

**EVALUATING THE SERVICE QUALITY OF INFORMATION TECHNOLOGY:
The perspective of users and service providers from a Brazilian University**

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ABSTRACT

The aim of this study is to evaluate the quality of information technology services (IT) of a higher education institution under the optics of users and service providers. Methodologically, the research is characterized by a quantitative approach, using case study and survey strategies. The research instrument is based on the SERVPERF evaluation model based on SERVQUAL, applied to users and IT service providers. Data analysis is performed through factor analysis and parametric tests. Among the main conclusions, the correspondence between the provided services and the staff's needs is identified to a greater extent and, to a lesser degree, to the needs of students. The staff of the analyzed institution, as well as the IT service providers showed to be rather aligned regarding the perception of service quality. The gap between perceptions is greater when it comes to students and IT service providers. In addition, the factor analysis did not confirm the five dimensions of the theoretical model in the observed population.

Keywords: *Information Technology, services, quality, evaluation, University.*

1. INTRODUCTION

Organizations increasingly rely on information technology (IT) demanding effective management practices of such technology. In the research agenda of the so called IT governance, research related to the management of IT services are to be found. The former function of IT services (hardware installation, software, networks/systems, application management, help desk) takes a different perspective aimed at offering planned and managed services according to business needs (Pollard & Cater -Steel, 2009; McNaughton et al, 2010). The focus shifts to the management of IT assets in order to promote service quality (Tan et al., 2009).

In an attempt to improve management and IT operations processes, a raising number of organizations are using frameworks of "best practices", such as the widespread ITIL (Information Technology Infrastructure Library). In contrast, it is also raising the development of models, standards and frameworks for managing IT services (Gacenga et al., 2010, 2011). The ISM (Integrated Service Management) and the FSM (Functional Service Management) offer on its website, 65 frameworks of information used for ITSM in organizations (www.itsmportal.com).

One of the assumptions of application frameworks for service management, such as ITIL, is precisely the provision of high quality services, ensuring the fulfillment of the expectations and needs of users (Pollard & Cater-Steel, 2009). But to what extent investments in managing IT services undertaken by the organizations are reflected in service quality perceived by users?

It is true that IT services as well as their management require high investments so that the evaluation of IT service quality, from the perspective of its customers (users), is essential to ensure its success and its use on an ongoing basis (Roses et al, 2009, Jia and Reich, 2011; Jia and Reich, 2008). However, given its intangible nature, the evaluation of IT is a challenge permeated process, which improves when its object is a service.

Studies have been conducted to evaluate the quality of IT services in different contexts, such as the study of Roses et al. (2009) in a large financial organization, and the investigations of Smith et al. (2007) and Badri et al. (2005) performed in higher education institutions. Other studies seek to evaluate the quality of management of IT services as is the case of Edgeman et al. (2005), who undertook a review of IT service providers for a government agency, and the study of MacNaughton et al. (2010), who propose a theoretical framework for the evaluation of management services, which apply the ITIL framework. Still there are those studies whose concern is to relate the quality of services with other variables (precedent and/or consequent) to the service quality, for example, Lee et al. (2007); Jia and Reich (2008); Jia and Reich (2011), and Sun et al. (2012).

From a theoretical perspective, little research has been done on the evaluation of IT service quality, revealing the existence of a gap on this issue (Lahtela et al., 2010). Badri et al. (2005) and Smith et al. (2007) argue that there are more publications covering topics related to the assessment of IT performance, than the evaluation of the quality of IT service. Within the context of Higher Education Institutions (HEIs), the number of researches is even lower.

Following the natural tendency of expansion of automated processes in HEIs, the computerization of academic and administrative services using information technology are inevitable. More specifically, in recent years, Brazilian IES are using IT on their operational processes, as well as to support strategic decisions. It creates a movement towards making IT resources available through a technology park, which supports the provided services both internally: the various departments and administrative sectors, as externally: the community and the academia (Palhares, 2011).

In addition, we must take into consideration that HEIs have a peculiar set of IT users (students, teachers, technical and administrative staff, managers, and others), which show significant differences in the roles they play within the University context, as in their use of IT (Mussi & Zwicker, 2012). In general, the quality of IT service can be evaluated from different perspectives, the perspective of internal users, of external users and of own service providers (OGC, 2007). At a University, students are considered external users, and the institutional staff constitutes internal service users. Here, it is expected that IT service providers of any given University, consider how different users - their customers - perceive the services received. It is also argued in favor of the perception alignment of IT service quality both by providers and users of these services (Roses et al., 2009). The alignment of this perception reflects the service provider's knowledge of its users, fact that might help service providers in taking better decisions as well as providing quality services.

In this context, the main objective of this research is to evaluate the quality of IT services, from the perspective of users and service providers in a University in Brazil. Specifically, we sought to, (i) measure the quality of IT services from the perspective of users; (ii) measure the quality of IT services from the perspective of providers, and (iii) identify the existence of differences in evaluating the quality of IT services between different users (students and staff), and between users and service providers.

The University where the study was conducted is 50 years old, and has 25,000 students including the ones enrolled in distance courses. This University has continuously been investing in IT, notable amongst those investments are the high-end server infrastructure; implementation of management systems such as SAP (accounting, financial, administrative); Peoplesoft (academic and CRM), and the implementation of the ITIL framework for managing IT services.

In order to present the carried out research, the following sections respectively present the previous research on evaluation of service quality in the IT environment; the methodology applied in the study; the obtained results, and some final remarks.

2 QUALITY EVALUATION OF IT SERVICE

Service is the application of skills and abilities through actions, processes and performance for the benefit of a subject or the organization itself (Vargo & Lusch, 2004). IT Service is characterized by a means of delivering value to customers, enabling the achievement of desired results. From this perspective, IT service stands for the combination of information technology (computational and technological resources), of people (service providers) and of processes (to design, deploy and provide services for users) (Cartlidge et al., 2007).

The service quality is considered an intangible factor if based on the perception of customers - service users (Jia and Reich, 2011; Roses et al, 2009; Jia and Reich, 2008; Cronin & Taylor, 1992). Cronin & Taylor (1992) list three aspects that justify the intangible nature of service quality: (a) the difficulty to measure - quality of service is harder to evaluate than quality of the product; (b) the way it is perceived - the perceptions of the result of service quality based on the comparison of customer expectations and actual performance, and (c) evaluation of quality - not only the results of service, but also the service delivery process.

Literature points to several constructs on performance evaluation in the IT field, but their metrics, measures, and measurement models are not clearly delimited (Gacenga et al., 2011). Models and/or tools available for evaluating the overall quality of service were first developed to measure the quality level by external clients of a given organization (Salomi et al., 2005). In this perspective, the model that has excelled, considered the most enduring and popular, is the SERVQUAL, which has its origin in the marketing literature services (Waugh, 2002; Badri et al., 2005; Jia and Reich, 2008). SERVQUAL is an instrument developed by Parasuraman et al. (1985, 1988, 1991), whose main characteristic is the focus on measuring quality of service based on customer satisfaction. The quality of service is defined as the degree of discrepancy between customer expectations and perceptions of service performance based on five dimensions: (i) tangibility; (ii) reliability; (iii) responsiveness; (iv) assurance, and (v) empathy.

A variant of SERVQUAL is proposed by Cronin and Taylor (1992), as they point out limitations of the model related to the evaluation of service quality based on gaps (less perceived performance expectations). The SERVPERF, as referred, is based on the perception of service quality discarding the component 'expectation' used by SERVQUAL, and maintaining the component 'performance perception'. Figure 1 shows the dimensions and items of SERVQUA /SERVPERF.

Figure 1: SERVQUAL/SERVPERF evaluating the external customers' satisfaction
Insert Figure 1 Here

These instruments have been used for the evaluation of IT services, such as studies of Badri et al. (2005); Smith et al. (2007); Roses et al. (2009); McNaughton et al. (2010); Jia and Reich (2011), and Sun et al. (2012). Two of them were conducted in HEIs, as shown in Figure 2.

Figure 2: Evaluation of IT services quality (SERVQUAL/SERVPERF)
Insert Figure 2 Here

The presented studies encompass the quality evaluation of IT service. Some of them propose to evaluate the quality of services alone (eg., Badri et al., 2005; Smith et al., 2007; Roses et al., 2009), others seek to evaluate the management of IT services, which analyze the evaluation of service quality, as proposed by McNaughton et al. (2010). There are also investigations taken into account, which aim to relate the quality of services with other variables considered precedent and/or consequent of the service quality through the creation of research models (eg., Jia and Reich, 2011; Sun et al., 2012).

Regarding the evaluation context, studies occurred in different business areas (IES, financial institutions, government agencies, insurance companies, industry). Research address the perspective (bywhich the service is evaluated) mainly from internal clients, some are also intended to investigate the perspective of service providers.

Departing from the review of scientific literature on the subject researched, the following section presents and justifies the methodological options of the researchers to evaluate the quality of IT service at the HEI where the study was conducted.

3 METHODOLOGY OF RESEARCH

The study is based on both quantitative and qualitative approaches applying survey methods, a case study (Yin, 2001), and cross sectional time horizon research (Bhattacharjee, 2012). The survey was conducted in a HEI in the south of Brazil. This is a multi-campus educational institution, nonprofit community open, founded in 1964,

aiming at the production of education, science, culture and social development. By the end of 2013, it had approximately 25,000 students enrolled in various courses including distance learning, 1,551 teachers, and 907 technical and administrative staff. The survey was conducted in direct education classrooms at University campuses.

The participants were divided into two groups: 1) IT service providers; and 2) users of IT services. The number of people for each group is shown in Table 1, corresponding to the total number of staff and students of direct education classrooms from University campuses.

Table 1: Research population: providers and users of IT services
Insert Table 1 Here

In the present study, IT service providers are all University's IT staff, who is responsible for providing IT services to users. Users of IT services are all other members of the University (direct education campuses), who use IT services encompassing students and staff (teachers, technical and administrative). The number of members of the two groups sums 12,366 individuals.

3.1 Data Collection Techniques

Data collection was performed by means of a structured questionnaire. We used the SERVPERF research instrument (Cronin & Taylor, 1992) with adaptations to the context of IT services at University. We opted for applying SERVPERF; its major psychometric properties enabled our cross-sectional studies (Cronin & Taylor, 1992, 1994; Roses et al., 2009).

Two questionnaires were developed; the first was intended for users of IT services and the second for IT service providers. We used the Likert scale of agreement/disagreement, in which 1 point stood for the statement "strongly disagree"; 2 points stood for the statement "partly disagree"; 3 points for the statement "neither agree nor disagree"; 4 points for "partly agree", and the highest, 5 points, for the statement "strongly agree".

The questionnaires were entered into the SurveyMonkey program (www.surveymonkey.com). This system was chosen for user friendly way to develop questionnaires and features that generate reliability and control in data collection. After the questionnaire design through this system we performed a pre-testing to validate the questions. The pre-test was applied to a sample of 10 respondents, being 2 service providers and 8 users (2 students, 2 technical administrators and 4 teachers), selected by the accessibility criterion. Pre-test answers were coded and analyzed, resulting in adjustments to the initial versions of the proposed questionnaires. Table 3 shows the blocks of the questionnaire applied to users, the objectives of these blocks, and related items. The tool for the IT providers includes the same items, adapting the structure of some questions.

Figure 3: Questionnaire blocks, objectives and items (users)
Insert Figure 3 Here

The questionnaires had a total of 27 questions, divided into four blocks: 1) IT services 2) SERVPERF adapted to IT service in the University context (items distributed in tangible, reliability, responsiveness, assurance and empathy dimensions); 2) characterization of the respondent; 3) open question.

3.2 Data analysis methods

In order to evaluate the internal consistency of the questionnaire, we used the calculation of Cronbach's Alpha. To analyze the quantitative data, we used descriptive statistics, factor analysis and parametric tests (Malhotra, 2010, Hair et al., 2010). The SPSS 22.0 software Statistic Desktop was used to support the analysis of quantitative data.

The factor analysis technique was applied in order to pursue existing factors in the set of variables, and to verify its correspondence with the five theoretical dimensions of SERVPERF instrument, established by Parasuraman et al. (1988). Factor analysis was used through the main component analysis method (PCA). Four steps have been taken: the first was to evaluate the adequacy of the data through the Kaiser-Meyer-Oiklin test (KMO); the second was to determine the number of cases and variables of the sample (Hair et al., 2010), these variables were chosen according to the theoretical model of SERVPERF; the third step was to apply the extraction technique of the factors, so we used the criterion of Eigenvalues, which considers only values greater than 1; the fourth step involved the interpretation of the factors by the unrotated factorial matrix. The factor loadings of each variable related to dimensions were observed, identifying those that had high factor loadings on both factors. We adopted

0.50 as an acceptable contribution limit for the factor (Hair et al., 2010). After the identification of factor loadings on both factors, the rotated matrix was used to achieve a simpler and significant factor standard.

The comparative analysis of the perceptions of the IT services quality in students, staff and IT providers, was also performed by the T Student test. Since our goal was to show if a parameter differs from a certain value, without checking if it is below or above, we used the two-tailed test, in which the rejection region is divided into two equal parts, each region has half the level of significance. The objective was to compare the students group with the staff's group, the students group with the group of IT services providers, and the staff's group with the one of IT services providers.

The following null and alternative hypotheses were established:

- a) H_0 : The perception of IT services quality to the x group equals the y group.
- b) H_1 : The perception of IT services quality to the x group is different from the y group.

We used the categorization technique (Saunders, Lewis and Thornhill, 2009) for the analysis of the responses to the open question. As a way of categorization, we used mixed analysis grid according to the definition of primary categories (closed grid), considering that, during the review process, new categories (open grid) can be added to those previously defined, and therefore, indicate the need for subdivision, inclusion or exclusion of categories. The primary categories corresponded to the dimensions of the SERVPERF instrument.

4 ANALYSES AND INTERPRETATION OF DATA

This section presents the number of respondents and the most commonly used IT services in the institution; the results of internal consistency analysis of the survey instrument; the evaluation of IT services quality by the groups surveyed, and the analysis of the theoretical categories alignment related to the researched population.

4.1 Respondents

The total number of respondents was 870 (eight hundred and seventy) divided into students, staff (technical – administrative and teachers), and IT professionals, as presented in Table 2.

Table 2: Number of questionnaires answered by group
Insert Table 2 Here

Regarding the item that identifies which IT services are used in the students' group, we highlight four services in terms of representativeness: Wi-Fi (91.1%), library system (52%), academic system Peoplesoft (45.5%), and the available computers in academic laboratories (43.3%). As regards the staff's group, the four most used services were: institutional email (91.5%), academic system Peoplesoft (74.2%), Wi-Fi (72%), and the available computers in administrative sectors (61,5%). Two common ground services are among the four most used services by both groups: Wi-Fi and academic system Peoplesoft. However, in the case of the latter, the questionnaire results show that the functionalities used by students are different from those used by the staff.

4.2 Consistency Evaluation

To evaluate the internal consistency of the questionnaires, we used the Cronbach's Alpha calculation. In the students' and staff's groups the value of the coefficient was 0.89, and in the IT providers' group, the calculation of Cronbach's Alpha coefficient was 0.93, representing the internal consistency of the questionnaires.

In order to present the agreement percentage (total agreement added to the partial correlation) of all the groups studied in each item of the questionnaire, Chart 1 illustrates the differences for each dimension, concerning the frequency distribution. The items were described according to the presented information.

Chart 1: Concordance percentage of each group by item and dimension
Insert Chart 1 Here

According to the results disposed on Chart 1, in general and in most items, the students' group shows a lower agreement level than the other groups. The staff's group shows a greater distance compared to the students, but on the other hand, they are closer to the values reported by IT providers, proving the existence of differences in perceptions.

In a tangible dimension, the major difference is related to the IT providers' group, which revealed 2 items in which the data are more scattered than the others (visual aspect of laboratories and maintenance of the laboratories' facilities). According to IT providers, laboratories have a good appearance and appropriate conservation for users,

but this perception contradicts the perceptions identified by the users, who use them in their daily routines. Items related to good visual appearance of the screens and reports had close agreement values between the groups, indicating their alignment. The measurement reliability values indicate a higher level of agreement for the groups of staff and IT providers, signaling a better alignment to the students' group. We had the same finding regarding the dimensions of responsiveness, assurance, and empathy. This fact shows a major difference in the perception of the students' group, when considering the staff groups and IT providers in reliability, responsiveness, assurance, and empathy dimensions.

4.3 Dimensionality of the instrument

The students' group data set showed the value 0.92 according to the Kaiser -Meyer- Olkin test (KMO). Sufficient correlations were observed to justify the factor analysis, since a substantial number of them had greater values than 0.30 (Hair et al. 2010).

Using the principal component analysis (PCA), and after the observation of the unrotated matrix, we checked commonalities, and lower loads to the acceptable minimum of 0.50 (Hair et al., 2010) were found in the sample, therefore they were eliminated.

Seven variables were excluded, and a new KMO test showed the value of 0.89. After computing the rotated matrix, we identified and extracted only the factors having greater Eigenvalues than one, resulting in four factors with a Variance Accounted total of 71%.

After analyzing the data mass consisting of 18 resulting variables, which showed a satisfactory level of reliability with a Cronbach's Alpha coefficient of 0.91, the result of the rotated matrix identified the factor loadings of each variable in relation to the four extracted factors, as shown in Table 3.

Table3: Rotated factor matrix, students group
Insert Table 3 Here

The illustration of this table presents loads which have greater values than 0.50.

The first extracted factor with 34.5% of the total variance, we observed that the factor loadings, considering the criteria of Hair et al. (2010), indicate that 10 variables were distributed in the following dimensions: reliability, responsiveness, empathy, and a major representation in the dimension of assurance. As regards the loading of each variable, starting from the assurance dimension (S1, S2, S3 and S4) we had a total of 3.2. The other variables showed lower factor loadings, the empathy dimension showed the E1 and E3 items having total load of 1.6, the R2 and R3 items (responsiveness dimension) had a total load of 1.4, and the C2 and C4 items (dimension reliability) had a total load of 1.4.

The second factor extracted with 51.1% of the total variance, showed that the factor loadings indicate four variables for only one dimension: the tangible. The loading of the variables (T3A, T3B, T3C and T3D), which are related to the ease of understanding and visual aspects of the screens and reports of systems, had a total load of 3.4.

The third factor extracted in 62% of the total variance of explanatory power showed that the factor loadings indicate two variables of the same size: the tangible as well as the factor 2. The loading of the variables (T2A and T2B), which relates to the attractiveness aspect of computer labs and to their preservation, sum a load of 1.8.

Closing with the last extracted factor with an explanatory power of 71% of the total variance, factor 4 presents significant factor loadings on 2 variables of the tangible dimension. The loading of the variables (T1A and T1B), which relate to computers and printers used in IES had a total load of 1.6.

As load factors were identified in the students' group, we can infer that two dimensions (safety and tangible) influence the perception of service quality with a higher loading. The assurance dimension showed the greatest influence, with total load of 3.2, suggesting that students positively evaluate the knowledge and the capacity of IT providers to give secure answers, given the acceptance requirements. The tangible dimension presented total load of 3.4 (in factor 2), suggesting that students also positively evaluate the issues related to equipment, appearance of physical facilities, screens, reports and availability of systems, meeting the acceptance requirements.

The analysis shows three different factors (factor 2, factor 3, and factor 4) being explained by variables related to the same size (tangible); factor 2 was explained by variables T3A, T3B, T3C, and T3D; factor 3 by T2A and T2B

variables, and factor 4 was explained by T1A and T1B variables. This may have happened in the perception of the students' group, because the variables may be related not just to one, but to more dimensions.

This distribution of factor loadings can be atypically explained by an intensive relationship between the dimensions (factors), and the respondent's difficulty to select the variables according to the same logic of the current theory.

Following the same order of steps performed on the students' group, the staff's group data set had an adequacy control by means of the Kaiser-Meyer-Olkin test (KMO), which showed the value of 0.90, within acceptable measures. We observed enough correlations to justify the factor analysis, which revealed a substantial number of correlations of 0.30 (Hair et al. 2010).

After analyzing the generate dun rotated factorial matrix, commonalities were verified by means of the ACP, and we found lower loads than the acceptable minimum of 0.50 (Hair et al., 2010) in the sample, therefore there was a need for disposal.

After the disposal of these 5 variables, the factor analysis was recomputed, and through the observation of the rotation matrix, we identified the need for disposal of 2 more variables: S1 (assurance dimension), and E3 (empathy), for they simultaneously influence two factors: ambiguity (Hair et al., 2010). The variable S1 influenced factors 1 and 2 exceeding the load of 0.50, as well as the influence of the variable E3 of factor 1 and 2.

With the disposal of seven variables, a new KMO test was conducted showing the result of 0.85. After the computation of the rotated matrix, we extracted five factors with 73.8% of explanatory power form the total variance.

Through the carried out analysis of the dataset consisting of 18 variables, the level of reliability seemed to be satisfactory with a Cronbach's Alpha coefficient of 0.89. We identified factor loadings of each variable related to five factors extracted after a new rotated matrix, as shown in Table 4.

Table4: Rotated factorial matrix, staff's group
Insert Table 4 Here

Table 4 illustrates the loads having higher values than 0.50.

As far as the first factor extracted with 39.5% of total variance is concerned, we observed that the factor loadings indicate six variables distributed in the following dimensions: reliability, responsiveness and empathy, a greater representation in the responsiveness dimension was stated. Regarding the loading of each variable, and starting with the responsiveness dimension (R1, R2 and R3) they have a total of 2.2. The other variables showed lower factor loadings for the reliability dimension in items C1 and C2 with a total load of 1.4, and the E2 item (empathy dimension) shows the load of 0.6.

The second extracted factor - factor two -which had an explanatory power of 51.8% of total variance, we observed that the factor loadings indicate four variables distributed in the dimensions of assurance and empathy. With greater representation in the assurance dimension, the items S2, S3, and S4 concern the confidence inspired by the behavior of IT providers and the knowledge required to meet the demands and safety in the responses to users had a total load of 2.4.

The third extracted factor - factor three -had an explanatory power of 61.2% of total variance. Here, we observed the factor loadings pointing to four variables of the tangible dimension. The loading of the variables (T3A, T3B, T3C, and T3D), which are related to the ease of understanding and visual aspects of the screens and reports of systems, had a total load of 3.3.

In factor four, having the explanatory power of 67.8% of total variance, we observed that the factor loadings indicate two variables of the tangible dimension. The loading of T2A and T2B variables, which are related to the attractive appearance of the computer labs and conservation, has total load of 1.9.

The last extracted factor - factor 5 -having the explanatory power of 73.8% of total variance, presents significant factor loadings on 2 variables of tangible dimension. The variables loading (T1A and T1B), which are related to computers and printers used in IES, presents a total load of 1.7.

Another identification observed on the load factors identified in the staff's group, can be interpreted as the dimension influence on the perception of service quality with greater loading, which is the tangible dimension, having a total load of 3.4 (in factor 3), suggesting that the staff also positively evaluate issues such as equipment, appearance of physical facilities, screens, reports, and availability of systems, meeting the requirements of acceptance.

The results analysis, as the students results, shows three different factors (factor 3, factor 4, and factor 5), which can be explained by variables related to the same dimension (tangible); factor 3 was explained by variables T3A, T3B, T3C, and T3D; factor 4, by the T2A and T2B variables, and factor 5 was explained by T1A and T1B variables. This result compared with the result of the students' group, can be interpreted as the relation of variables in both groups to more than one dimension. This might have happened because of the respondents' difficulty to select them.

3.4 Comparative analysis of perceptions between the groups

To perform a comparative analysis of perceptions of IT services quality in students', developers', and IT providers' groups representing independent and different dimension samples, we chose the Student's T test. In the first comparison, the students' group versus the staff's group, we used the SPSS software, and the variables with commonalities above 0.50 resulting from the factor analysis performed on the students' group. Eighteen variables were distributed into five dimensions, which were part of the T test. The following assumptions were considered:

H_0 : The perception of IT services quality for the students' group is equal to the staff's group.

H_1 : The perception of quality of IT services for the students' group is different from the staff's group.

To test whether $H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 \neq \mu_2$, we applied the bilateral test considering the equal variances not assumed, and adopting the significance level of 95% ($\alpha = 0.05$). Initially, we analyzed the results of the Levene test. For the first variable analyzed: T1A, the test probability was 0.99 which is higher than 0.05, so we analyzed the p value (two-tailed) as the value showed to be close to 0, less than 0.05. Therefore we can state that there is evidence of statistically significant differences between the two groups for this variable, rejecting H_0 in this case. Following the same calculation of the first variable, table 5 was designed to show the compilation of all the variables and their results, indicating in the last column if H_0 was accepted or rejected.

Tabela5: T test for the comparison of students' and staff's groups
Insert Table 5 Here

Table 5 illustrates the generated result by the T test for students' and staff's groups. By means of the Levene test, we observed in the second column the test probability values (p), in the fifth column the statistic T test values, the test's probability of significance p (2). And, in the last column, the interpretation' result, accepting or rejecting the H_0 .

In accordance with the same techniques used in the previous comparison, and only changing the group in the null and alternative hypotheses, the comparison was performed between the students' and IT providers' groups. The same 18 variables were considered, distributed throughout the five dimensions, which were part of the T test. We considered the following assumptions:

H_0 : The students' group perception of quality of IT services is equal to the IT providers' group.

H_1 : The students' group perception of IT services quality is different from the IT providers' group.

Thus, the result of the Levene test analysis for the first variable T1A showed a test probability of 0.008, which is less than 0.05, so the value p (2) was analyzed. As 0.03 is a smaller value than 0.05, there is evidence of significant differences for this variable in the two groups. In conclusion, one can reject the H_0 in this case. Following the same calculation of the first variable, Table 6 was designed to show the compilation of all the variables and their results, indicating the acceptance or rejection of H_0 in the last column.

Table6: T test for the comparison between groups of students and IT providers
Insert Table 6 Here

Table 6 illustrates the generated result of the T test for students' and IT providers' groups. By means of the Levene test, in the second column, we observed the probability test values (p), in the fifth column, the values of the statistic

T test, and the test probability of significance p (2). The last column shows the result of the interpretation, which accepts or rejects the H_0 .

Considering the same techniques used in the comparison between the students' group vs. the staff's group, and only changing the group in the null and alternative hypotheses, the comparison was performed between the staff's and the IT providers groups. The same 18 variables were assigned, distributed throughout the five dimensions, which were part of the T test. The following assumptions were considered:

H_0 : The quality perception of IT services for the staff's group is equal to the IT providers' group.

H_1 : The quality perception of IT services to the staff's group is different from the IT providers' group.

Thus, analyzing the result of the Levene test for the first variable T1A, this test probability was of 0.03, which is less than 0.05, therefore, we analyzed the value p (2). As the value of 0.78 is greater than 0.05, we concluded that one can not reject H_0 . Following the same calculation of the first variable, table 7 was designed showing the compilation of all the variables and their respective results, signaling, in the last column, if H_0 was accepted or rejected.

Table7: T test to compare the groups of staff and IT providers
Insert Table 7 Here

Table 7 illustrates the generated result of the T test for the students' and IT providers' groups. By means of the Levene test, in the second column, we observed the probability test values (p), in the fifth column, the values of the statistic T test, and the test probability of significance p (2). The last column shows the result of the interpretation, which accepts or rejects the H_0 .

3.5 Analysis of the open question

The open question used in the questionnaires was: "Comments (give information/opinions on the quality of services provided by the Center for IT Services)." We gathered a total of 126 responses to this question, from which 120 were from the users and 6 from the IT service providers.

The content of the responses was analyzed according to the categorization technique in order to verify the existence of other dimensions (categories) and/or other subcategories not provided the theoretical model (SERVPERF) within the researched context. Therefore, the definition of primary categories followed the dimensions as well as the related items of SERVPERF.

Two categories emerged from this analysis. Both associated with the tangible dimension. The first - "infrastructure" - which grouped data relating to the infrastructure of laboratories, such as "tables", "plugs", "number of laboratories". The second - "user-friendliness" - grouped data relating to the systems' ease of use. New categories did not emerge from the other dimensions.

5. FINAL REMARKS

This research aimed to assess the quality of IT services from the perspective of users and service providers in a HEI. The results showed that the students group is less satisfied with IT services than the group of the staff. This result emerges from: the tangible dimension, which brings together issues related to physical aspects of IT services; the reliability dimension, related to the ability of IT providers in providing an accurate service; the responsiveness dimension, related to communication with users and providers, and the empathy dimension, which incorporates relationship issues and service needs.

Another finding related to the fact that groups of staff and IT providers are more aligned regarding the perceptions of service quality in all dimensions. The gap between perceptions is greater when it comes to students and IT professionals. Thus, we can state that, to a greater extent, the services provided correspond to the needs of the staff, and to a lesser extent, to the students' needs. This fact however, does not seem evident to IT professionals. An alignment of perception between groups of users and IT professionals only occurs on one item of tangible dimension (visual aspect of the screens and reports of the systems).

The results indicate no confirmation of the 5 dimensions of the theoretical model (tangible, reliability, responsiveness, assurance, and empathy) as predicted by Parasuraman et al. (1988). However, the pattern observed in this study is consistent with previous studies conducted in the public and academic sectors (Donnelly & Dalrymple, 1995; Donnelly & Shiu, 1999; Smith et al. 2007). Thus the dimensionality of the search tool tailored

for IT, using the scale SERVPERF (Cronin & Taylor, 1992) by the factor analysis did not confirm the existence of the five dimensions, proposed by Parasuraman et al. (1988), as expected.

Regarding the comparison of perceptions of different groups, we used the comparison test between two independent samples (T test). After the tests, the first scenario: "students x staff" as their perceptions of quality of IT services provided by IES, showed that there is evidence of statistically significant differences between these groups. The same happened to "students x IT providers". Comparing "collaborators x IT providers", we concluded that there is a difference of perceptions in the tangible dimension, where there were significant disagreements. In the other dimensions, the result was more aligned, which confirms that the perception of service quality gap is smaller when considering staff x service providers.

The limitations of this research are mainly related to issues such as: trustworthiness in the answers of respondents, differences in existing perceptions about the options of the scale used, and the performance of a single case study. We recommend the use of the instrument and the proposed methods of analysis for future research at other Universities. This research seeks to contribute to further investigation of the dimensionality of SERVPERF in the IT context. Emerging categories in tangible dimension may also be tested in other studies.

Taking into account that IT services in a HEI require substantial investments, the results of this study reinforce the relevance of analyzing the quality of these services in the light of different user groups. This action, if continuously carried out in the organization, helps to minimize the perception gaps between users and service providers, and consequently improves the quality of services rendered, as well as brings users and providers of IT services closer.

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Figure 1: SERVQUAL/SERVPERF evaluating external clients satisfaction

Dimension	Description	Items quantity
TANGIBLE	Characterized by physical aspects of the service, such as physical facilities, equipment, visual appearance	4
RELIABILITY	Performance of the promised services in a reliable and accurate fashion	5
RESPONSIVENESS	Willingness to help customers by providing a fast service	4
ASSURANCE	Staff's knowledge and ability to convey trust	4
EMPATHY	Individually relationship with the client	5

Source: Adapted from Parasuraman et al. (1988)

Figure 2: Evaluating IT services quality (SERVQUAL/SERVPERF)

Author	Objective	Context	Perspective and instrument	Results
Badriet al. (2005)	- To identify gaps in the chain of IT service providers by evaluating the quality of IT services	- IES in the UAE supported by the Federal Government	Internal / external customers and service providers SERVQUAL adapted for IT;	- The model provided mixed results, but all in all, the results favored the score of perception. - Some statistical tests suggested that the SERVQUAL did not have the necessary characteristics for a good adjustment. - From the standpoint of those surveyed, the instrument was a useful indicator, identifying gaps in service quality.
Smith et al.(2007)	- To evaluate the quality of IT services;	- HEI from the United Kingdom	Internal and external customers; SERVQUAL	- It was not possible to produce a 5 dimensions' profile, as predicted by the SERVQUAL. Both for students and for staff, some dimensions are confused. - Significant difference between the expectations of students and the expectations of the staff. - Relative importance of each dimension in the following order (reliability, responsiveness, assurance, empathy and tangible).
Roses et al. (2009)	To evaluate the different perceptions of quality of IT services	- Brazilian retail bank.	Internal costumers and IT employees SERVPERF adapted	- The model was important to strengthen the communication between IT staff with customers, and enable IT area managers to reflect on what their customer needs. - From the point of view of the relationship with customers, the results indicated that the SERVPERF instrument is a valid measure to evaluate the perception of the performance of IT services. - Dissatisfaction with the quality of service in the 5 dimensions.
McNaughton et al. (2010)	-To evaluate the management of IT services	Organizations that are deploying or using the ITIL framework	Internal costumers and IT employees SERVQUAL adapted to IT; metrics for each ITIL process	- Theoretical framework for ITIL job evaluation (extent to which ITIL best practices are successful, and support the business processes).
Jia and Reich (2011)	To evaluate internal procedures of an IT department that influence customer satisfaction level and quality of IT services	Organizations of North America (government agency, insurance company and industry)	Internal costumers and IT employees SERVQUAL adapted to IT; IT Service Climate (Jia & Reich., 2008)	- The concept of IT services climate allowed the explanation of the quality of IT services evaluations by the customers of IT services - It highlights the importance of a technically competent IT workforce and the critical need to build a favorable climate service to improve service quality and customer satisfaction.
Sun et al.(2012)	- To analyze the antecedents of satisfaction of IT services' users, and evaluate the quality of IT services;	- Financial institutions in China.	Internal costumers SERVQUAL adapted; theory of social capital and instrument of user satisfaction (Baroud et al. (1988)	- The results suggest that the quality of service has a strong effect on user satisfaction when the relational and cognitive capital are greater.

Source: Designed by the authors.

Table 1: Research population: providers and users of IT services

Groups		Number of participants
IT services providers		53
Users	Students	10.311
	Staff (teachers)	1.313
	Staff (technical and administrative)	689
		12.366

Source: Designed by the author.

Figure 3: Questionnaire, objectives and items (users) blocks

Questionnaires blocks	Block's objective	
1) IT services	Identify the IT services used by the user and the means to access these services.	
2) SERVPERF	SERVPERF dimensions and related items adapted to the IT context	
	TANGIBLE	The equipment meets the needs of the activities. T1A computers T1B printers T2 As for computer labs, answer: T2A The visual aspect of the computer labs is attractive. T2B The facilities are preserved for users. As for the screens and reports of MinhaUnisul portal systems: T3A Seem to be easy to understand MinhaUnisul screens T3B Seem to be easy to understand - Reports T3C Have good visual appearance- MinhaUnisul screens T3D Have good visual appearance - Reports T4 The systems I use are available when I try to access them.
	RELIABILITY	C1 When the IT Service Desk promises a service in a specific period of time, the service is really delivered. C2 When you present a problem or a need for the IT Service Desk, IT staff show interest in solving it. C3 When the IT service provided by the IT Service Desk is completed, there is no need for corrections. C4 IT Service Desk has the ability to deliver IT services with accuracy (no errors).
	RESPONSIVENESS	R1 The IT Service Desk informs exactly when services will be conducted. R2 If you have an urgent need, you receive immediate attention of the IT Service Desk. R3 The IT Service Desk solve your problems and questions at the right time. R4 Changes and problems with IT services are reported by the IT Service Desk proactively.
	ASSURANCE	S1 You feel safe in the relationship with the IT Service Desk. S2 The behavior of the IT Service Desk staff inspires confidence. S3 IT Service Desk staff has the knowledge required to meet their demands. S4 IT Service Desk staff are always sure when they answer your questions.
	EMPATHY	E1 IT Service Desk staff understand the specific needs presented by you. E2 The IT Service Desk seeks to strengthen the relationship with users. E3 The IT Services Desk has IT staff that consider to your needs. E4 The computer labs' office hours meet your needs.
3) Respondent's characterization	Intended to identify characteristics of the respondents (campus activities, bonding time)	
4) Open question	Identify the study context, the possibility of other issues related to the quality of IT services not covered by SERVPERF items.	

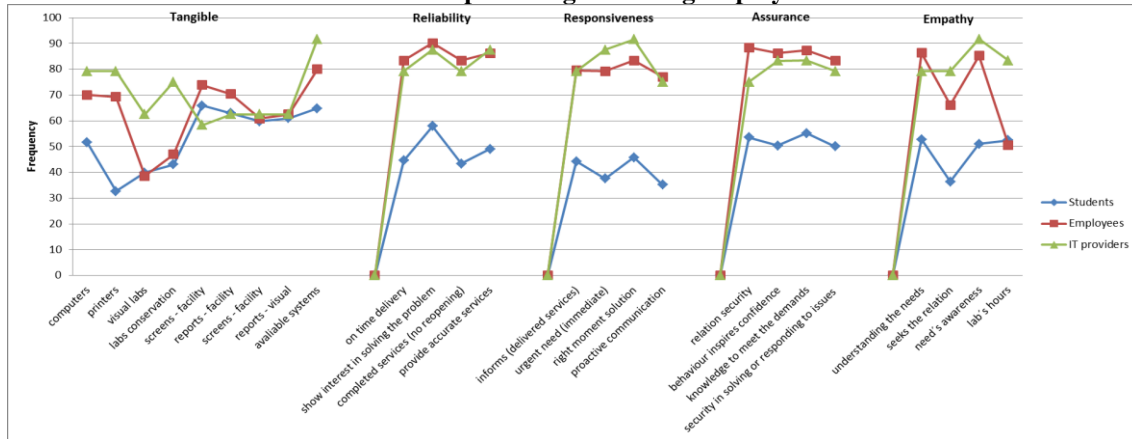
Source: Designed by the authors.

Table 2: Number of questionnaires answered by group

Groups	Population	Answers	%
Students	10311	563	5,5%
Staff	2002	283	14%
IT providers	53	24	45,3%

Source: Designed by the author.

Chart 1: Concordance percentage of each group by item and dimension



Source: Designed by the author.

Table 3: Rotated factorial matrix, students' group

Rotated factorial matrix				
	Factors			
	1	2	3	4
Computers				0,8
Printers				0,84
The visual aspect of the computer labs is attractive.			0,92	
The facilities are preserved for users.			0,91	
When you present a problem or a need for the IT Service Desk, IT staff show interest in solving it.	0,71			
Seem to be easy to understand.- Minha Unisul screens		0,83		
Seem to be easy to understand - Reports		0,82		
Have good visual appearance - MinhaUnisul screens		0,87		
Have good visual appearance - Reports		0,89		
IT Service Desk has the ability to deliver IT services with accuracy (no errors).	0,7			
If you have an urgent need, you receive immediate attention of the IT Service Desk.	0,7			
The IT Service Desk solve your problems and questions at the right time.	0,77			
You feel safe in the relationship with the IT Service Desk.	0,78			
The behavior of the IT Service Desk staff inspires confidence.	0,83			
IT Service Desk staff have the knowledge required to meet their demands.	0,82			
IT Service Desk staff are always sure when they answer your questions.	0,85			
IT Service Desk staff understand the specific needs presented by you.	0,82			
The IT Services Desk has IT staff that consider to your needs.	0,75			

Source: Designed by the author.

Table 4: Rotated factorial matrix, staff's group

Rotated factorial matrix					
	Factors				
	1	2	3	4	5
Computers					0,82
Printers					0,87
The visual aspect of the computer labs is attractive.				0,95	
The facilities are preserved for users.				0,94	
When the Central IT Service promises a service in a specific period of time, the service is really delivered.	0,72				
When you present a problem or a need for the IT Service Desk, IT staff show interest in solving it.	0,69				
Seem to be easy to understand - MinhaUnisul screens			0,78		
Seem to be easy to understand - Reports			0,85		
Have good visual appearance - MinhaUnisul screens			0,83		
Have good visual appearance - Reports			0,84		
The IT Service Desk informs exactly when services will be conducted.	0,74				
If you have an urgent need, you receive immediate attention of the IT Service Desk.	0,76				
The IT Service Desk solve your problems and questions at the right time.	0,74				
The behavior of the IT Service Desk staff inspires confidence.		0,75			
IT Service Desk staff have the knowledge required to meet their demands.		0,86			
IT Service Desk staff are always sure when they answer your questions.		0,79			
IT Service Desk staff understand the specific needs presented by you.		0,76			
The IT Service Desk seeks to strengthen the relationship with users.	0,56				

Source: Designed by the author.

Table 5: T test for the comparison of students' and staff's groups

	Levene	T test for average's equality				Interpretation
	Sig.	t	Df	Sig. (2)	Average difference	Null hypothesis
Computers	0,99	-4,66	538,75	0,00	-0,41	rejected
Printers	0,23	-8,46	561,77	0,00	-0,77	rejected
The visual aspect of the computer labs is attractive.	0,00	0,79	486,79	0,43	0,10	not possible to reject H ₀
The facilities are preserved for users.	0,00	1,19	485,96	0,23	0,15	not possible to reject H ₀
When you present a problem or a need for the IT Service Desk, IT staff show interest in solving it.	0,00	-11,88	688,96	0,00	-0,83	rejected
Seem to be easy to understand - MinhaUnisul screens	0,00	-2,29	683,45	0,02	-0,20	rejected
Seem to be easy to understand - Reports	0,00	-0,94	669,90	0,35	-0,08	not possible to reject H ₀
Have good visual appearance - MinhaUnisul screens	0,00	-2,40	654,77	0,02	-0,22	rejected
Have good visual appearance - Reports	0,00	-1,53	664,43	0,13	-0,13	not possible to reject H ₀
IT Service Desk has the ability to deliver IT services with accuracy (no errors).	0,00	-11,37	666,35	0,00	-0,75	rejected

If you have an urgent need, you receive immediate attention of the IT Service Desk.	0,00	-11,24	610,35	0,00	-0,88	rejected
The IT Service Desk solve your problems and questions at the right time.	0,00	-10,90	630,83	0,00	-0,78	rejected
You feel safe in the relationship with the IT Service Desk.	0,00	-12,44	693,90	0,00	-0,88	rejected
The behavior of the IT Service Desk staff inspires confidence.	0,00	-12,62	673,88	0,00	-0,87	rejected
IT Service Desk staff have the knowledge required to meet their demands.	0,00	-12,28	699,70	0,00	-0,78	rejected
IT Service Desk staff are always sure when they answer your questions.	0,00	-11,32	685,54	0,00	-0,77	rejected
IT Service Desk staff understand the specific needs presented by you.	0,00	-11,13	680,51	0,00	-0,74	rejected
The IT Services Desk has IT staff that consider to your needs.	0,00	-11,06	633,62	0,00	-0,77	rejected

Source: Designed by the author.

Table 6: T test for the comparison of students' and IT providers' groups

	Levene	T test for average's equality			Interpretation
	Sig.	t	Df	Sig. (2)	Average difference Null hypothesis
Computers	0,01	-2,23	25,71	0,04	-0,47 rejected
Printers	0,07	-4,67	26,11	0,00	-0,98 rejected
The visual aspect of the computer labs is attractive.	0,04	-3,19	26,01	0,00	-0,81 rejected
The facilities are preserved for users.	0,00	-4,21	27,40	0,00	-0,94 rejected
When you present a problem or a need for the IT Service Desk, IT staff show interest in solving it.	0,11	-3,50	25,89	0,00	-0,67 rejected
Seem to be easy to understand. - MinhaUnisul screens	0,09	0,79	26,24	0,44	0,17 not possible to reject H ₀
Seem to be easy to understand - Reports	0,00	-0,56	27,19	0,58	-0,11 not possible to reject H ₀
Have good visual appearance - MinhaUnisul screens	0,25	-0,28	25,59	0,78	-0,07 not possible to reject H ₀
Have good visual appearance - Reports	0,03	0,05	26,14	0,96	0,01 not possible to reject H ₀
IT Service Desk has the ability to deliver IT services with accuracy (no errors).	0,04	-3,99	25,78	0,00	-0,73 rejected
If you have an urgent need, you receive immediate attention of the IT Service Desk.	0,04	-5,46	26,63	0,00	-0,98 rejected
The IT Service Desk solve your problems and questions at the right time.	0,00	-5,75	27,44	0,00	-0,88 rejected
You feel safe in the relationship with the IT Service Desk.	0,03	-2,34	25,89	0,03	-0,46 rejected
The behavior of the IT Service Desk staff inspires confidence.	0,14	-4,90	25,99	0,00	-0,91 rejected
IT Service Desk staff have the knowledge required to meet their demands.	0,16	-2,81	25,45	0,01	-0,54 rejected
IT Service Desk staff are always sure when they answer your questions.	0,00	-2,63	26,15	0,01	-0,48 rejected
IT Service Desk staff understand the specific needs presented by you.	0,06	-3,17	26,02	0,00	-0,57 rejected
The IT Services Desk has IT staff that consider to your needs.	0,02	-6,25	26,58	0,00	-1,03 rejected

Source: Designed by the author.

Table 7: T test for the comparison of staff's and IT providers' groups

	Levene	T test for average's equality				Interpretation
	Sig.	t	Df	Sig. (2)	Average difference	Null hypothesis
Computers	0,03	-0,27	29,19	0,79	-0,06	not possible to reject H ₀
Printers	0,02	-0,99	29,43	0,33	-0,22	not possible to reject H ₀
The visual aspect of the computer labs is attractive.	0,00	-3,39	31,90	0,00	-0,91	rejected
The facilities are preserved for users.	0,00	-4,55	36,29	0,00	-1,09	rejected
When you present a problem or a need for the IT Service Desk, IT staff show interest in solving it.	0,68	0,77	26,66	0,44	0,15	not possible to reject H ₀
Seem to be easy to understand - MinhaUnisul screens	0,64	1,64	27,20	0,11	0,37	not possible to reject H ₀
Seem to be easy to understand - Reports	0,16	-0,14	28,72	0,88	-0,03	not possible to reject H ₀
Have good visual appearance.- MinhaUnisul screens	0,53	0,56	26,72	0,58	0,14	not possible to reject H ₀
Have good visual appearance - Reports	0,62	0,62	27,36	0,54	0,14	not possible to reject H ₀
IT Service Desk has the ability to deliver IT services with accuracy (no errors).	0,90	0,13	26,84	0,90	0,02	not possible to reject H ₀
If you have an urgent need, you receive immediate attention of the IT Service Desk.	0,33	-0,56	29,20	0,58	-0,10	not possible to reject H ₀
The IT Service Desk solve your problems and questions at the right time.	0,29	-0,67	30,02	0,51	-0,11	not possible to reject H ₀
You feel safe in the relationship with the IT Service Desk.	0,77	2,11	26,60	0,05	0,42	not possible to reject H ₀
The behavior of the IT Service Desk staff inspires confidence.	0,87	-0,21	27,01	0,84	-0,039	not possible to reject H ₀
IT Service Desk staff have the knowledge required to meet their demands.	0,77	1,24	25,98	0,22	0,24	not possible to reject H ₀
IT Service Desk staff are always sure when they answer your questions.	0,21	1,62	27,05	0,12	0,30	not possible to reject H ₀
IT Service Desk staff understand the specific needs presented by you.	0,78	0,95	26,95	0,35	0,17	not possible to reject H ₀
The IT Services Desk has IT staff that consider to your needs.	0,33	-1,56	28,59	0,13	-0,26	not possible to reject H ₀

Source: Designed by the author.