

Review Article

Literature Review and Example: Quality of University Services using Servperf and Statistical Techniques to Reduce Variables in Latent Variables

Santiago Domingo Moquillaza Henríquez¹, Miguel Angel Cano Lengua²

¹Academic Department of Computer Science, Universidad Nacional Mayor de San Marcos, Lima, Perú.

²Facultad de Ciencias Matemáticas, Universidad Nacional Mayor de San Marcos, Universidad Tecnológica del Perú, Lima, Perú

²Corresponding Author : mcanol@unmsm.edu.pe

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Abstract - To know the quality of university services, it was necessary to inquire with university students. It is known that to reduce variables in a survey, and there are statistical techniques, such as exploratory and confirmatory factor analysis, to find the most representative items. However, the interaction of these statistical techniques with oriented methodologies to measure the quality of university services was not found in the reviewed literature. Therefore, the objective of the research was to first carry out a literature review study according to the research string, interacting the known statistical techniques with the Servperf methodology and the quality of university services. To investigate, research questions were raised, which were acquitted; also, to consolidate the study as a practical contribution, a model is made with its respective example of how to carry out the reduction of items based on the statistical techniques mentioned, for which a survey was prepared in based on the Servperf methodology, then experts validated these questions, the survey was deployed, and the reliability was seen to do then the exploratory factor analysis and then the confirmatory one so that they were left with the necessary items for the latent variables.

Conclusions: It contributes to the literature review regarding the quality of university services using the model Servperf and statistical techniques like Exploratory and Confirmatory factor analysis; a model is generated that can serve as an example for other investigations.

Keywords - Servperf model, Quality of services, Survey, Exploratory factor analysis, Confirmatory factor analysis.

1. Introduction

According to Castro, see [1]. He tells us: "The setting is an increasingly global village that has become the epicenter of events that impact people's cultural, social, political, and economic lives in various ways." In this global context, universities are the axis of the development of countries; for this reason, they must always be monitoring the quality of university services, with students being the ones who must be inquired about their perception since they are the reason and those who receive the service.

To investigate and collect information regarding the quality of the services provided by the university, the Servperf model will be used; once the survey validated by expert judgment has been focused and reading about the techniques that allow having the most representative questions, the conclusion has been reached that exploratory and confirmatory factor analysis are the most used, in this way, it is ensured that the survey is representative for the decision-making that should be done, as well as giving

priority to the items with the greatest relevance in the various dimensions generated.

The main gap is that no studies combine a model; in this case, ServPerf is oriented towards university quality, and that interacts with statistical techniques such as exploratory and confirmatory analysis to create a submodel which are the main variables for decision making.

The novelty is that applying the research string is based on the Servperf and quality model and the aforementioned statistical techniques. Based on the research questions, it was found that the main attributes and topics to be considered in a student satisfaction survey, likewise the similar models and the statistical techniques that can be used. As a practical contribution, a case study is shown in section 5 to show its application.

This research is carried out because no articles demonstrate the reduction of items in articles related to Servperf oriented to the university environment.



Likewise, based on state of the art, an example model is made as a product of existing research on how to find the latent variables with their respective reliability and validity. Next, you need some concepts such as:

The SERVPERF model, according to [2], tells us: "Cronin y Taylor (1992), with its SERVPERF model. Its name is due to the exclusive attention it pays to performance assessment (SERvice PERformance) for the measurement of service quality. It comprises the same items and dimensions as the Servqual model; the only difference is that it eliminates the part that refers to expectations".

The quality dimension SERVPERF, according to [3], tells us: "Tangible elements: Appearance of physical facilities, equipment, personnel, and communication materials.

1.1. Reliability

Ability to perform the promised service reliably and carefully.

1.2. Responsiveness

Willingness and attention shown by collaborators, especially in conflictive or unforeseen situations.

1.3. Security

Knowledge and care shown by employees and their abilities to inspire credibility and trust. It includes the original dimensions of professionalism, courtesy, credibility, and safety.

1.4. Empathy

Individualized attention that companies offer to their customers. Includes the original dimensions of accessibility, communication and customer understanding".

According to [4], the service quality tells us: "Parasuraman, Zeithaml and Berry made a substantial contribution to the difference between the expectations of the clients of the services and the perceptions of the received service".

It is also expressed according to [5]: "the customer's subjective evaluation of a consumption experience, based on some relationship between customer perceptions and the objective attributes of the product ". In the same way, [6] tells us: "Cronin and Taylor (1992) proposed that the perception of performance are only criteria to measure and define the quality of the service and they drew the SERVPERF model".

The survey is a method that is carried out through interrogative questions, seeking to know aspects related to the groups, see [7].

According to exploratory factor analysis, [8] mentions that: "It is a data reduction technique that is used to find homogeneous groups of variables, where a priori there is no conceptual dependence of some variables on others."

It consists of a statistical technique to reduce variables so that the most representative items of a dimension or factor remain.

According to [9], the confirmatory factor analysis tells us: "Confirmatory factor analysis can be considered as an extension of the maximum likelihood method for factor extraction".

The ethical aspects of research, according to [10], tell us: "Science is based on a series of postulates that later lead it to a supposed truth; for this reason, man is called to search for knowledge through science, but hand in hand with ethical values that lead to humanity to scientific growth".

In the present investigation, the perception of students is taken with the questions valued by experts, as well as its deployment; its reliability is then evaluated to reveal the feeling of quality on the part of the undergraduate student.

2. Review Methodology

To carry out the literature review, focus on the model Servperf model and statistical techniques that allow for to reduction of the number of variables in the survey.

For the systematic review of the methodology of Kitchenham Barbara, see [11]. Which follows the following phases:

- **Planification**
This stage consisted of developing research questions, search protocols and keywords, as well as evaluating resources and creating inclusion and exclusion criteria.
- **Realization**
In this stage, the planning is executed, choosing the primary papers, according to the inclusion and exclusion criteria, established to include or discard articles.
- **Results**
In this phase, the statistics are made based on the research questions. The results are analysed and discussed.

2.1. Review Planning

To have a better idea of the problem of knowing the quality of university services, the following research questions are asked:

Table 1. Inclusion Criteria

Criteria	Reason
Research focus	Studies related to the Servperf methodology with statistical survey techniques to work with the quality services of universities
English language	Only articles in English are considered
Abstracts related to state of the art and some collaterals.	According to the study approach
Articles with impact factor	Only journal articles with sjr impact -factors are considered
Document type	Magazine article Magazine review article
Areas	Generally oriented to university education
Period	From 2022 to 2017

Table 2. Exclusion Criteria

Criteria	Reason
Studies that do not correspond to the research questions	To be able to carry out the statistics of articles related to said questions that will respond to the investigation to be carried out.
It was ruled out by titles; that they did not have the words of the search string	Because if the keywords are not considered, other articles are filtered.
Articles not related to university quality	It must be framed in the research approach.

RQ1: What should be measured to improve the quality of university services?

RQ2: Which models are frequently used to monitor the quality of university services?

RQ3: How to measure the quality of university services?

It was considered for the search in Google Scholar: (quality AND servperf AND ("higher education" OR college OR university OR universit*)) AND " confirmatory factor analysis" AND "exploratory factor analysis"), Filtering by the interval of the last 5 years of 2017 to 2022.

Noting that when using the string, if the name of a repository is placed next to it, for example, ELSEVIER, Articles that are in said repository appear, for example, in Scopus: (quality AND servperf AND ("higher education" OR college OR university OR universit*)) AND " confirmatory factor analysis" AND "exploratory factor analysis") ELSEVIER

To choose the article, the abstract is read, first determined by the title if it corresponds to the research topic.

In other words, the conditions to consider to choose the article, the inclusion criteria Table 1 and the exclusion criteria Table 2 must be considered.

The following Fig. 1 shows the number of articles, filtered based on the search string 541 articles were chosen:

2.2. Realization Questions of Investigation

2.2.1. RQ1 What is measured to improve university status?

“Service quality has been widely recognized as the core value of any higher education institution (HEIs), especially in the context of higher education reform in Vietnam”, see [12]

“The paper aims to assess the student’s perceived service quality using SERVPERF scale and to find the relations between perceived service quality, satisfaction, and loyalty in one public university in Vietnam”, see [12].

“The results showed that the quality of education service mediated the relationship between customer orientation and customer value; the quality of education service fully mediated the relationship between customer orientation and customer value; rapport had a mediating effect on the relationship between customer orientation and quality of education service, but it was found that rapport had no mediating effect in relation to the quality of education service and customer value”, according to [13].

“The non-academic aspect of service quality is the most influential variable in student satisfaction, and student satisfaction strongly influences the institutional reputation. Also, student satisfaction mediates the relationship between non-academic aspects of service quality and institutional reputation”, according to [14].

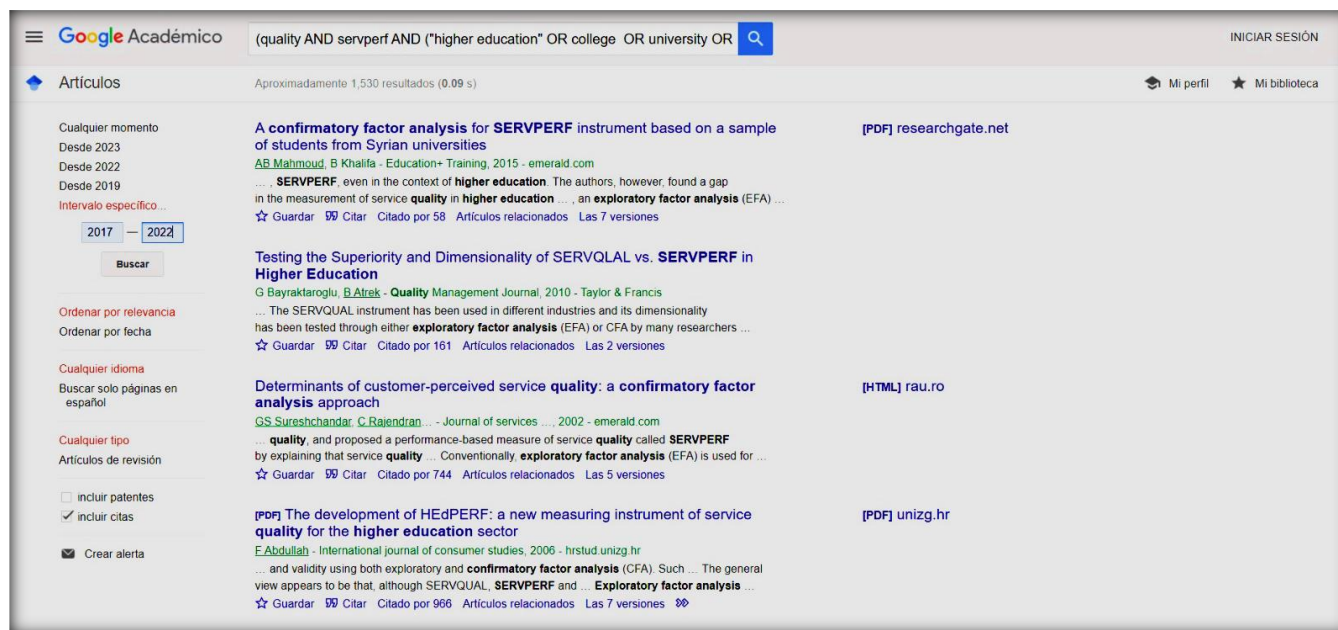


Fig. 1 Filtered string in Google Scholar

“The collected data will then be processed and analyzed utilizing SPSS and AMOS to test the HEDPERF measurement scales for university service quality in an emerging country, Vietnam, and to determine if there are associations between university service quality, student satisfaction, motivation, performance and loyalty as well.”, see [15].

“Five factors explaining 60.335% of the total variance were identified: (1) Teachers, (2) Support academic resources, (3) Administrative support, (4) User interface and (5) Course enrollment”, according to [16].

“A total of eight regulations were proposed: academic/extracurricular activities, infrastructure, faculty research expertise, teaching and learning quality, placement opportunities, marketing and promotion, education cost and social influence. The first four were autonomous motivations, and the remaining were controlled motivations”, according to [17].

“The new model called Islamic Higher Education Service Quality (i-HESQUAL) with seven dimensions of quality that are considered important by students, i.e. teaching capability and competence of academic staff (TCC), reliability of service (ROS), the reputation of university (REP), the responsiveness of employees (RES), empathy of employees (EMP), internalization of Islamic values (IIV) and library service support (LSS)”, according to [18].

“Five dimensions of service quality were identified, namely: General Attitude, Facilitating Elements, Access, Lecture Rooms and Health Services. Results also showed that most students (48.3 per cent) perceived overall service

quality at NUST to be average while 28.6 per cent and 23.1 per cent had a negative and positive perception of overall service quality respectively”, see [19].

“It was ascertained that students ranked KSQDs as follows: Responsiveness, Assurance, Reliability, Tangibles, and Empathy (RARTE), and in terms of their importance, the KSQDs were ranked as follows: Responsiveness, Reliability, Assurance, Empathy and Tangibles (RRAET). Higher education leadership should take note of the KSQDs and focus their resources on these in order to create a student-centric organization”, see [20].

“The findings revealed that higher education institutions (HEIs) should accentuate greater safety value by adjusting their service quality to current students’ challenges of attaining a safe state. The adjustments can strengthen students’ perceived safety, subsequently influencing their satisfaction with HEIs services”, according to [21].

“The findings of the study suggested that teaching skills of the teacher, staff competence, reputation and access have a significant impact on student satisfaction whereas generic skills of teachers and staff attitude do not influence student satisfaction significantly”, according to [22].

“Students’ satisfaction based on the training service quality at universities in Dong Nai province. The results showed five factors affecting the training service quality, including the quality of Human Resources (HR), Training Program (TP), Facilities (FA), Support Services (SUS), and Extracurricular Activities (EA). Besides, the training service quality affects the students’ satisfaction with 1% significance.” see [23].

Table 3. Summary Characteristics of what should be measured in Universities

Author	Attributes	Year
Bui, Ha, Bui, et al.	Satisfaction, loyalty	2022
Kim, H., Lee, Y	quality of education service	2020
Moslehpour, M., Chau, K., Hoang, M., Hanjani, A	service quality, non-academic aspects of service, institutional reputation	2020
Le Tran Lam Tra, Nguyen Thi Le Ha	service quality, student satisfaction, motivation, performance and loyalty	2021
Rotta, D., Usuga, O. & Clavijo, V.	Teachers, Support academic resources, Administrative support, User interface, Course enrollment	2020
Mishra, A., Yousaf, A., Amin, I.	academic/extracurricular activities, infrastructure, faculty research expertise, teaching and learning quality, placement opportunities, marketing and promotion, education cost and social influence	2021
Asnawi, N., Setyaningsih, N.,	teaching capability and competence of academic staff (TCC), reliability of service (ROS), the reputation of the university (REP), the responsiveness of employees (RES), empathy of employees (EMP), internalization of Islamic values (IIV) and library service support	2020
Moyo, A., Ngwenya, N.,	General Attitude, Facilitating Elements, Access, Lecture Rooms and Health Services	2018
Sanyab, S., Govender, K	Responsiveness, Assurance, Reliability, Tangibles, and Empathy, categorized as follows: Responsiveness, Reliability, Assurance, Empathy and Tangibles	2018
Sheng, M., Fauzi, A	their service quality to current students' challenges of attaining a safe state	2022
Singh, S., Jasial, S.,	teaching skills of the teacher, staff competence, reputation and access, satisfaction	2020
Hieu, H, Huan, N, Tan Phong V.	Facilities, Support services, Extracurricular activities	2021
Marimon, F, Machuca, M, Mirabent, J	'skills development, referring to the skills that students might acquire and (iii) 'services and facilities of the university	2017
Springer, M., Tyran, C.,	assess academic advising services	2022
Darawong, Ch, Sandmaung, M	service quality that affects student satisfaction is responsiveness, followed by empathy and facility.	2019

“The aim of this study is twofold. First, we validate a scale to assess the quality of the university experience by students (*UnivQual*).

Three main dimensions are envisioned:

- (i) ‘curriculum’, which refers to the quality of the learning methods and the coordination efforts throughout the whole study period;
- (ii) ‘skills development, referring to the skills that students might acquire and
- (iii) ‘services and facilities of the university’”, see [24].

According to Tyran, see [25] tells us: “This study aims to describe the development and validation of a student survey instrument to assess academic advising services. 1 a well-known instrument for service quality”.

“The model examination result was statistically

acceptable regarding reliability and validity. The strongest dimension of service quality that affects student satisfaction is responsiveness, followed by empathy and facility, accordingly”, see [26].

Table 3 shows all the attributes that the investigations measure.

2.2.2. RQ2 Which models are frequently used to monitor the quality of university services?

According to Tabaku, see [27], “A modified SERVPERF version was used to measure service quality.

This study was designed to find evidence of the HEdPERF scale used for measuring the perceived service quality from the perspective of students in higher education institutions (HEI) worldwide.” see [28].

“This study developed an SEM method based on SERVQUAL, LibQUAL+ and SERVPERF instruments, including 30 items under five service quality dimensions and eight satisfaction items with the 7-point Likert scale to appraise the impact of library service quality dimensions on user satisfaction.”, according to [29].

“Considering students as the key stakeholders in higher education institutions (HEIs), the present study identifies service quality (SQ) indicators from their perspectives and proposes a more comprehensive instrument for measuring SQ exclusively in HEIs. HEISQUAL covers the operational as well as technical aspects of SQ by following a holistic approach, which has largely been ignored in previous studies.”, according to [30].

“In this context, the current study aims to make a comparative analysis of perceived service quality of cab aggregators and traditional public transportation services in the National Capital Region (NCR) using SERVPERF (Service Performance) model.”, according to [52].

“The result of this paper reveals that SERVQUAL is the most widely accepted scale, which dominates in higher education. The paper focuses on revealing the dimensions which are used in past studies.” see [32].

“With the objective to detect the main components of service quality influencing students’ satisfaction, the article uses HEdPERF as a measuring instrument of higher education service quality. Data is collected from 793 students of one of the largest universities in the country”, see [33].

“Reviews the role of students' satisfaction and factors that may influence students' satisfaction and presents the empirical research with the case of Thainguyen University.

The main results are

1. Five factors in the SERVQUAL model influence students’ satisfaction in the order of decreasing importance as follow: Tangible, Assurance, Reliability, Empathy and Responsiveness;

2. The Two-Way Anova test and Tukey Post Hoc Tests show no difference in assessing the satisfaction of male and female students, and 1-year student and 5-year student have a difference in accessing their satisfaction”, according to [34].

“The LibWebSQ is a reliable and valid scale to be used in Nigerian university libraries for web-based service quality measurement”, according to [35].

Table 4 shows the main Models to measure quality, publication year and respective researchers.

Tabla 4. Models to Measure Quality

Author	Methodologies	Year
Tabaku, E	SERVPERF	2018
Silva, D, Marconde de Moraes, H., Mariya ,I., César, F.	HEdPERF	2017
Alam, MD, Mezbah-ul-Islam	SERVQUAL, LibQUAL+ and SERVPERF	2022
Abbas, J.	HEISQUAL	2020
Garima, A., Ashok, K	SERVPERF	2021
Gupta, P., Kaushik, N.	SERVQUAL	2018
Tandilashvili, N.	HEdPERF	2019
Son, H., Ha , N, Khuyen	SERVQUAL	2018
Haruna, B., Kiran, K., Tahira, M	LibWebSQ	2017

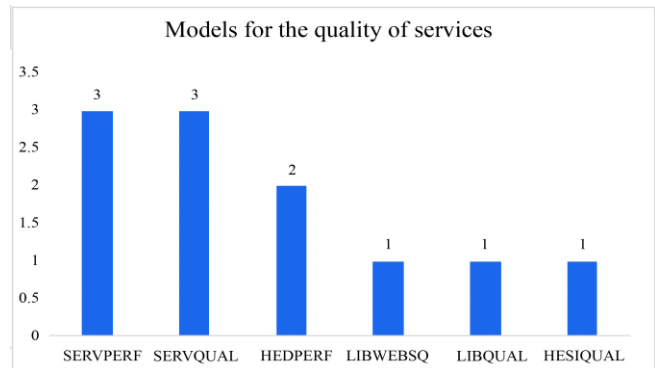


Fig. 2 Frequency of methodologies that address quality

From the review of the literature, the most used models can be seen in Fig. 2.

2.2.3. RQ3 How to measure the quality of university services?

“This research adopts a quantitative approach through a survey method. A structured questionnaire was designed as a means for collecting data. Data were collected from 182 postgraduate students in an Egyptian higher education university. Data were examined by exploratory factor analysis to pinpoint the main irregularities explained by the extracted factors. Then, confirmatory factor analysis was carried out to filter the ratios and empirically test the assessment efficiency of the developed model”, see [36].

“In this study, a three-stage systematic scale development procedure has been adopted. Initially, the extant literature review delineated the construct. Exploratory study techniques like focus group study and expert opinion helped in purifying the scale. In the second stage, principal component analysis with varimax rotation and Kaiser normalization (exploratory factor analysis) was used to refine the scale. Finally, multi-trait-multimethod matrix analysis was done to test the reliability and validity of the scale”, see [37].

“A quantitative survey design was used to collect the data. Structural equation modeling was used to determine the influence of web-based service quality on the three latent constructs. The respondents were students, academic staff, and non-academic staff from two federal universities in the North-western zone of Nigeria”, according to [35].

“The collected data were analyzed using SPSS statistical software, and a confirmatory factor analysis was applied to ensure the discriminant and convergent validities of the model. Correlation and regression analyses were used to test the hypotheses”, according to [38].

“The structural equation modeling was used to analyze the influence of mediating variable and hypotheses testing. The population of this study was fourth-year business students of nine “grade one” private universities in Bangladesh. Data (n = 310) were gathered from students pursuing studies at different private universities in Bangladesh”, see [39].

“Conducted confirmatory factor analysis, exploratory factor analysis and structural equation modeling to test the reliability and validity of scales”, according to [40].

“a 46-item questionnaire was developed and tested with multivariate statistical techniques (exploratory factor analysis and Cronbach’s alpha). In total, 629 students participated in the study.”, according to [41].

According to Mandal, see [42] tells us: “We have randomly surveyed students of pharmaceutical graduation course of the six institutes. We have developed (Employing Exploratory Factor Analysis) and compared the models based on gap and performance scores with the help of indices relevant to Confirmatory Factor Analysis (CFA) and validated by carrying out Ordinary Least Squares (OLS) considering overall satisfaction as dependent and all explored items for measuring service quality as independent variables.”

“Data analysis included an exploratory factor analysis (EFA) approach followed by confirmatory factor analysis (CFA). A final step was another thematic analysis of narrative data from the only open-ended question, which yielded additional service quality dimensions”, see [43].

“The conceptual model was validated using structural equation modelling. The study makes an innovative theoretical contribution by establishing a relationship between experience-centric brand performance and brand image and the antecedents and consequences of this link. In addition, student satisfaction and trust were demonstrated to mediate the relationship between perceived service quality, brand performance, brand image and behavioural intention in a higher education context”, see [53].

Table 5. Statistical Techniques

Author	Techniques	Year
Khalad, M., & Khoursed, N.	Exploratory factor analysis	2017
Verma, S., Prasad, R.	Structural equation modeling	2017
Weerasinghe, I, Fernando,R.,	Confirmatory factor analysis	2018
Osman, A, Saputra, S.,	The structural equation modeling	2019
Lois, A., Chakrabarti, S.	confirmatory factor analysis, exploratory factor analysis and structural equation modeling	2022
Da Silva,A., Gôuvea,M., Semensato, B., Lhamas, F	multivariate statistical techniques, Cronbach’s alpha	2022
Mandal, K., Gupta, H.,	Exploratory Factor Analysis, Confirmatory Factor Analysis	2019
Schalkwyk, R, Steenkamp, R.	exploratory factor analysis, confirmatory factor analysis	2020
Sultan, P, Wong, Ho	structural equation modelling	2019
Sidi, L	structural equation modeling	2018
Chaudhary, S., Kumar Dey, A,2021	Exploratory and confirmatory factor analyses, Structural equation modelling	2021

“Based on responses from 568 students at Qatar University, the hypotheses were tested using structural equation modeling (SEM). The results demonstrated that reputation and academic aspects are the only dimensions that affect students’ emotional attachment positively”, according to [45].

Exploratory and confirmatory factor analyses were used to validate the instruments. Structural equation modelling was used to examine the associations between the constructs”, according to [46].

The Table 5 shows the most used techniques, publication year and respective researchers and the figure 3 shows the techniques of this RQ3.

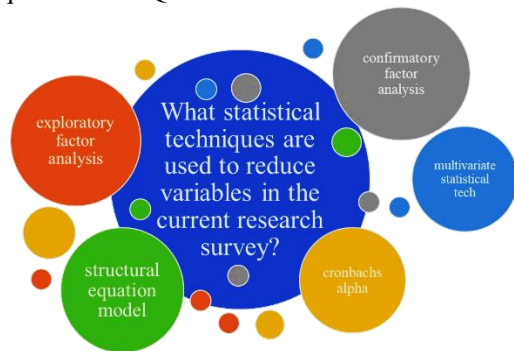


Fig. 3 Frequency of statistical techniques

2.3. Results

As the literature review is analysed, the topics must be considered to develop a satisfaction survey, models, and statistical techniques to reduce the questionnaire and keep the most representative questions.

The information is of quality articles; it can be seen in Fig. 4 and Fig. 5. Fig. 4 shows the quality of the journals. Fig. 5 shows journals by year. Likewise, Fig. 6 shows the repositories elected.

The articles have been chosen from the repositories, the articles found in Emerald ScienceDirect and Springer were found in Scopus.

From the literature review, it is observed that Servqual and Servperf are the most used, emphasizing that Servperf comes from Servqual; the difference is that expectations are not considered, making it easier to get results than to have a photograph in the case of the present investigation.

Regarding the dimensions of these models. They revolve around Tangibility, Reliability, Sensitivity, Security, and Empathy.

Work is done to measure based on statistical techniques, being the exploratory, confirmatory analysis, the surveys, statisticians to observe the internal consistency, and the validity of the questionnaire of questions.

The information has been obtained from high-level magazines and important and current repositories.

Quality Assurance in Education is the journal that contributes the most to university education in the present research.

The quality of the services affects satisfaction, which

must be constantly monitored. For this, surveys are necessary to study the attributes of the first research question. RQ1.

It is observed from the initial chain Fig. 1 that there is a wide range of research regarding the statistical techniques used to measure the quality of services.

The student perceives the quality of services expressed in the survey, generating a level of satisfaction based on which decisions are made; it can be seen in Fig. 7.

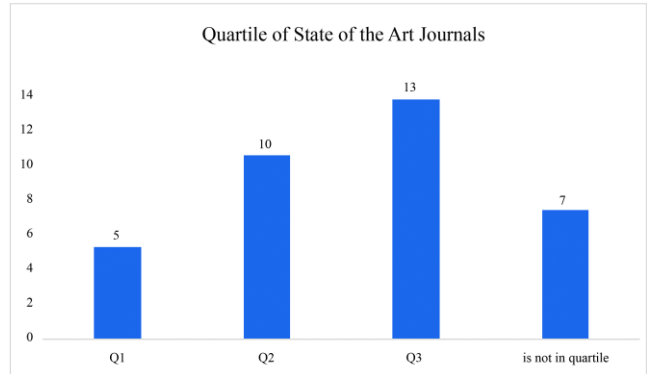


Fig. 4 Magazine Quartile

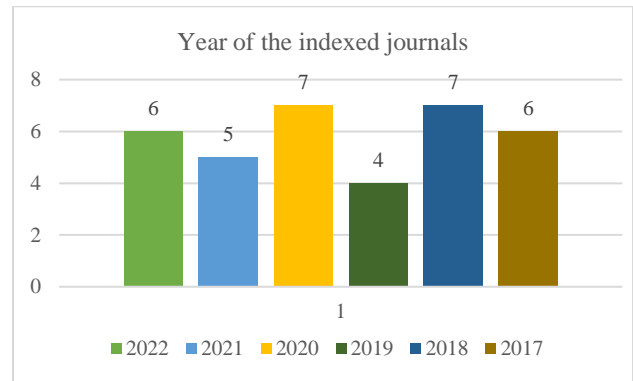


Fig. 5 Years of publication of the articles

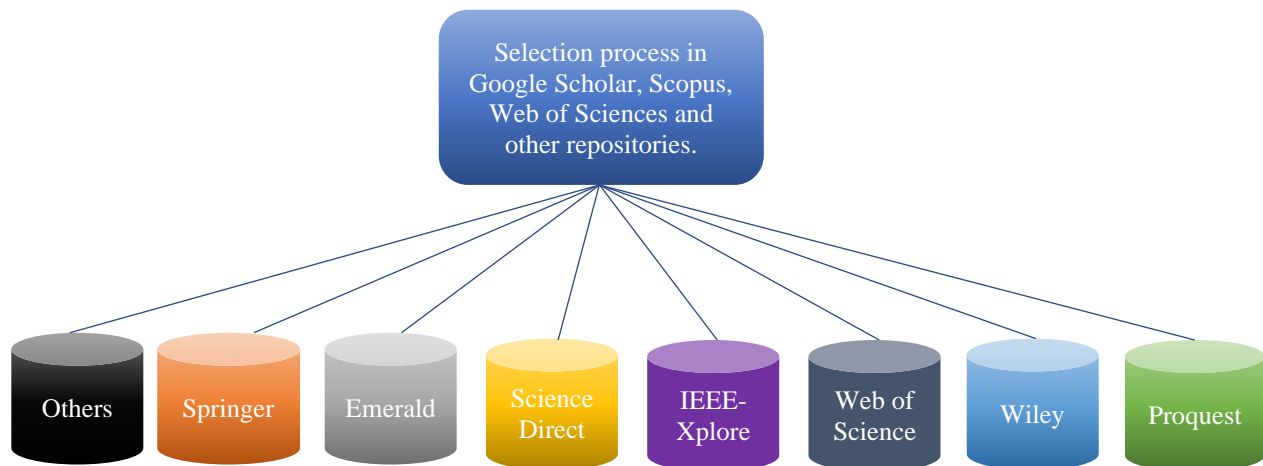


Fig. 6 Repositories used in this investigation

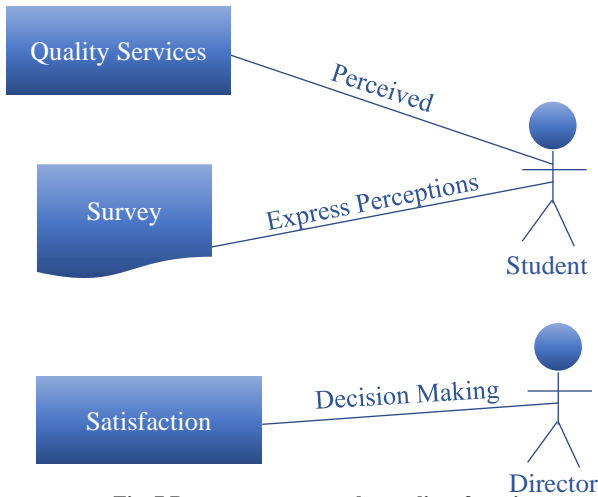


Fig. 7 Process to measure the quality of services

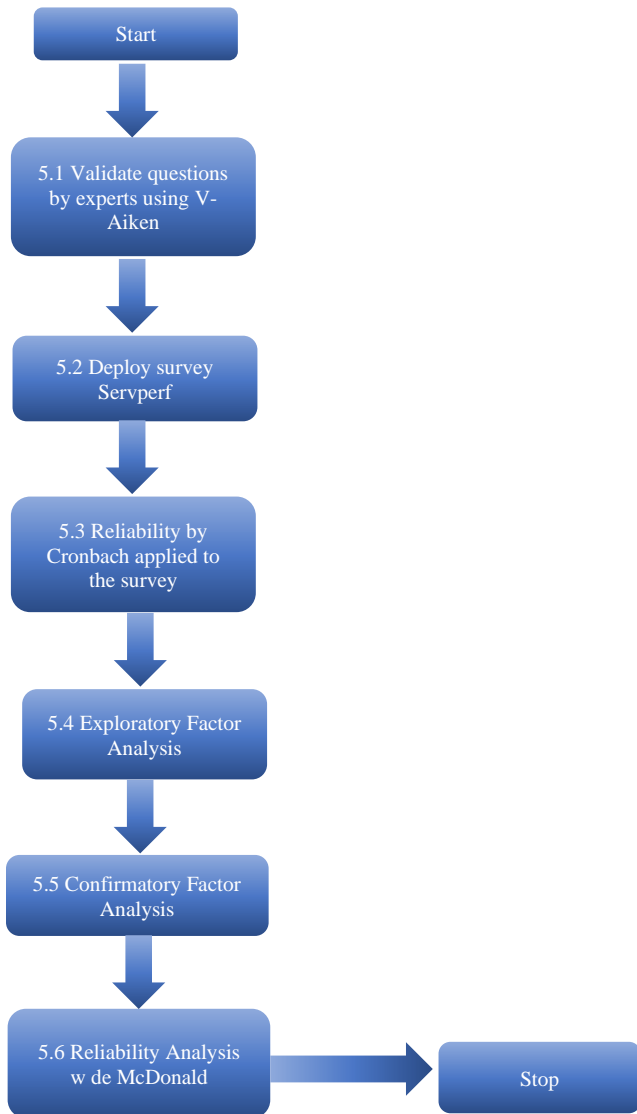


Fig. 8 Methodology in this investigation to reduce items of the survey

2.4. A Brief Analysis of the Literature Review

From the systematic review of the literature, it can be inferred that to prepare the survey, the questions related to the answers to question 2 with the corresponding dimensions must be considered; likewise, there is a diversity of quality-oriented models similar to the Servperf model which can be applied to the university reality, on the other hand, after carrying out the survey, the questions that are the main. The questions that are the main ones must be refined through exploratory and confirmatory factor analysis.

The refined model is necessary to make the decisions since the variables with the highest factor loads are the most important in the survey. Based on the literature review, a case is presented as an example carried out for an investigative case that gave rise to this article.

3. Methodology for an Investigative Case

For the application case, using statistical techniques and the Servperf methodology for the quality of the university.

Fig. 8 shows the methodology to be developed. With this methodology, a case study is solved below.

3.1. Validate Questions by Experts using Aiken

First, must be validated the survey questions, for which 8 experts have worked.

Aiken's formula:

According to Sedeño and Tejera, see [47], in their research work, “they state that the expert judges considered the instrument very appropriate provided and under the condition that the items with a V were eliminated of Aiken of inferior contents a 0.75”; in this investigation, the score exceeds the such value.

$$CVR_i = \frac{(Ne - \frac{N}{2})}{\frac{N}{2}}$$

CVR_i = Content validity ratio, which, if the calculated value is greater than or equal to 0.75, indicates that the item is essential.

Ne = a number of experts indicating that the survey item is relevant.

N = number of experts

In this investigation, the survey items have been validated by Aiken; each item varied between 0.9 and 0.94.

The original survey had 31 questions, which experts approved.

3.2. Deploy survey SERVPERF

For which a sample of a population of 1644 students

was taken, applying the following formula:

Formula for finite populations

$$n = \frac{Z^2pqN}{e^2(N - 1) + Z^2pq}$$

Assuming preliminary p and q=0.5; Z=1.96 ; e=5%.

Being N=1594 total enrollment in the cycle 2019-II, which, when operating, gives 309 surveys.

From which the sample of 309 was obtained to measure the quality of university services based on the methodology ServPerf.

4. Results and Discussion

4.1. Results

4.1.1. Reliability by Cronbach Applied to the Survey

Based on the model, the survey is deployed based on the items resulting from the 31-question model. Its internal consistency should be observed in this case; Cronbach was used, as shown in the result in Table 06.

Table 6. Alpha de Cronbach for this investigation

Cronbach's Alpha	No. of elements
0.955	31

According to [48], they express that: “Values of 0.7 or higher are desirable. As observed in our research, the value is: 0.955, which is highly reliable.”

Of a total of 31 questions under the SERVPERF approach, we proceed to perform the exploratory factorial analysis.

4.1.2. Exploratory Factor Analysis

Survey Servperf, after exploratory factor analysis now, in order to keep the main items, the Varimax rotation method was used for the extraction of unweighted least squares and the coefficients, the absolute value of 0.5 in the SPSS software to keep the items with the highest factor, from which come the latent variables to which names are assigned such as Administrative, Pedagogical y Equipment.

It shows the following Table 7 after applying the reduction of variables of the exploratory factorial method in SPSS.

Table 7. KMO and Bartlett test

Kaiser-Meyer-Olkin measure of sampling adequacy	0.936
Bartlett's test of sphericity Approx. Chi-squared	6705,629
Bartlett	$gl = 351$ $Sig. = ,000$

The KMO is 0.936 > 0.5, and the significance level of Bartlett is 000 < 0,05; this indicates that the number of items can be reduced using exploratory factor analysis.

Table 8 shows the factor of the dimensions for questions generated.

Table 8. Questions, Administrative And Equipment

No	Questions	Administrative (Factor)
1	Administrative and managerial staff provide prompt and timely support	.830
2	You have the certainty that there are no errors in your transactions	.811
3	When you have problems, there is a willingness to help you	.786
4.	The Faculty cares about the interests and needs of the students	.774
5	Administrative and executives can solve their problems	.770
6	The way to communicate with the Faculty to carry out appropriate consultations	.737
7	The administrative and managerial staff is friendly at the time of inquiries	.724
8	The administrative and managerial staff master their competencies	.718
9	The attitude of the administrative and managerial staff instills confidence	.715
10	The systems and means of communication meet your expectations	.678
11	The teachers comply with the syllabus	.644
12	The opening hours at the Faculty are convenient for you	.654
13	When you request a procedure, they do it on time	.621
14	The Faculty keeps students informed in a timely manner	.602
15	The Faculty provides personalized attention to students	.557

No.	Questions	Pedagogical (Factor)
16	recoded_methodology	.865
17	The Faculty worries before the student is observed	.852
18	Consider learning according to the market	.730
19	consider that the classes are of quality	.634
20	The way in which the classes are being developed is of the right level	.724
21	The way the evaluations are being carried out is the right one	.631
22	Professors resolve their doubts after class	.559
23	The Professors who teach at the Faculty are up-to-date	.555
No.	Questions	Equipment
24	The laboratories have sufficient equipment for the classes	.826
25	The Faculty has modern hardware equipment	.800
26	software for the optimal development of classes	.685
27	The programming of courses in laboratories is suitable for the use of machines.	.636
28	The Internet connection is good at the Faculty	.617
29	The infrastructure and social spaces of the Faculty are adequate	.559

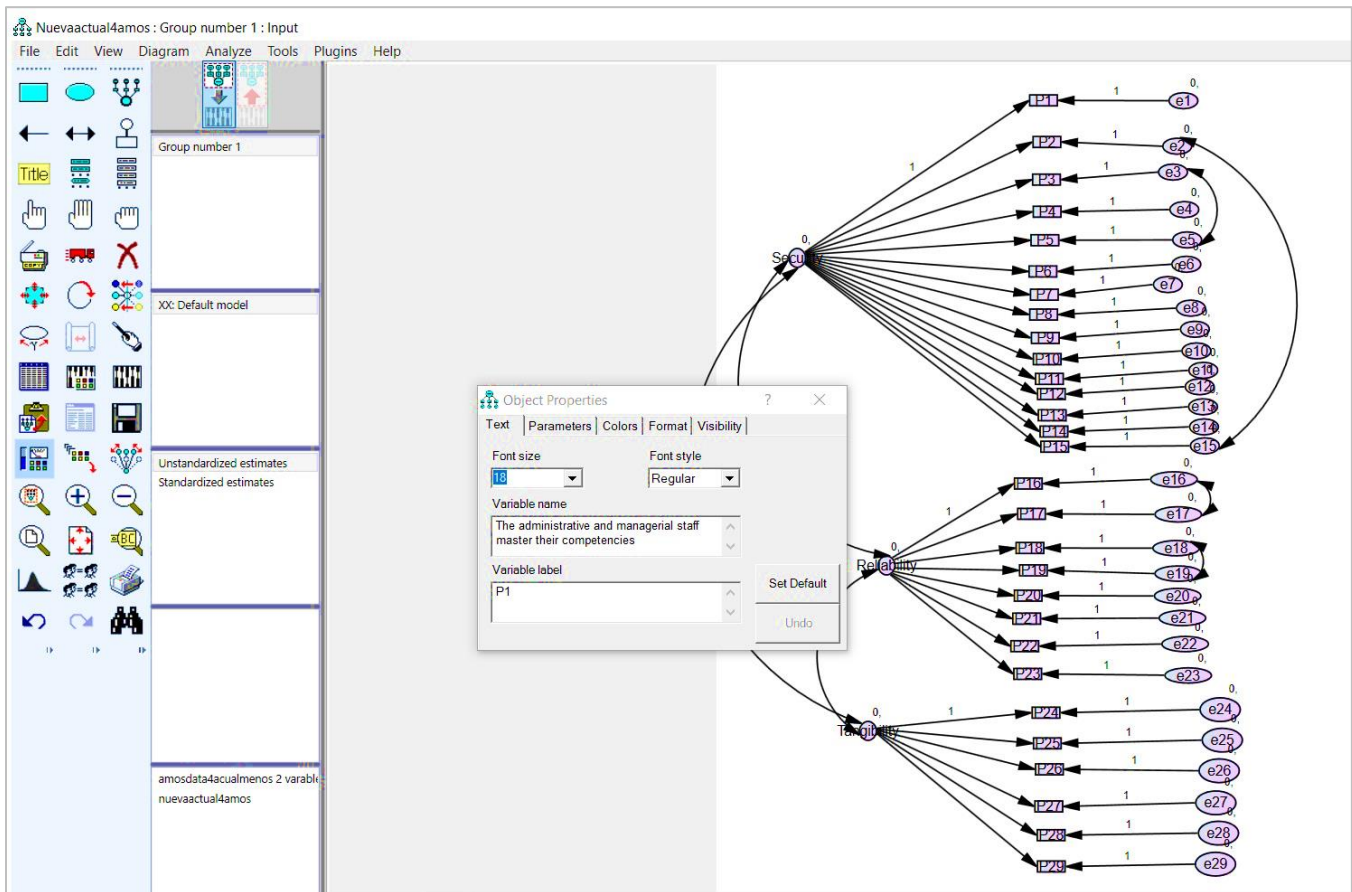


Fig. 9 Model confirmatory factorial Analysis

Table 9. Shows the iterations of models

MODEL	CHI-SQUARED	RMSEA	CFI	TLI	NFI	PRATIO	PCFI	PNFI	AIC
MODEL 1	0	0.062	0.939	0.933	0.893	0.919	0.862	0.82	997.801
MODEL 2	0	0.06	0.943	0.938	0.897	0.916	0.864	0.822	968.228
MODEL 3	0	0.057	0.947	0.942	0.901	0.914	0.865	0.823	940.79
MODEL 4	0	0.054	0.953	0.949	0.907	0.911	0.869	0.827	895.108

Extraction method : unweighted least squares.
 Rotation method : Varimax with Kaiser normalization.
 The rotation has converged in 5 iterations.

4.1.2. Confirmatory Factor Analysis

Proceeds to validate the latent variables of the exploratory factor analysis.

Variables are converted as Pi as shown in Fig. 9. Recoding variables P1: Administrative and managerial staff provide prompt and timely support.

And so on with the other Pi variables.

Using Amos and reading the survey file working with the exploratory analysis items.

After running the model four times:

Looking for the indicators to confirm the exploratory model, this Table 9 is shown above. The number of variables in Table 6 there were 31 variables; after applying the exploratory and confirmatory factor analysis, the survey was reduced to 29 questions out of the 31 that it was originally.

It is observed that model 4 meets the conditions to consider the model since several of these indicators fit the model: $CFI \geq 0.9$, $TLI \geq 0.9$, $NFI \geq 0.9$, $PRATIO \geq 0.9$ and Chi-square is 0, for thence is accepted the new model; indicators that are enough to choose the new reduced model

4.1.3. Reliability Analysis de McDonald

In any case, we validate the items of the latent variables, using the Jamovil software to see if the items of the latent variables or variables of Table 09 and Figure 10 meet internal consistency, that is, reliability; the results yielded:

Table 10 shows the reliability result when running it with the Jamovil software. A survey with the items having a high reliability of 0.952 (McDonald's w) is observed, for which the items of the latent variables represent the survey that serves as a model.

Table 10. Reliability Analysis w de McDonald

Scale Reliability Statistics		
	Cronbach's Alpha	w of Mc Donald
scale	0,951	0,952

In other words, the 31 questions from the original survey are represented by the 29 questions, a product of the consolidated factorial analysis in the confirmatory analysis.

4.2. Discussion

For state of the art, a string of investigations was built based on the Servperf quality model for the university level, with exploratory and confirmatory factorial techniques, finding various articles that answer the research questions; however, from the review of the literature, no articles were found where there are sub-models focused on the quality of university services using Servperf or other models, that are generated from the research string. For this reason, a case study is shown in section 5 to reinforce the article, which makes it innovative.

5. Conclusion

The research questions were answered in the literature review or state of the art.

A model is created to reduce the number of items in a survey to work for decision-making with the most representative of the latent variables.

Section 5 shows a case study in order to see the applicability. It contributes to the literature which can be applied to the social sciences such as engineering since research often has to be validated through surveys.

As an additional contribution, It should be noted that the Servperf model and the submodel generated by applying statistical techniques can be implemented through Scrum or Rup methodologies to create software for decision-making; see [49-51]

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