PARADOKS Ekonomi, Sosyoloji ve Politika Dergisi
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# *Performing Parametric and Nonparametric Statistical Methods Using Higher Education Service Quality Data*

## *Yükseköğretimde Hizmet Kalitesi Verilerini Kullanarak Parametrik Ve Parametrik Olmayan İstatistiksel Yöntemlerin Uygulanması*

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# *PERFORMING PARAMETRIC AND NONPARAMETRIC STATISTICAL METHODS USING HIGHER EDUCATION SERVICE QUALITY DATA*

## *YÜKSEKÖĞRETİMDE HİZMET KALİTESİ VERİLERİNİ KULLANARAK PARAMETRİK VE PARAMETRİK OLMAYAN İSTATİSTİKSEL YÖNTEMLERİN UYGULANMASI*

**Yrd. Doç. Dr. Selim TÜZÜNTÜRK,**
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## Abstract:

*The importance of the usage of parametric and nonparametric statistical methods is inevitable for many science branches in the scientific world. On the other hand, service quality in education has great importance for personal development and performance, for success of an institution and also for country's development. In this study, an adapted version of Parasuraman and et al's (1988) service quality (SERVQUAL) scale for higher education was used to gather service quality data. With the gathered data, parametric and nonparametric statistical methods were performed. The focus of this study was to determine whether the quality perceptions, expectations and the service quality differ between departments (Economics, Public Finance, Labour Economics and Industrial Relations, Business Administration, Public Administration, International Relations and Econometrics), gender (female, male), education type (formal and evening) and class (first, second, third and fourth) or not. In the end of this study, results were discussed.*

***Keywords:*** *Parametric Methods, Non-Parametric Methods, Service Quality in Education.*

## Özet:

*Bilim dünyasında birçok bilim dalı için parametrik ve parametrik olmayan istatistiksel yöntemleri kullanmanın önemi kaçınılmazdır. Öte yandan, eğitimde hizmet kalitesi kişisel gelişim ve performans için, bir kurumun başarısı için ve hatta ülkenin gelişimi için büyük öneme sahiptir. Bu çalışmada, hizmet kalitesi verilerinin elde edilmesi için Yüksek Öğretim için hizmet kalitesi (SERVQUAL) ölçeğinin Parasuraman ve diğerlerinden (1988) uyarlanmış bir versiyonu kullanılmıştır. Elde edilen veriler ile parametrik ve parametrik olmayan istatistiksel yöntemler uygulanmıştır. Bu çalışmanın odak noktası kalite algılarının, kalite beklentilerinin ve hizmet kalitesinin bölümlere göre (İktisat, Maliye, Çalışma Ekonomisi ve Endüstri İlişkileri, İşletme, Kamu Yönetimi, Uluslararası İlişkiler ve Ekonometri), cinsiyete göre (Bayan, Bay), eğitim türüne göre (örgün ve gece), ve sınıfa (birinci, ikinci, üçüncü ve dördüncü) göre farklılık gösterip göstermediğinin belirlenmesidir. Çalışmanın sonunda, sonuçlar tartışılmıştır.*

***Anahtar Kelimeler:*** *Parametrik Yöntemler, Parametrik Olmayan Yöntemler, Eğitimde Hizmet Kalitesi*

# PERFORMING PARAMETRIC AND NONPARAMETRIC STATISTICAL METHODS USING HIGHER EDUCATION SERVICE QUALITY DATA

## 1. INTRODUCTION

Data are at the core of all statistical analyses. Every empirical research attempt begins with gathering qualified data. In this context, to be aware of data types, data structures and levels of measurement and to gather data purposefully have great importance for any statistical analyses.

Quantitative and Qualitative data are the two main types of statistical data. When the data studied can be reported numerically, it is called **quantitative data**. Quantitative are either discrete or continuous. **Discrete data** can be only certain values such as the number of bedrooms in a house (1, 2, 3, etc.), the number of a children in a family. **Continuous data** can be any value within a specific range such as the yearly rain fall in Bursa (42,2 kilogram per square meter) and the air pressure in a tire (2,2 bar or 32 psi). On the other hand, when the characteristic being studied is nonnumeric, it is called **qualitative data** such as gender (female and male), eye color (blue, green and brown) and marital status (married and single).

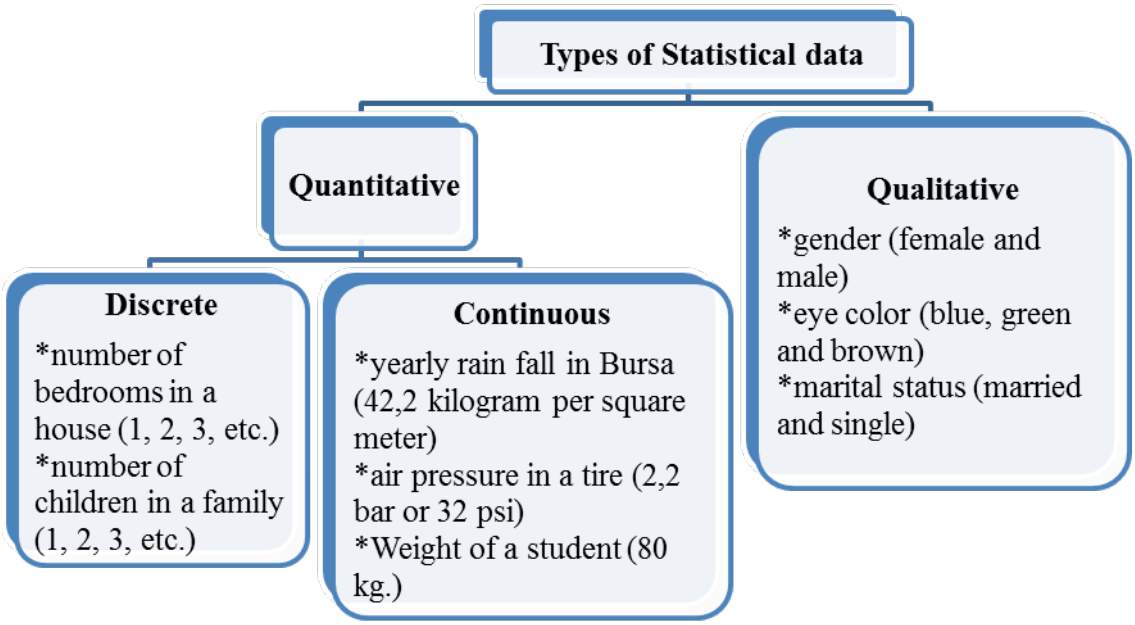


**Figure 1. Types of Statistical Data**

Assigning to a numerical value to a variable is a process called **measurement** (Weiers, 2002: 10). Data can be classified according to levels of measurement (Lind and et al. 2006: 9). There are four levels of measurement. These are respectively from lowest level to highest level: nominal, ordinal, interval and ratio (Weiers, 2002: 10; Lind and et al. 2006: Oğuzlar, 2007:3; Serper, 2010:40; Bayram, 2009: 11; Işığıçok, 2011:6; 10; Gürsakal, 2012: 43).

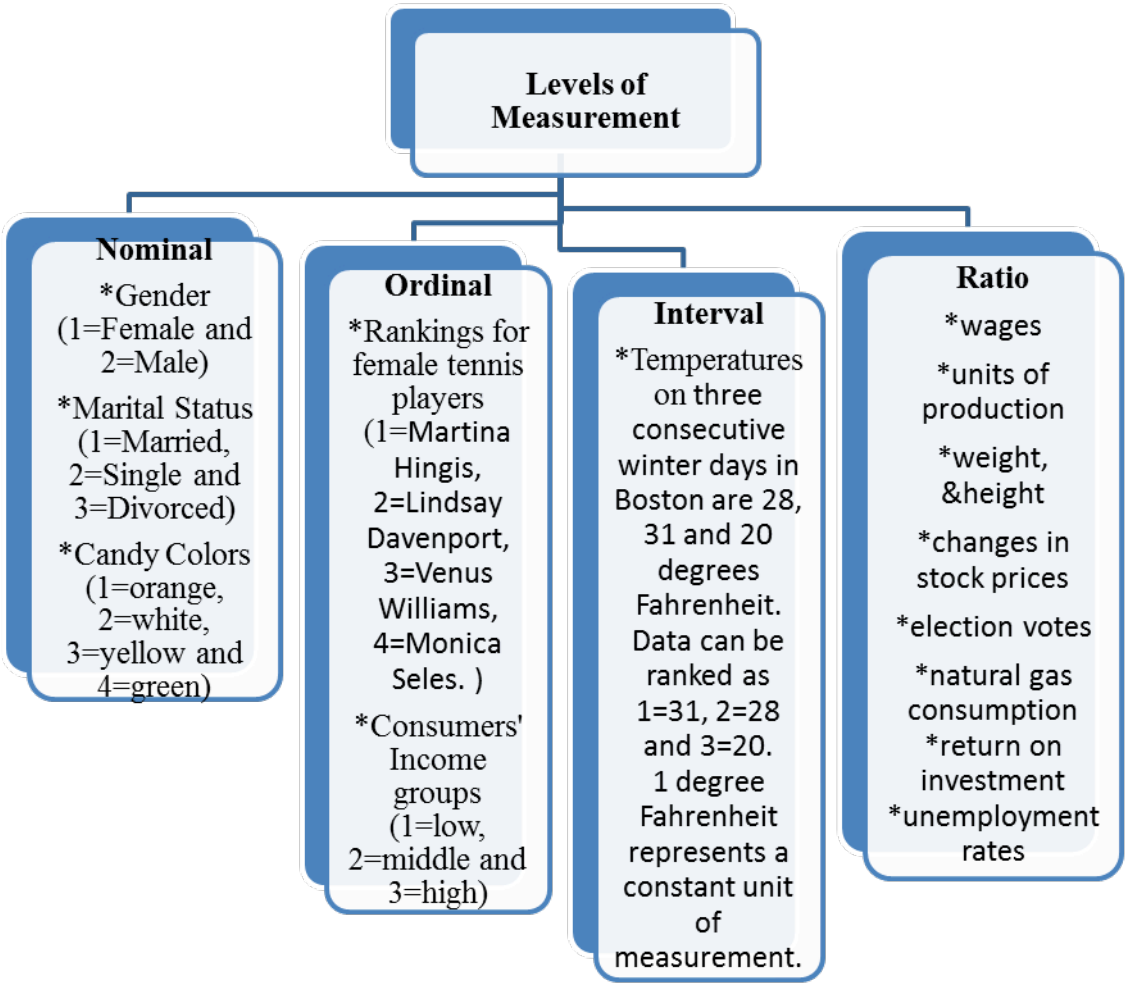


**Figure 2. Levels of Measurement**

In the nominal level of measurement, the observations can only be classified and counted (Lind and et al. 2002: 10). There is no particular order to the labels. **Numbers used for identifying membership in a group or category** (Weiers, 2002: 10). For example, gender is example of the nominal level of measurement. Gender is classified into two, 1=female and 2=male. We could report female or male first. Suppose the number of students is counted in a class and how many of them are female and male are reported.

In the ordinal level of measurement, numbers represent "greater than" or "less than" measurements such as preferences or rankings (Weiers, 2002: 11). **Numbers are viewed in terms of ranks (i.e., greater than, less than), but do not represent distances between**

**objects.** For example, rankings for female tennis players: 1=Martina Hingis, 2=Lindsay Davenport, 3=Venus Williams, 4=Monica Seles.

The interval scale includes all the characteristics of the ordinal level, but in addition, the difference between values is a constant size (Lind and et al. 2002: 11). Lind and et al. (2002) give temperature as an example for the interval scale. Suppose the high temperatures on three consecutive winter days in Boston are 28, 31 and 20 degrees Fahrenheit. **These temperatures can be easily ranked (1=31, 2=28 and 3=20), but we can also determine the difference between temperatures. This is because degree markings serve as a unit of measurement** (Weiers, 2002: 11). This is possible because 1 degree Fahrenheit represents a constant unit of measurement (Lind and et al. 2002: 11). Equal differences between two temperatures are the same, regardless of their position on the scale. That is, the difference between 10 degrees Fahrenheit and 15 degrees is 5; the difference between 50 and 55 degrees is also 5 degrees. It is also important to note that 0 is just a point on the scale. It does not represent the absence of the condition. Zero degrees of Fahrenheit do not represent the absence of heat, just that it is cold. On questionnaire items like the following, business research practitioners typically treat the data as interval scale since the same physical and numerical distances exist between alternatives (Weiers, 2002: 11):

| | | | | | |
|---|---|---|---|---|---|
| | ( ) | ( ) | ( ) | ( ) | ( ) |
| Kmart prices | 1 | 2 | 3 | 4 | 5 |
| | Low | | | | High |

The ratio scale is similar to the interval scale, but **has an absolute zero and multiples are meaningful** (Weiers, 2002: 11). Practically all quantitative data are the ratio level of measurement. It has all characteristics of the interval level, but in addition, **0 point is**

**meaningful and the ratio between numbers is meaningful** (Lind and et al. 2002: 12). Examples of the ratio scale measurement are as follows: wages, units of production, weight, height, changes in stock prices, election votes, natural gas consumption, return on investment, unemployment rates and etc.

The levels of measurement is important because it enables us to determine the statistical methods (tests) that should be performed (Lind and et al. 2006: 10; Işığıçok, 2011: 7; Gürsakal, 2012: 43). These statistical methods are divided into two, parametric methods and nonparametric methods. Parametric methods include tests such as t test, Analysis of Variance (ANOVA) and etc. Nonparametric methods include tests such as Mann-Whitney U, Kruskal Wallis and etc.

On the other hand, service quality in higher education which is defined as "the difference between students' expectation and their experience of education service is important for personal development and performance, for success of an institution and for country's development.

In this context, at first service quality in higher education will be measured with an adapted version of Parasuraman and et al's (1988) Servqual Scale. Then parametric and nonparametric statistical methods will be performed with the gathered service quality data. The aim of this study is to determine whether the quality perceptions, expectations and service quality differ between gender (female and male), education type (formal and evening), class (first, second, third and fourth) and departments (Economics, Public Finance, Labour Economics and Industrial Relations, Business Administration, Public Administration, International Relations and Econometrics) or not.

The rest of the paper organized as follows: Section 2 explains the parametric and nonparametric statistical methods (tests). Section 3 covers Servqual Scale and its adapted version. Section 4 presents the application. And Section 5 was composed of results.

## 2. PARAMETRIC AND NONPARAMETRIC METHODS (TESTS)

Parametric methods (tests) are applied when the sampling distributions of the data variables satisfy **normal model** (Marques de Sá, 2003: 141). The normal probability distribution and its accompanying normal curve have the following characteristics (Lind and et al. 2002: 227; see Aytaç (2004: 269-299) for details): 1-The normal curve is bell-shaped and has a single peak at the center of the distribution. 2-The normal probability distribution is symmetrical about its mean. 3-The normal curve falls off smoothly in either direction from central value. It is asymptotic, meaning that curve gets closer and closer to the X-axis but never actually touches it.

On the other hand, nonparametric tests make no assumptions regarding the distributions of the data variables. They are adequate to **small samples**. There are nonparametric tests that can be applied to **ordinal and/or nominal data**. Nonparametric tests are, in general, **less powerful** than their parametric counterparts (Marques de Sá, 2003: 141). Some commonly used parametric and nonparametric methods are presented in the table below*:

**Table 1. Parametric and NonParametric Comparisons**

| | **Parametric** | **Nonparametric** |
|---|---|---|
| **Distinctive Characteristics** | | |
| Distribution Assumption | Normal | - |
| Variance Assumption | Homogeneous | - |
| Levels of Measurement | Ratio or Interval | Ordinal or Nominal (Ratio or Interval) |
| Centrality Measure | Mean | Median |
| Correlation Coefficient | Pearson | Spearman |
| Sample Size | Small (n<30) | Small (for instance |

* These tests are the tests that are commonly used in all scientific researches. There are more other tests that can be classified under these two headings. For ease of exposition, more of these tests are not included in this text. Researchers can easily reach them from any text books (See, Aytaç, 1991; Oğuzlar, 2007; Bayram, 2009; Işığıçok, 2011; Gürsakal, 2013 and etc. ). Moreover, hypotheses of the above tests and test statistics formulas are also included in a detailed way in these books.

| | | |
|---|---|---|
| | Large (use n≥30 when the population distribution is suspicious) | n=6) |
| | | |
| **Methods (Tests)** | | |
| One Sample Test (Inference on one population) | One Sample t Test | One Sample Sign Test |
| Independent Two Samples (Inference on two population) | Independent Samples t Test | Mann-Whitney U Test |
| Independent more than Two Samples (Inference on more than two population) | Independent Measures One-Way ANOVA | Kruskal-Wallis H |
| Repeated Two Samples | Paired Samples t Test | Wilcoxon Test |
| Repeated more than Two Samples | Repeated Measures One-Way ANOVA | Friedman's Test |

In the first part of Table 1, some distinctive characteristics of parametric and nonparametric methods were presented. In the second part of Table 1, methods (tests) were given. In methods (tests), parametric methods are seen in the second column and their counterparts are seen in the third column. For instance, the counterpart of parametric One Sample t Test for nonparametric test is One Sample Sign Test.

At the beginning, the distribution of the data should be checked. Data can be tested with normality tests such as Kolmogorov Smirnov Test, Shapiro Wilk Test or Anderson Darling Test whether it follows a normal distribution or not. In these tests null hypothesis is population is distributed normally and alternative hypothesis is population is not distributed normally. If the data are normally distributed, then parametric tests can be applied. If not, transformation methods can be applied. For instance, if the data are highly rights skewed then take the logarithm of the data (for more methods, see Oğuzlar, 2007: 115). After then, the transformed data is checked again for normality with one of the normality tests (Kolmogorov Smirnov Test, Shapiro Wilk Test or Anderson Darling Test). If the data are normally distributed, then parametric tests can be applied. If the data are still not normally distributed, then their nonparametric counterparts should be applied.

## 3. PARASURAMAN AND ET AL'S (1988) SEVQUAL SCALE AND ITS ADAPTED VERSION

Service quality concept has become a pivotal concern in 1980s (Parasuraman and et al, 1985; Abili and et al, 2011). Service quality is a measure of how well the service level delivered matches customer expectations (Parasuraman and et al, 1985).

Service quality in education is simply defined as the students' overall evaluation on the services they receive (Hanaysha and et al, 2011). Service quality in education is specifically defined as "the difference between students' expectation and their experience of education service (in other words performance of the institution rated by students) (Hanaysha and et al, 2011; Al-Alak and Alnaser, 2012).

Servqual Score=Performance – Expectations

Service quality in education covers a variety of educational activities both inside and outside the classroom such as classroom based activities, faculty member/student interactions, educational facilities and contacts with the staff of the institution.

Service quality in education is important for personal development and performance, for success of an institution and for country's development. And also, universities are the ones that prepare the professionals who will work as managers in companies and manage public and private resources and care for the health and education of new generations (Oliveira and Ferreira, 2009).

**Table 2. Some Initiatives and Notes of Various Researchers on the Measurement of Servqual**

| |
|---|
| Parasuraman and et al (1985; 1988; 1991) five dimensional scale |
| Gronross (1988) six criteria |
| Carney (1994) nineteen variables attributes |
| Owlia and Aspinwall (1996) six dimensional with thirty attributes |
| Athiyaman (1997) eight characteristics |
| Mathew and Beartriz (1997) twenty six items |
| Lee and et al (2000) |
| Hadikoemoro (2002) five dimensions with thirty five items |
| Sangeeta et al (2004) five factors |
| Brooks (2005) three criteria |

Parasuraman and et al's (1988) Servqual Scale is a concise scale that can be used for service quality evaluations across wide variety of service industries (Dado and et al, 2011). Higher education service quality can be measured with an adapted version of Parasuraman and et al's (1988) Servqual Scale.

**Table 3. Some Recent Studies Performed with Servqual in Higher Education**

| |
|---|
| Higher education in Jordan (Alak and Alnaser, 2012) |
| Higher education in Malaysia (Hanaysha and et al, 2011) |
| Higher education in Serbia (Rozsa, 2011; Dado and et al, 2011) |
| Higher education in Iran (Abili and et al, 2011) |
| Higher education in Brazil (Oliveira and Ferreira, 2009) |
| Higher education in Malesia (Hasan and Ilias, 2008) |
| Higher education in China (Barnes, 2007) |

There are five dimensions in Parasuraman and et al's (1985, 1988, 1991) servqual scale. These are: tangibles (the physical facilities, equipment, and appearance of personnel), reliability (the ability to perform the desired service dependably, accurately and consistently), responsiveness (the willingness to provide prompt service and help

customers), security (employees' knowledge, courtesy and ability to convey trust and confidence) and empathy (the provision of caring individualized attention to customers). An adapted version of Parasuraman and et al's (1988) sevqual scale to higher education services by Oliveira and Ferreira (2009) is shown in the Table below.

**Table 4. An Adapted Version of Servqual Scale to Higher Education Services**

| Performance (P) | Expectation (E) |
|---|---|
| **Tangibility** | |
| 1 – Your Higher education institution has modern equipment, such as laboratories. | 1 – Excellent Higher education institutions must have modern equipment, such as laboratories. |
| 2 – Your Higher education g institution installations are well conserved. | 2 – Higher education institution installations must be well conserved. |
| 3 – The employees and teachers at your institution of Higher education present themselves (clothes, cleanliness, etc.) in an appropriate manner for their position. | 3 – Employees and teachers at excellent institutions of Higher education must present themselves (clothes, cleanliness, etc.) in an appropriate manner for their position. |
| 4 - The material associated with the service provided in your institution of Higher education, such as journals, printed matter, has a good visual appearance and is up to date. | 4 - The material associated with the service provided in excellent institutions of Higher education, such as journals, printed matter, must have a good visual appearance and be up to date. |
| **Reliability** | |
| 5 – When your institution of Higher education promises to do something in a certain time, it does so. | 5 – When excellent institutions of Higher education promise to do something in a certain time, they must do so. |
| 6 – When you have a problem, your institution of Higher education demonstrates sincere interest in solving it. | 6 – When a student has a problem, excellent institutions of Higher education demonstrate sincere interest in solving it. |
| 7 – Your institution of Higher education will do the job right the first time and will persist in doing it without error. | 7 – Excellent of institutions of Higher education will do the job right the first time and will persist in doing it without error. |
| **Responsibility** | |
| 8 – Employees and professors at your institution of Higher education promise you the services within deadlines they are able to meet. | 8 – Employees and teachers at excellent institutions of Higher education promise their clients the services within deadlines they are able to meet. |
| 9 – The employees and teachers at your institution of Higher education are willing and available during service providing. | 9 – The employees and teachers at excellent institutions of Higher education are willing and available during service providing. |
| 10 – The employees and teachers at your institution of Higher education always show good will in helping. | 10 – The employees and teachers at excellent institutions of Higher education will always show good will in helping their students. |
| 11 – The employees and teachers at your institution of Higher education are always willing to explain your doubts. | 11 – The employees at excellent institutions of Higher education are always willing to explain doubts their students may have. |

**Security**

| | |
|---|---|
| 12 - The behavior of employees and teachers at your institution of Higher education inspire confidence. | 12 - The behavior of employees and teachers at excellent institutions of Higher education must inspire confidence in the students. |
| 13 – You feel safe in your transactions with your institution of Higher education. | 13 – Students at excellent institutions of Higher education feel safe in their transactions with the institution. |
| 14 – The employees and teachers at your institution of Higher education are polite. | 14 - The employees and teachers at excellent institutions of Higher education must be polite to the students. |
| 15 – The employees and teachers at your institution of Higher education have the knowledge needed to answer your questions. | 15 – The employees and teacher at excellent institutions of Higher education must have the knowledge needed to answer student questions. |

**Empathy**

| | |
|---|---|
| 16 – Your institution of Higher education has convenient business hours for all students. | 16 – Excellent institutions of Higher education must have convenient business hours for all students |
| 17 – Your institution of Higher education has employees and teachers who provide individual attention to each student. | 17 – Excellent institutions of Higher education must have employees and teachers who provide individual attention to each student. |
| 18 – Your institution of Higher education is focused on the best service for its students. | 18 – Excellent institutions of Higher education must be focused on the best service for their students. |
| 19 – Your institution of Higher education understands the specific needs of its students. | 19 – Excellent institutions of Higher education must understand the specific needs of their students. |

These questions should be scored on a Likert scale from 1 to 7 (1=Mediocre, 2=Weak, 3=little satisfactory, 4=Satisfactory, 5=Good, 6=Very good, 7=Excellent).

## 4. APPLICATION

An adapted version of Parasuraman and et al's (1988) sevqual scale to higher education services by Oliveira and Ferreira (2009) was used to gather servqual data. All data was gathered from the students of Faculty of Economics and Administrative Sciences of Uludağ University in 2012. 119 individuals were responded. All analyses were performed with SPSS package. Application has four steps: In the first step, descriptive statistics and reliability of the servqual scale will be shown. In the second step the tabulation of the servqual data will be presented. Normality tests will be performed in the third step. And in the fourth step parametric and nonparametric methods will be performed with the gathered data.

Descriptive statistics of the respondents are as follows below:

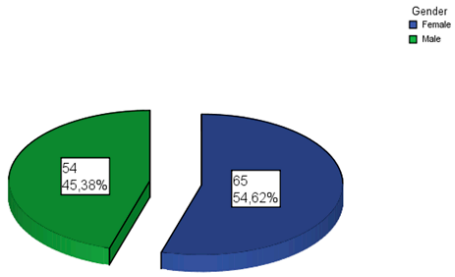


**Figure 3. Pie Chart of Gender Distribution**

Out of 119 respondents 65 students (54,62%) were female and 54 students (45,38%) were male.

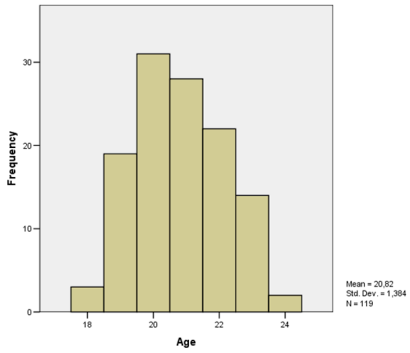


**Figure 4. Histogram of Ages**

Ages of 119 students ranges between 18 and 24. The average of ages for the sample data is nearly 21.

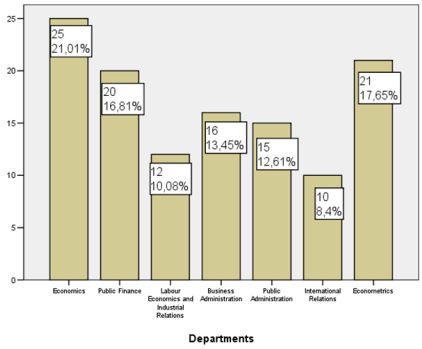


**Figure 5. Bar Graph of Departmental Distribution**

Out of 119 respondents 25 students (21,01%) were Economics department students, 21 students (17,65%) were Econometrics department students, 20 students (16,81%) were Public Finance department students, 16 students (13,45) were Business administration department students, 15 students (12,61%) were Public Administration department students, 12 students (10,08%) were Labour Economics and Industrial Relations department students and 10 students (8,4%) were International Relations department students.

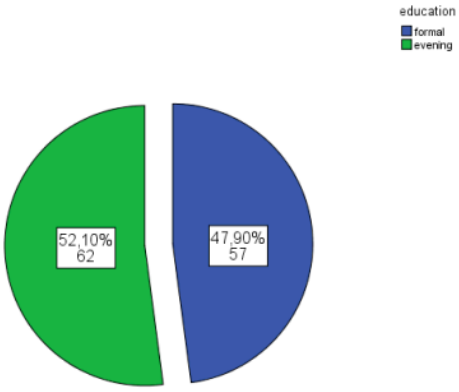


**Figure 6. Pie Chart of Education Type**

Out of 119 respondents 62 students (52,10%) were evening education students and 57 students (47,90%) were formal education students.

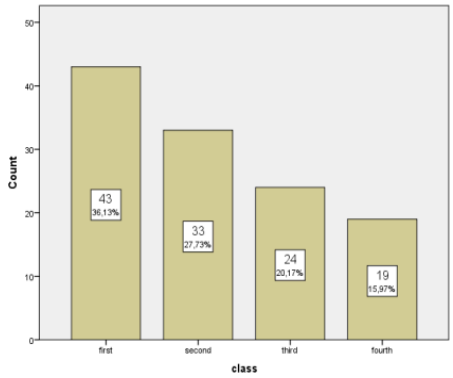


**Figure 7. Bar Chart of Class**

Out of 119 respondents 43 students (36,13%) were first class students, 33 students (27,73%) were second class students, 24 students (20,17%) were third class students and 19 students (15,97%) were fourth class students.

**Table 5. Reliability of the Servqual Scale**

| **Dimensions** | **Items** | **Cronbach Alpha for Performance** | **Cronbach Alpha for Expectations** |
|---|---|---|---|
| Tangibility | 1, 2, 3 and 4 | 0,737 | 0,755 |
| Reliability | 5, 6 and 7 | 0,843 | 0,658 |
| Promptness | 8, 9, 10 and 11 | 0,896 | 0,830 |
| Security | 12, 13, 14 and 15 | 0,829 | 0,703 |
| Empathy | 16, 17, 18 and 19 | 0,846 | 0,806 |
| Cronbach Alpha for all items | 1-19 | 0,944 | 0,902 |

All alpha values $0,60 \leq \alpha < 0,70$ are acceptable, $0,70 \leq \alpha < 0,90$ are good and $0,90 \leq \alpha$ are excellent values for reliability of the scale. Reliability of the scale for each dimension found good and for all items (for the whole scale) found excellent.

**Table 6. Tabulation of the Servqual Data**

| | | Perceptions | | | | | | | | Expectations | | | | | | | | P-E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Average | | | | | | | | Average | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| Tangibility | 1 | 16 | 27 | 8 | 13 | 31 | 9 | 15 | 3,86 | - | 1 | 1 | 3 | 4 | 18 | 92 | 6,63 | **-2,77** |
| | 2 | 13 | 22 | 12 | 22 | 29 | 14 | 7 | 3,85 | 2 | 2 | 1 | 2 | - | 27 | 85 | 6,50 | **-2,65** |
| | 3 | 6 | 8 | 6 | 9 | 29 | 41 | 20 | 5,10 | - | 4 | 2 | 9 | 5 | 33 | 66 | 6,17 | **-1,07** |
| | 4 | 12 | 14 | 11 | 20 | 27 | 20 | 15 | 4,31 | - | 2 | - | 2 | 7 | 43 | 65 | 6,38 | **-2,07** |
| | **Average Tangibility = -2,14** | | | | | | | | | | | | | | | | | |
| Reliability | 5 | 16 | 14 | 11 | 24 | 25 | 20 | 9 | 4,04 | - | 1 | - | 3 | 6 | 27 | 82 | 6,55 | **-2,51** |
| | 6 | 22 | 22 | 13 | 22 | 19 | 12 | 9 | 3,55 | 1 | 3 | 1 | 10 | 11 | 28 | 65 | 6,11 | **-2,56** |
| | 7 | 22 | 20 | 14 | 23 | 20 | 15 | 5 | 3,53 | 1 | 6 | 9 | 10 | 18 | 41 | 34 | 5,49 | **-1,96** |
| | **Average Reliability = -2,34** | | | | | | | | | | | | | | | | | |
| Promptness | 8 | 11 | 16 | 17 | 21 | 21 | 25 | 8 | 4,10 | - | 3 | 7 | 5 | 16 | 37 | 51 | 5,93 | **-1,83** |
| | 9 | 14 | 9 | 16 | 16 | 26 | 26 | 12 | 4,31 | - | 8 | 4 | 10 | 22 | 32 | 43 | 5,63 | **-1,32** |
| | 10 | 10 | 12 | 15 | 18 | 29 | 22 | 13 | 4,36 | - | 6 | 5 | 11 | 24 | 26 | 47 | 5,68 | **-1,32** |
| | 11 | 15 | 12 | 15 | 23 | 26 | 20 | 8 | 4,05 | 1 | 5 | 8 | 15 | 12 | 35 | 43 | 5,59 | **-1,54** |
| | **Average Promptness = -1,50** | | | | | | | | | | | | | | | | | |
| Security | 12 | 18 | 12 | 13 | 24 | 22 | 21 | 9 | 4,00 | 1 | 4 | 1 | 5 | 5 | 38 | 65 | 6,21 | **-2,21** |
| | 13 | 25 | 17 | 10 | 19 | 16 | 20 | 12 | 3,77 | 2 | 7 | 3 | 11 | 15 | 32 | 49 | 5,70 | **-1,93** |
| | 14 | 13 | 10 | 5 | 24 | 25 | 29 | 13 | 4,48 | 1 | 2 | 3 | 6 | 8 | 29 | 70 | 6,23 | **-1,75** |
| | 15 | 5 | 7 | 8 | 17 | 22 | 36 | 24 | 5,08 | 1 | 1 | 3 | 1 | 6 | 28 | 79 | 6,44 | **-1,36** |
| | **Average Security = -1,81** | | | | | | | | | | | | | | | | | |
| Empathy | 16 | 12 | 15 | 9 | 16 | 23 | 31 | 13 | 4,41 | - | 5 | 2 | 7 | 9 | 28 | 68 | 6,15 | **-1,74** |
| | 17 | 28 | 14 | 10 | 15 | 23 | 16 | 13 | 3,76 | 1 | 5 | 5 | 10 | 17 | 30 | 51 | 5,78 | **-2,02** |
| | 18 | 12 | 16 | 13 | 22 | 22 | 14 | 20 | 4,24 | 1 | 1 | 2 | 4 | 7 | 30 | 74 | 6,36 | **-2,12** |
| | 19 | 25 | 19 | 9 | 23 | 14 | 17 | 12 | 3,68 | 5 | 3 | 3 | 7 | 14 | 30 | 57 | 5,85 | **-2,17** |
| | **Average Empathy= - 2,01** | | | | | | | | | | | | | | | | | |
| **Overall Average= -1,96** | | | | | | | | | | | | | | | | | | |

In the Table above, responses for perceptions (P) and expectations (E) are seen that were scored for Likert Scale from 1 to 7 and the averages were calculated for each item. The service quality scores (P-E) that was calculated for each of the items are presented at the last column. The quality expectations of the students for any higher education are higher than the quality perceptions of the students for students of Faculty of Economics and Administrative Sciences of Uludağ University. This results negative service quality scores (P-E) for each of the items means that quality expectations for the quality of the education were not satisfied. **However, this result is not surprising because most quality expectations can't be satisfied for any institution**.

The averages of service quality scores for each one of the dimension were also calculated (-2,14 for tangibility, -2,34 for reliability, -1,50 for promptness, -1,81 for security and -2,01 for empathy). Overall average of service quality scores for these five dimensions is -1,96.

Averages of 19 items for each one of the 119 individuals were calculated for P, E and the difference of P and E (P-E). Then, normality tests were performed with these three new continuous variables.

**Table 7. Tests of Normality**

| | Kolmogorov-Smirnov | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| P | ,071 | 119 | ,200* | ,981 | 119 | ,100* |
| E | ,132 | 119 | ,000 | ,905 | 119 | ,000 |
| P-E | ,066 | 119 | ,200* | ,980 | 119 | ,074* |

Both normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) gives same results that the P and PE data are normally distributed (Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected ) while the E data is not normally distributed (Sig. or p-value < $\alpha$=0,05 means that null hypothesis should be rejected ). This means that parametric methods can be performed with the P and P-E data and nonparametric methods can be performed with the E data.

Now, our aim is to determine whether the quality perceptions (P), differ between gender (female and male), education type (formal and evening), class (first, second, third and fourth) and departments (Economics, Public Finance, Labour Economics and Industrial Relations, Business Administration, Public Administration, International Relations and Econometrics) or not.

**Table 8. Independent Samples t Test of Gender for P Data**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| P | Equal variances assumed | 3,815 | ,053 | -1,097 | 117 | ,275 | -,26775 | ,24416 | -,75130 | ,21581 |
| | Equal variances not assumed | | | -1,074 | 100,584 | ,285 | -,26775 | ,24927 | -,76226 | ,22677 |

Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. There is no difference in mean perception scores between female group and male group.

**Table 9. Independent Samples t Test of Education Type for P Data**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| P | Equal variances assumed | 2,260 | ,135 | -,775 | 117 | ,440 | -,18895 | ,24396 | -,67209 | ,29419 |
| | Equal variances not assumed | | | -,771 | 112,238 | ,443 | -,18895 | ,24522 | -,67480 | ,29691 |

Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. There is no difference in mean perception scores between formal education group and evening education group.

**Table 10. Test of Homogeneity of Variances of Class for P Data**

| Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|
| ,213 | 3 | 115 | ,887 |

Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. Variances are homogeneous. Homogeneity assumption satisfied as was normality assumption.

**Table 11. One-Way ANOVA of Class for P Data**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 17,066 | 3 | 5,689 | 3,429 | ,019 |
| Within Groups | 190,782 | 115 | 1,659 | | |
| Total | 207,849 | 118 | | | |

Sig. or p-value ≥ $\alpha$=0,01 means that null hypothesis shouldn't be rejected. There is no difference in mean perception scores between first class group, second class group, third class group and fourth class group.

**Table 12. Test of Homogeneity of Variances of Department for P Data**

| Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|
| ,863 | 6 | 112 | ,525 |

Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. Variances are homogeneous. Homogeneity assumption satisfied as was normality assumption.

**Table 13. One-Way ANOVA of Departments for P Data**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 12,295 | 6 | 2,049 | 1,174 | ,325 |
| Within Groups | 195,554 | 112 | 1,746 | | |
| Total | 207,849 | 118 | | | |

Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. There is no difference in mean perception scores between Economics department group, Econometrics department group, Public Finance department group, Business administration department group, Public Administration department group, Labour Economics and Industrial Relations department group and International Relations department group.

Now, our aim is to determine whether the service quality (P-E), differ between gender (female and male), education type (formal and evening), class (first, second, third and fourth) and departments (Economics, Public Finance, Labour Economics and Industrial Relations, Business Administration, Public Administration, International Relations and Econometrics) or not.

**Table 14. Independent Samples t Test of Gender for P-E Data**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| PE | Equal variances assumed | ,392 | ,532 | -,388 | 117 | ,699 | -,10951 | ,28214 | -,66827 | ,44926 |
| | Equal variances not assumed | | | -,386 | 110,613 | ,700 | -,10951 | ,28355 | -,67141 | ,45239 |

Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. There is no difference in mean service quality scores between female group and male group.

**Table 15. Independent Samples t Test of Education Type for P-E Data**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| PE | Equal variances assumed | ,252 | ,616 | -,308 | 117 | ,759 | -,08654 | ,28125 | -,64354 | ,47046 |
| | Equal variances not assumed | | | -,309 | 116,970 | ,758 | -,08654 | ,28005 | -,64118 | ,46809 |

Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. There is no difference in mean service quality scores between formal education group and evening education group.

**Table 16. Test of Homogeneity of Variances of Class for P-E Data**

| Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|
| ,414 | 3 | 115 | ,743 |

Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. Variances are homogeneous. Homogeneity assumption satisfied as was normality assumption.

**Table 17. One-Way ANOVA of Class for P-E Data**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 25,875 | 3 | 8,625 | 3,980 | ,010 |
| Within Groups | 249,193 | 115 | 2,167 | | |
| Total | 275,068 | 118 | | | |

Sig. or p-value ≥ $\alpha$=0,01 means that null hypothesis shouldn't be rejected. There is no difference in mean service quality scores between first class group, second class group, third class group and fourth class group.

**Table 18. Test of Homogeneity of Variances of Department for P-E Data**

| Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|
| ,889 | 6 | 112 | ,506 |

Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. Variances are homogeneous. Homogeneity assumption satisfied as was normality assumption.

**Table 19. One-Way ANOVA of Department for P-E Data**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19,831 | 6 | 3,305 | 1,450 | ,202 |
| Within Groups | 255,237 | 112 | 2,279 | | |
| Total | 275,068 | 118 | | | |

Sig. or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. There is no difference in mean service quality scores between Economics department group, Econometrics department group, Public Finance department group, Business administration department group, Public Administration department group, Labour Economics and Industrial Relations department group and International Relations department group.

Now, our aim is to determine whether the expectations (E), differ between gender (female and male), education type (formal and evening), class (first, second, third and fourth) and departments (Economics, Public Finance, Labour Economics and Industrial Relations, Business Administration, Public Administration, International Relations and Econometrics) or not.

**Table 20. Mann-Whitney U Test of Gender for E Data**

| | E |
|---|---|
| Mann-Whitney U | 1584,000 |
| Wilcoxon W | 3729,000 |
| Z | -,914 |
| Asymp. Sig. (2-tailed) | ,361 |

Asymp. Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. The population medians are equal which means that there is no difference in median of expectations quality scores between female group and male group.

**Table 21. Mann-Whitney U Test of Education Type for E Data**

| | E |
|---|---|
| Mann-Whitney U | 1454,000 |
| Wilcoxon W | 3107,000 |
| Z | -1,668 |
| Asymp. Sig. (2-tailed) | ,095 |

Asymp. Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. The population medians are equal which means that there is no difference in median of expectations quality scores between formal education group and evening education group.

**Table 22. Kruskal-Wallis H Test of Class for E Data**

| | E |
|---|---|
| Chi-Square | 3,700 |
| df | 3 |
| Asymp. Sig. | ,296 |

Asymp. Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. The population medians are equal which means that there is no difference in median of expectations quality scores between first class group, second class group, third class group and fourth class group.

**Table 23. Kruskal-Wallis H Test of Departments for E Data**

| | E |
|---|---|
| Chi-Square | 2,782 |
| df | 1 |
| Asymp. Sig. | ,095 |

Asymp. Sig. (2-tailed) or p-value ≥ $\alpha$=0,05 means that null hypothesis shouldn't be rejected. The population medians are equal which means that there is no difference in median of expectations quality scores between Economics department group, Econometrics department group, Public Finance department group, Business administration department group, Public Administration department group, Labour Economics and Industrial Relations department group and International Relations department group.

## 5. RESULTS

In this study, the importance of data types, data structures, levels of measurement and gathering data purposefully were underlined. Some commonly used parametric and nonparametric methods were described. It was stressed that when and how to use these methods was important issue.

An adapted version of Parasuraman and et al's (1988) sevqual scale to higher education services by Oliveira and Ferreira (2009) was used to gather servqual data. Reliability of the scale for each dimension found good and for all items (for the whole scale) found excellent.

Normality tests showed that the P and PE data are normally distributed while the E data is not normally distributed. So, parametric methods performed with the data for P and PE and nonparametric methods performed with the data for E.

Servqual scores were computed. The quality expectations of the students for any higher education found higher than the quality perceptions of the students for students of Faculty of Economics and Administrative Sciences of Uludağ University. This result means that quality expectations for the quality of the education were not satisfied. However, this result is not surprising because most quality expectations can't be satisfied for any institution.

Finally, no differences found in perceptions (P), service quality (P-E) and expectations quality (E) scores for genders, education types, classes and departments. Detailed results are as follows:

Results for perceptions (P) data:

- No difference found in mean perception scores between female group and male group.
- No difference found in mean perception scores between formal education group and evening education group.
- No difference found in mean perception scores between first class group, second class group, third class group and fourth class group.
- No difference found in mean perception scores between Economics department group, Econometrics department group, Public Finance department group, Business administration department group, Public Administration department group, Labour Economics and Industrial Relations department group and International Relations department group.

Results for service quality (P-E) data:

- No difference found in mean service quality scores between female group and male group.
- No difference found in mean service quality scores between formal education group and evening education group.
- No difference found in mean service quality scores between first class group, second class group, third class group and fourth class group.
- No difference found in mean service quality scores between Economics department group, Econometrics department group, Public Finance department group, Business administration department group, Public Administration department group, Labour Economics and Industrial Relations department group and International Relations department group.

Results for expectations quality (E) data:

- No difference found in median of expectations quality scores between female group and male group.
- No difference found in median of expectations quality scores between formal education group and evening education group.
- No difference found in median of expectations quality scores between first class group, second class group, third class group and fourth class group.
- No difference found in median of expectations quality scores between Economics department group, Econometrics department group, Public Finance department group, Business administration department group, Public Administration department group, Labour Economics and Industrial Relations department group and International Relations department group.

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