: Prepared by authors.

The DIHESQ model is represented graphically in Figure 1. Having reviewed the factor loadings (standardized coefficients), it can be concluded that the two dimensions that contribute most to explaining the dependent variable (quality of service in distance higher education) are EFEED (evaluation and feedback) and PROF (professors and teaching); and the two dimensions that contribute the least to explaining the dependent variable are AORG (administration and organization) and AINS (institutional support).

Figure 1
Optimal model of distance higher education service quality (DIHESQ)



Note. *Significant at 0.01.
Source: Prepared by authors.

In addition, it can be concluded that the DIHESQ model has adequate levels of validity and reliability. In order to determine the reliability, the H coefficient is calculated (Hancock & Mueller, 2001). It can be concluded that the DIHESQ scale has a high degree of reliability because the H coefficient has values higher than 0.9 for each one of the subscales. In addition, the DIHESQ scale has a high degree of reliability, since the values of composite reliability (construct reliability) are higher that the recommended level of 0.7 (Fornell & Larcker, 1981) (see Table 6).

Table 6
Reliability and convergent validity statistics of the DIHESQ model

Constructs	Coefficient H	Construct reliability(ρη)	Average extracted variance
PROF	0.977	0.969	0.838
PCME	0.966	0.961	0.781
EFEED	0.977	0.967	0.829
AORG	0.981	0.973	0.856
PFUN	0.965	0.953	0.770
PEMO	0.954	0.946	0.745
AINS	0.942	0.910	0.632
SOLAB	0.933	0.892	0.629

Prepared by authors.

In order to measure the validity of the DIHESQ scale, it was ascertained that its content validity is already assured because the subscales used to measure the DIHESQ were designed on the basis of a detailed analysis of the literature. Later, the proposed scales were submitted for evaluation and discussion with experts and for validation by distance higher education students.

The validity of the construct was verified taking into account the convergent validity and the discriminant validity of the scale resulting from a confirmatory factorial analysis. The convergent validity was evaluated using the average extracted variance per factor. If this is less than 0.50 then the variance due to measurement error is greater than the variance captured by the construct, and the validity is questionable (Fornell & Larcker, 1981) (see Table 6). The convergent validity was also confirmed by the fact that the average of the standardized loads on a factor is 0.7 or more (Hair *et al.*, 1998) and all the standardized coefficients were statistically significant at 0.01 and greater than 0.6 (Anderson & Gerbing, 1988; Bagozzi & Yi, 1988).

Discriminant validity is crucial to carrying out an analysis of the latent variable (Fornell & Larcker, 1981). Fornell and Larcker (1981) recommend the use of average extracted variance, which corresponds to the mean shared variance between the construct and its measures. This measure should be greater than the variance shared between the construct and the other constructs in the model analyzed. Table 7 shows that the DIHESQ scale fulfills the conditions of discriminant validity.

Table 7
Discriminant validity of the DIHESQ model

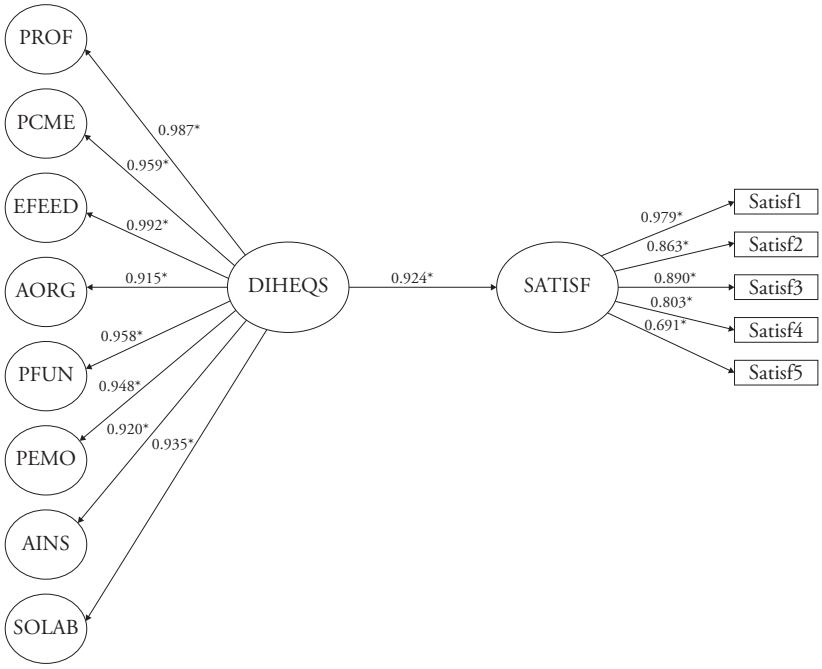
Constructs	Average extracted variance	Pairs of constructs	Common variance between constructs
PROF	0.838	PROF-PCME	0.418
PCME	0.781	PROF-EFEED	0.442
EFEED	0.829	PROF-AORG	0.426
AORG	0.856	PROF-PFUN	0.428
PFUN	0.770	PROF-PEMO	0.424
PEMO	0.745	PROF-AINS	0.475
AINS	0.632	PROF-SOLAB	0.358
SOLAB	0.629	PCME-EFEED	0.587
		PCME-AORG	0.566
		PCME-PFUN	0.567
		PCME-PEMO	0.561
		PCME-AINS	0.630
		PCME-SOLAB	0.475
		EFEED-AORG	0.598
		EFEED-PFUN	0.601
		EFEED-PEMO	0.594
		EFEED-AINS	0.618
		EFEED-SOLAB	0.503
		AORG-PFUN	0.578
		AORG-PEMO	0.573
		AORG-AINS	0.626
		AORG-SOLAB	0.483
		PFUN-PEMO	0.575
		PFUN-AINS	0.629
		PFUN-SOLAB	0.486
		PEMO-AINS	0.623
		PEMO-SOLAB	0.480
		AINS-SOLAB	0.539

Prepared by authors.

Finally, validity in relation to a criteria is ascertained through concurrent validity. To confirm this type of validity, this study proposed a causal relationship widely employed in the literature that suggests that service quality can directly influence consumer satisfaction (for example, Kristensen, Mar-

tensen, & Gronholt, 1999; Subramony, Beehr, & Johnson, 2004; Liu & Yun, 2005). The DIHESQ construct that resulted from a psychometric analysis of the previously analyzed data was used for this analysis, in addition to a scale with sufficient content validity and reliability constructed to measure student satisfaction with their university (coefficient H = 0.970; construct reliability = 0.928). The satisfaction scale (SATISF) had high levels of overall fit, since it fulfilled the criteria of χ^2 (2.920), CFI (0.992), TLI (0.984), RMSEA (0.149), and WRMR (0.391). As Figure 2 shows, there is an evident positive cause–effect relationship between the two variables. This allows us to deduce that the proposed DIHESQ construct demonstrates adequate concurrent validity, which supports the criteria validity of this concept.

Figure 2
Relationship between service quality and satisfaction in the validation of the DIHESQ model



Note. *Significant at 0.01.
Source: Prepared by authors.

Taking into account all the analyses carried out, it can be concluded that the scale proposed to measure the service quality of distance higher education from the perspective of students shows a high level of reliability, validity, and dimensionality.

4. Discussion and conclusions

Through a confirmatory factorial analysis, the DIHESQ model was psychometrically validated. During this process, adequate levels of content validity, construct validity (discriminatory validity and convergent validity) and criteria validity were obtained. The DIHESQ model is multidimensional, second-order, and reflexive, and therefore the latent variable (the service quality in distance higher education construct) gives the observed variables (dimensions of service quality).These results are in line with the literature since majority of the scales to measure service quality are multidimensional, with variation in the number of dimensions (from 2 to 10), according to the context of the service (Asubonteng, McCleary, & Swan, 1996; Ladhari, 2008).

In descending order, the dimensions that contributed the most to explaining service quality in distance higher education are: evaluation and feedback, professors and teaching, curriculum plan and study material, functional platform, emotional platform, social and work, institutional support, and administration and organization.

In non-traditional higher education, the evaluation and feedback dimension is considered critical by students since it is the instrument through which professors discover how much students have learned and if the processes of teaching and learning are being correctly implemented.

At the same time, the professors and the teaching dimension is also important, given that distance education does not allow for a direct relationship between professors and students, and therefore it is expected that professors will respond prudently and effectively to the various matters that come up with students during the course.

Students also value the curriculum plan and study material because in distance education, much of the teaching process falls to the study material, which makes the service tangible and is the basis on which student evaluations are carried out. Furthermore, the study material should be based on a curriculum plan that is attractive and reflects the needs of the labor market.

In addition, students point to the importance of the functional platform dimension, which favors the teaching and learning process by taking into account matters related to ease of use, stability of connections, and attractive design, while also facilitating communication with professors and providing access to important dates and other administrative measures related to academic planning. The emotional platform dimension is included with the latter. It corresponds to the hedonic aspect of the platform since it takes into account matters related with the enjoyment students feel when using the virtual platform or interacting with fellow students; this dimension also

includes not feeling frustrated when using the platform or worrying about sharing private information.

The social and labor dimension is also taken into account. This refers to the support that students receive in their interaction with third parties, whether fellow students (social aspect) and/or the labor market (work aspect). This dimension is also related with the reputation of the university and of the students' academic program.

The institutional support dimension refers to advice provided to students about the specificities of studying through distance education. This dimension also deals with support provided for issues related to the teaching and learning process, financial matters, and evaluation flexibility.

The administration and organization dimension is related to proper planning and fulfillment of academic activities and to students' communication with administrative staff regarding their concerns and whether their problems are resolved with empathy and satisfactorily.

These results are of theoretical importance since there are few studies in the literature that propose, develop, and/or validate models related distance higher education (Martínez-Argüelles et al., 2010; Martínez-Argüelles et al., 2013; Araya-Castillo & Bernardo, 2019). At the same time, the results have practical importance because they can serve as tools for universities to improve the quality of the service they provide and thus improve their positioning in programs as well as the employment expectations of their graduates.

However, there are some limitations that affect the generalizability of the model. First, the process of proposing, developing, and validating the DIHESQ measurement scale entails the challenge of taking into account elements that are relevant to all modalities of learning in higher education (distance, blended, and e-learning). Second, when generalizing the DIHESQ scale, factors that must be taken into consideration include the particularities of each level of study (undergraduate, graduate, continuing education, etc.); the type of institution (public, private with state support, private); and the area of study (administration and business, education, engineering, health, etc.). Third, universities vary in the amount of resources they have, their years of experience in distance education, strategic plans, competitive strategies, type of corporative governance, levels of specialization, administrative models, and teaching and learning processes. This makes it difficult to propose, develop, and validate scales that can be generalizable. Fourth, the perception of students regarding the service they receive is influenced by the characteristics of the higher education sector, such as its level of maturity, degree of concentration, government regulation, the existence

and functioning of regulatory bodies, level of development, and level of specialization. In addition, the measurement scales have to be adjusted to the cultural characteristics of the country in question, such as, language, customs, patterns of behavior, values, and principles and norms of social behavior.

Despite these limitations, this research contributes to knowledge about higher education sectors, and the results obtained can be used as a starting point for research carried out in other cultural contexts, markets, submarkets, areas of education (type or area of studies), or specific universities.

The DIHESQ scale can be used as a starting point for researchers to propose, develop, and/or validate service quality scales. This is because structural equations serve to validate the structure, composition, and relations of the model.

In addition, future research could analyze the cross-cultural validation of the DIHESQ scale; that is, the methodology described in this study could be used in other countries, along with the indicators, structural relations, and sub-scales that make up the model.

Future studies might also focus on the incorporation of other factors that have an impact on students' perceptions of the service they receive. For example, in Chile, students increasingly place great importance on university accreditation, as well as the quality of academic programs.

At the same time, an analysis could be carried out of whether the relative importance of the service quality dimensions varies according to the personal characteristics of the students (age, gender, occupation, income, etc.), modality of non-traditional education (distance, blended, e-learning), level of study (professional degree, diploma course, Master's degree, etc.), area of study (economics and business, education, health, engineering, etc.), and type of university (public, private with state support, wholly private).

References

Akbariyeh, H. (2012). A survey study on affecting factors of students' satisfaction from the electronic services quality of higher education institutions. *International Journal of Natural and Engineering Sciences*, *1*(6), 61-66.

Anderson, J., & Gerbing, D. (1988). Structural equation modelling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411-423.

Araya-Castillo, L., & Bernardo, M. (2019). Calidad de servicio en educación superior a distancia: propuesta de los modelos DIHESQ y SIBDHE. *Revista Espacios*, *40*(44), 12.

Araya-Castillo, L., & Rivera-Arroyo, J. (2021). ¿Cómo las instituciones de educación superior deben enfrentar los nuevos desafíos del entorno? *Revista de Ciencias Sociales (Ve)*, *XXVII*(1), 22-32.

Asubonteng, P., McCleary, K. J., & Swan, J. E. (1996). SERVQUAL revisited: A critical review of service quality. *Journal of Services Marketing*, *10*(6), 62-81.

Bagozzi, R., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of Marketing Science*, *6*(1), 74-94.

Barrientos-Báez, A., Martínez-Sala, A., Altamirano, V., & Caldevilla-Domínguez, D. (2021). Fake news: La pandemia de la covid-19 y su cronología en el sector turístico. *Historia y Comunicación Social*, *26*(Especial), 135-148.

Barrientos Oradini, N., & Araya-Castillo, L. (2018). Educación superior en Chile: una visión sistémica. *Revista Aletheia*, *10*(1), 80-109.

Batista-Foguet, J. M., & Coenders, G. (1998). Introducción a los modelos estructurales. Utilización del análisis factorial confirmatorio para la depuración de un cuestionario. In J. Rendom (Ed.), *Tratamiento informático de datos* (pp. 229-286).

Batista-Foguet, J. M., & Coenders, G. (2000). *Modelos de ecuaciones estructurales (modelos para el análisis de relaciones causales).* Madrid: Editorial La Muralla y Editorial Hespérides.

Batista-Foguet, J. M., Coenders, G., & Alonso, J. (2004). Análisis factorial confirmatorio. Su utilidad en la validación de cuestionarios relacionados con la salud. *Medicina Clínica*, *122*(1), 21-27.

Bernardo, M., Marimon, F., & Alonso-Almeida, M. (2012). Functional quality and hedonic quality: A study of the dimensions of e-service quality in online travel agencies. *Information & Management*, *49*(7), 342-347.

Bersin, J. (2004). *The blended learning book: Best practices, proven methodologies and lessons learned*. Hoboken, NJ: Wiley & Sons.

Bohrnstedt, G. W. (1976). Evaluación de la fiabilidad y la validez en la medición de actitudes. In G. F. Summers (Comp.), *edición de actitudes*. Mexico City: Ed. Trillas.

Brunner, J. J., Ganga-Contreras, F., & Rodríguez, E. (2018). Gobernanza del capitalismo académico: aproximaciones desde Chile. *Revista Venezolana de Gerencia*, *23*(1), 11-35.

Brunner, J. J., Labraña, J., Ganga-Contreras, F., & Rodríguez-Ponce, E. (2019). Idea moderna de universidad: de la torre de marfil al capitalismo académico. *Educación XX1*, *22*(2), 119-140.

Brunner, J. J., & Uribe, D. (2007). *Mercados universitarios: el nuevo escenario de la educación superior.* Santiago de Chile: Ediciones Universidad Diego Portales.

Buil, I., Hernández, B., Sese, F., & Urquizu, P. (2012). Los foros de discusión y sus beneficios en la docencia virtual: recomendaciones para un uso eficiente. *Innovar*, *22*(43), 131-143.

Caldevilla-Domínguez, D., Barrientos-Báez, A., & Padilla-Castillo, G. (2021). Twitter as a tool for citizen education and sustainable cities after COVID-19. *Sustainability*, *13*(6), 3514.

Capelleras, J. L., & Veciana, J. M. (2004). Calidad de servicio en la enseñanza universitaria: desarrollo y validación de una escala de medida. *Revista Europea de Dirección y Economía de la Empresa*, *13*, 55-72.

Casanueva, C., Periáñez, R., & Rufino, J. E. (1997). Calidad percibida por el alumno en el servicio docente universitario: Desarrollo de una escala de medida. In *XI Congreso Nacional Aedem, VII Congreso Hispano-Francés*, *2*, 27-34.

Castillo, J. A., & Ganga-Contreras, F. (2020). Dimensiones propuestas por la teoría de agencia: visiones de expertos sobre el gobierno universitario argentino. *Interciencia*, *45*(4), 1-24.

Childers, T. L., Carr, C. L., Peck, J., & Carson, S. (2001). Motivaciones hedónicas y utilitarias para el comportamiento de compras minoristas en línea. *Journal of Retailing*, *77*(4), 511-535.

Cronin, J., & Taylor, S. (1992). Measuring service quality: A reexamination and extension. *Journal of Marketing*, 55-68.

Cupani, M. (2012). Análisis de ecuaciones estructurales: conceptos, etapas de desarrollo y un ejemplo de aplicación. *Revista Tesis*, *1*(1), 186-199.

De Lange, P., Suwardy, T., & Mavondo, F. (2003). Integrating a virtual learning environment into an introductory accounting course: Determinants of student motivation. *Accounting Education*, *12*(1), 1-14.

De Wulf, K., & Odekerken-Schröde, G. (2003). Assessing the impact of a retailer's relationship efforts on consumer attitudes and behavior. *Journal of Retailing and Consumer Services*, *10*, 95-108.

Delgado-Almonte, M., Bustos, A., & Pedraja-Rejas, L. (2010). Information technologies in higher education: Lessons learned in industrial engineering. *Educational Technology & Society*, *13*(4), 140-154.

Deng, S., & Dart, J. (1994). Measuring market orientation: A multi-factor, multi-item approach. *Journal of Marketing Management*, *10*(8), 725-742.

Denzin, N. K., & Lincoln, Y. S. (2000). *The discipline and practice of qualitative research. Handbook of qualitative research.* Thousand Oaks, CA: Sage Publications.

Ding, L., Velicer, W. V., & Harlow, L. L. (1995). Effects of estimation methods, number of indicators per factor, and improper solutions on structural equation modeling fit indices. *Structural Equation Modeling*, *2*, 119-143.

Douglas, J., McClelland, R., & Davies, J. (2008). The development of a conceptual model of student satisfaction with their experience in higher education. *Journal of Quality Assurance in Education*, *16*(1), 19-35.

Ehlers, U. (2004). Quality in e-learning from a learner's perspective. *European Journal of Open and Distance Learning*, *1*, 73-90.

Entwistle, N., & Tait, H. (1990). Approaches to learning, evaluation of teaching, and preferences for contrasting academic environments. *Higher Education*, *19*(2), 169-194.

Escobedo Portillo, M., Hernández Gómez, J., Estebané Ortega, V., & Martínez Moreno, G. (2016). Modelos de ecuaciones estructurales: características, fases, construcción, aplicación y resultados. *Ciencia & Trabajo*, *18*(55), 16-22.

Fernández Pulido, R. (2008). *Modelos de medida y análisis factorial confirmatorio.* En M. A. Verdugo, M. Crespo, M. Badía & B. Arias. (Eds.), *Metodología en la investigación sobre discapacidad. Introducción al uso de las ecuaciones estructurales. VI Simposio Científico SAID* (pp. 29-42). Salamanca: Publicaciones del Inico, Colección Actas.

Fornell, C., & Larcker D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *J Mark Res*, *18*(1), 39-50.

Ganga-Contreras, F., Díaz-Barrios, J., & Borjas, C. (2020). Políticas de generación de recursos financieros en la universidad pública venezolana. *Interciencia*, *45*(4), 176-182.

Ganga-Contreras, F., Suárez-Amaya, W., Calderón, A.-I., Wandercil da Silva, M., & Jung, H. (2019). Retos a la gobernanza universitaria: acotaciones sobre la cuestión de la autoridad y la profesionalización de la gestión de las universidades. *Revista Fronteiras*, *8*(3), 435-456.

Gil Villa, F., Urchaga Litago, J. D., & Sánchez Fernández, A. (2020). Percepciones y expectativas en el alumnado universitario a partir de la adaptación a la enseñanza no presencial motivada por la pandemia de COVID-19. *Revista Latina de Comunicación Social*, *78*, 65-85.

Gonzálvez-Vallés, J. E., Barquero-Cabrero, J. D., Caldevilla-Domínguez, D., & Barrientos-Báez, A. (2021). Tipsters and addiction in Spain. Young people's perception of influencers on online sports gambling. *International Journal of Environmental Research and Public Health*, *18*, 6152.

Greasley, A., & Bennett, D. J. (2004). A virtual learning environment for operations management: Assessing the student's perspective. *International Journal of Operations and Production Management*, *24*(10), 974-993.

Grow, G. (1991). Teaching learners to be self direct. *Adult Education Quarterly*, *41*(3), 125- 149.

Gruber, T., Fub, S., Voss, R., & Glaser-Zikuda, M. (2010). Examining student satisfaction with higher education services: Using a new measurement tool. *International Journal of Public Sector Management*, *23*(2), 105-123.

Hair, J., Anderson, R., Tatham, R., & Black, W. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River: Prentice-Hall.

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2005). *Multivariate data analysis*, (6th ed.). London: Prentice-Hall International.

Hampton, G. (1993). Gap analysis of college student satisfaction as a measure of professional service quality. *Journal of Professional Services Marketing*, *9*(1), 115-128.

Hancock, G. R., & Mueller, R. O. (2001). Rethinking construct reliability within latent variable systems. *Structural equation modeling: Present and future*, 195-216.

Haynes, S. N., Nelson, K., & Blaine, D. (1999). *Psychometric issues in assessment research.* In P. C. Kendall, J. N. Butcher, G. Holmbeck (Eds.), *Handbook of research methods in clinical psychology*. New York: Wiley.

Hill, F. M. (1995). Managing services quality in higher education: The role of the students as primary consumers. *Quality Assurance in Education*, *3*(3), 10-21.

Holdford, D., & Patkar, A. (2003). Identification of the service quality dimensions of pharmaceutical education. *American Journal of Pharmaceutical Education*, *67*(4), 1-11.

Icli, G. E., & Anil, N. K. (2014). The HEDQUAL scale: A new measurement scale of service quality for MBA programs in higher education. *South African Journal of Business Management*, *45*(3), 31-43.

Jain, R., Sahney, S., & Sinha, G. (2013). Developing a scale to measure students' perception of service quality in the Indian context. *The TQM Journal*, *25*(3), 276-294.

Jiménez-Bucarey, C. G., Araya-Castillo, L., & Rojas-Vallejos, J. (2020). Calidad de servicio como área de investigación en educación superior. *Interciencia*, *45*(7), 329-337.

Jöreskog, K., & Sorbom, D. (1993). *New feature in Lisrel 8*. Chicago: Scientific Software.

Jung, I. (2011). The dimensions of e-learning quality: From the learner's perspective. *Education Technology Research Development*, *59*, 445-464.

Kahn, J. H. (2006). Factor analysis in counseling psychology research, training and practice: Principles, advances and applications. *The Counseling Psychologist*, *34*, 1-36.

Keegan, P. (2011). Transformative e-learning and teaching in mandatory tertiary education. *Asian Social Science*, *7*(11), 66-74.

Kristensen, K., Martensen, A., & Gronholdt, L. (1999). Measuring the impact of buying behaviour on customer satisfaction. *Total Quality Management*, *10*(4-5), 602-614.

Labay, D. G., & Comm, C. L. (2003). A case study using gap analysis to assess distance learning versus traditional course delivery. *The International Journal of Educational Management*, *17*(7), 312-317.

Ladhari, R. (2008). Alternative measures of service quality: A review. *Managing Service Quality*, *18*(1), 65-86.

Larraín, C., & Zurita, S. (2008). The new student loan system in Chile's higher education. *Higher Education*, *55*(6), 683-702.

Larwood, L., Falbe, C., Kriger, M., & Miesing, P. (1995). Structure and meaning of organizational vision. *Academy of Management Journal*, *38*(3), 740-769.

Liu, C. M., & Yun, C. (2005). The multi-dimensional and hierarchical structure of perceived quality and customer satisfaction. *International Journal of Management*, *22*(3), 426-435.

López, R., & Yadav, N. (2010). Imports of intermediate inputs and spillover effects: Evidence from Chilean plants. *Journal of Development Studies*, *46*(8), 1385-1403.

Malhotra, N. (2004). *Investigación de mercados* (4.ª ed.). Mexico City: Pearson Educación.

Martensen, A., Grønholdt, L., Eskildsen, J. K., & Kristensen, K. (2000). Measuring student oriented quality in higher education: Application of the ECSI methodology. *Sinergie – Rapporti di Ricerca*, *9*(18), 371-383.

Martínez-Argüelles, M. J., Blanco, M., & Castán, J. M. (2013). Las dimensiones de la calidad del servicio percibida en entornos virtuales de formación superior. *Revista de Universidad y Sociedad del Conocimiento (RUSC)*, *10*(1), 89-106.

Martínez-Argüelles, M., Castán, J., & Juan, A. (2010). How do students measure service quality in e-learning? A case study regarding an internet-based university. *Electronic Journal of e-Learning*, *8*(2), 151-160.

Martínez-González, J. A., Parra-López, E., & Barrientos-Báez, A. (2021). Millennials' support for tourism development: The effect of market orientation by governments. *Tourism Review*. http://doi.org/10.1108/TR-10-2020-0487

MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. *MIS Quarterly*, *35*(2), 293-334.

Morales, M., & Calderón, L. (1999). Assessing service quality in schools of business: Dimensions of service quality in continuing professional education (CPE). *Cuadernos de Difusión*, *5*(9-10), 125-140.

Moreira, J. A., Reis-Monteiro, A., & Machado, A. (2017). Higher education distance learning and e-learning in prisons in Portugal. *Comunicar*, *51*(XXV), 39-49.

Nath, A., & Zheng, L. (2004). *Perception of e-service quality in e-commerce* (Master's thesis), Lulea University of Technology.

Netemeyer, R. G., Bearden, W. O., & Sughash, S. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, California: Sage Publications.

Nunnally, J. (1978). *Psychometric* (2nd ed.). New York: McGraw-Hill.

Nunnally, J. (1987). *Teoría psicométrica*. Mexico City: Trillas.

Nunnally, J., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

O'Neill, M., & Palmer, A. (2003). An exploratory study of the effects of experience on consumer perceptions of the service quality construct. *Managing Service Quality*, *13*(3), 187-196.

O'Ryan, R., De Miguel, C., Miller, S., & Pereira, M. (2010). The socioeconomic and environmental effects of free trade agreements: A dynamic CGE analysis for Chile. *Environment and Development Economics*, *16*(3), 305-332.

Olinsky, A., Chen, S., & Harlow, L. (2003). The comparative efficacy of imputation methods for missing data in structural equation modeling. *European Journal of Operational Research*, *151*(1), 53-79.

Orgaz, M. B. (2008). *Introducción a la metodología SEM: concepto y propósitos fundamentales*. In M. A. Verdugo, M. Crespo, M. Badía & B. Arias (Coords.), *VI Simposio Científico SAID: Metodología en la investigación sobre discapacidad. Introducción al uso de las ecuaciones estructurales* (pp. 14-28). Colección Actas 5/2008. Salamanca: Publicaciones del Inico.

Pereda, M., Airey, D., & Bennett, M. (2009). Service quality in higher education: The experience of overseas students. *Journal of Hospitality, Leisure, Sport and Tourism Education*, *6*(2), 55-67.

Ruiz, M., Pardo, A., & San Martín, R. (2010). Modelo de ecuaciones estructurales. *Papeles del Psicólogo*, *31*(1), 34-45.

Salmerón-Pérez, H., Rodríguez-Fernández, S., & Gutiérrez-Braojos, C. (2010). Metodologías que optimizan la comunicación en entornos de aprendizaje virtual. *Comunicar*, *34*, 163-171.

Sarabia, F. (1999). *Metodología para la investigación en marketing y dirección de empresas*. Madrid: Ediciones Pirámide.

Sebastián, J. (2007). Conocimiento, cooperación y desarrollo. *CTS: Revista Iberoamericana de Ciencia, Tecnología y Sociedad*, *3*(8), 195-208.

Sena Rivas, W. R., Casillas Martín, S., Barrientos-Báez, A., & Cabezas González, M. (2019). La educomunicación en el contexto de alfabetización de personas jóvenes y adultas en América Latina: estado de la cuestión a partir de una revisión bibliográfica sistemática. *Revista Latina de Comunicación Social*, *74*, 133-171.

Senthilkumar, N., & Arulraj, A. (2011). SQM-HEI – determination of service quality measurement of higher education in India. *Journal of Modelling in Management*, *6*(1), 60-78.

Song, J. H., & Zinkhan, G. M. (2008). Determinants of perceived web site interactivity. *Journal of Marketing*, *72*, 99-113.

Subramony, M., Beehr, T., & Johnson, C. (2004). Employee and customer perceptions of service quality in an Indian firm. *Applied Psychology. An International Review*, *53*(2), 311-327.

Sultan, P., & Wong, H. Y. (2011). Service quality in a higher education context: Antecedents and dimension. *International Review of Business Research Papers*, *7*(2), 11-20.

Sutarso, Y., & Suharmadi, A. (2011). Promotion of e-technology-based services: A case study of e-service quality at a university in Indonesia. *International Journal of Business and Information*, 112-133.

Tan, K., & Kek, S. (2004). Service quality in higher education using an enhanced SERVQUAL approach. *Quality in Higher Education*, *10*(1), 17-24.

Tejedor, S., Cervi, L., Tusa, F., & Parola, A. (2020). Educación en tiempos de pandemia: reflexiones de alumnos y profesores sobre la enseñanza virtual universitaria en España, Italia y Ecuador. *Revista Latina de Comunicación Social*, *78*, 1-21.

Torres, E., & Araya-Castillo, L. (2010). Construcción de una escala para medir la calidad del servicio de las universidades: una aplicación al contexto chileno. *Revista de Ciencias Sociales (Ve)*, *16*(1), 54-67.

Udo, G. J., Bagchi, K. K., & Kirs, P. J. (2011). Using SERVQUAL to assess the quality of e-learning experience. *Computers in Human Behavior*, 27(3), 1272-1283.