

## **Statistical quality control charts for measuring educational service quality at Albaha University, Saudi Arabia, from the viewpoint of students**

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### **Abstract:**

The research aims to use statistical quality control charts to measure the quality level and the quality gap between the perceptions of students and their expectations for the service level provided by Albaha University. The data comprises a total of 200 students selected randomly from a cluster sample of 4 faculties during the period 1-30/04/2015. The data collection involves the use of the service quality (SERVQUAL) questionnaire that measures perceptions and expectations of students for service level in five dimensions consisting assurance, responsiveness, empathy, reliability, and tangibles. The statistical analytic approach of the research focuses on statistical quality control charts (arithmetic mean and capability process). The results reveal that the service level is outside the boundaries of quality control. There is a negative gap in the Faculty of Arts and Sciences in Mandag, and the Faculty of Administrative and Financial Sciences; and there is a positive gap in the Faculty of Arts and Humanities of Sciences in Aqiq, and the Faculty of Science in Aqiq respectively. Also, the results demonstrated that there is a negative quality gap in each of the five SERVQUAL dimensions. The least and the most negative quality gap means are found to be in the assurance elements and tangible dimensions respectively.

**Key words:** Statistical quality control charts, service quality, higher education.

### **Acknowledgment:**

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### **Introduction:**

Statistical quality control is used to describe a set of statistical tools used by professionals of quality, it is used to analyze and resolution the quality problems. Statistical Quality Control charts are used in production and services environments to analyze process parameters to determine where a controlled process is within or out of control. Control charts are valuable for several purposes of the process improvement cycle. Quality is a key factor of keeping the business organization environment in continuous performance improvement in order to meet the requirements of international standards of quality service.<sup>1</sup>

A control charts is one of the statistical process control techniques; this chart plots the averages of measurements of a quality characteristic in samples taken from the process of time (or the sample number). The chart has a center line (CL), upper and lower control limits (UCL and LCL)<sup>2</sup>.

Quality control charts are currently the most widely-adopted control technique. Control charts are a statistical method used to distinguish between the variation due to general causes and special causes. The control chart can be divided into two groups according to the type of data, control chart for attribute data and control chart for variable data<sup>3</sup>. The statistical quality control charts used to evaluate the quality of Albaha University, the quality of courses at many colleges of the university, routine reviews always include representatives from the external community, including internationally respected academics from other countries while conducting this research. The University works in many standards of quality, and works to obtain academic accreditation from some recognized accreditation bodies. The problem of the research represents in the question: how to measure the quality level and the quality gap between the perceptions of students and their expectations for the service level provided by Albaha University through using statistical quality control charts and t-test. The research objective represents in knowledge of the quality level and the quality gap between the perceptions of students and their expectations for the service level provided by Albaha University through using statistical quality control charts and t-test. The important of this research appear in two ways, one is the knowledge of quality control charts, and the other is the field of application of measuring the quality level and the quality gap between the perceptions and expectations of students for the service level provided by Albaha University, also this research helps to locate areas of performance where improvements are needed, or areas where resources could be better utilized. The hypothesis of this research represents into two ways: the service level lies outside the boundaries of quality control, and there is a negative gap of education service level provided by Albaha University between the perceptions and expectations of students. The methodology of this research is statistical analytical approach focusing on statistical quality control charts (arithmetic mean, capability process, and t-test) to measure the quality level and quality gap of educational service according to perceptions and expectations of the Albaha University students.



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The limits of this research represent in student of Albaha University in the year 2015. The structure of this research includes a general introduction, theoretical framework, methodology, analysis, and conclusion.

### **Background:**

Service quality achieves when a service meets or exceeds of beneficiaries expectations.<sup>4</sup>

Many nonprofit organizations have become aware of the fact that recognizing their customers' needs is a key to their business success. Higher education institutions are placing greater emphasis on meeting students' expectations and needs. As universities continue to become more student oriented, student perceptions of higher educational facilities and services are becoming more important<sup>5</sup>. The key to service quality, then, is to meet or exceed consumer expectations.

SERQUAL (abbreviation of the words Service and Quality) is a model for measuring the quality of services through the difference between customers' expectations and perceptions along five dimensions.<sup>6</sup>

As per the researchers, (Kebriaei and Roudbari, 2008) they have determined the quality gap of educational services in Zahedan University of Medical Sciences in Iran. The results of that research showed that a negative gap of quality existed in all dimensions of service, the largest and smallest differences between students and faculties viewpoint were in the responsiveness and tangibility dimensions are good<sup>4</sup>.

As per (Rahim M, Daneshmandi H, Choobineh A, 2014) research to determine a quality gap in educational services by the students of Health and Nutrition School of Shiraz University of Medical Sciences is very pivotal. Thus the results showed that there was a quality gap in all 5 dimensions of educational services. In that research, the largest and the smallest gaps were observed in responsiveness and reliability respectively<sup>7</sup>.

As per (Aghamolaei T and Zare S, 2008) research to determine the quality gap of educational services in viewpoints of students in Hormozgan University of medical sciences is important. Hence, the results demonstrated that in each of the five SERVQUAL dimensions, there was a negative quality gap. The least and the most negative quality gap means we're the reliability and responsiveness dimensions respectively are more reliable<sup>8</sup>.

According to the above-mentioned points in previous researches we conclude that all studies focus on measuring the quality gap, and the objective of this research represents into determining the quality level and the gap between the perceptions of students and their expectations for the service level provided by Albaha University through using statistical quality control charts and t-test.



### Methods:

The research was conducted during second semester in April of academic year 2014/2015 “10/04/2015” among students population of Albaha University. A total of 277 students were selected by cluster sampling “The clusters sample was selected because there are many colleges in the university in difference province and this sample allow for ignoring some clusters, and this helps to control the data collection and reduce the cost. 72% of the students responded, which was 200, and then the society divided into clusters. Four clusters (faculties) are selected randomly, Arts and Sciences in Mandag, Administrative and Financial Sciences, Arts and Humanities of Sciences in Aqiq, and Science in Aqiq. Then sup sample size was selected through Equal allocation With samples per cluster, also the fifty students in any faculty divide into five subsamples ranges for purpose of statistical quality control charts as (1-10, 11-20, 21-30, 31-40, and 41-50) which represent preparatory, Second, Fourth, sixth, and eighth levels. The number of students in each faculty was selected randomly from each cluster by using simple random sample in one month for all faculties, through a week for each faculty. Because there was no change in the studied elements, opposite the samples that are applying in the quality control in the industrial fields, which requires taking sub-samples after each period of time, because there is, expected change will occur in the studies elements (product).

**The sample size is determined using the following equation:**

$$n = \frac{z^2 \sigma^2}{d^2} \rightarrow (1)$$

Where:

Z is the value of standard normal distribution

D is the desired margin of error.

$\sigma$  is the standard deviation.

By 95% confidence level standard normal distribution was 1.96, the desired margin of error was 0.09 and the standard deviation of a quality gap was 1.07 extracted from Kebriaei’s research<sup>4</sup> as a previous study in the same subject which was permitted and applied in the field of scientific research.

The instrument was an adaptation of the SERVQUAL survey. The original SERVQUAL survey was specifically designed to assess organizations and businesses in the service sector.<sup>9</sup> Some changes were made to adapt this research's survey to an academic setting by Parasuraman.<sup>10</sup> The adaptation of the SERVQUAL survey was made up in this research is nineteen parallel likert scale items measuring five postulated dimensions of service quality, which consist of tangibles (4 items), reliability (4 items), responsiveness (3 items), assurance (4 items), and empathy (4 items). “The SERVQUAL questionnaire is attached in Appendix”



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The questionnaire was judged by four faculty members (their specializations are administration and statistics) of Albaha and Omdurman Islamic Universities, and the arbitrators agreed to keep the scale without change. Also the Validity " refers to how well a test measures what it is purported to measure and Reliability " is the degree to which an assessment tool produces stable and consistent results " had applied for the questionnaire through a sample of Albaha University students, by using Cronbach's Alpha coefficients to test the reliability, and a square root of the reliability for the validity. The Cronbach's Alpha coefficients computed by the following equation through SPSS:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum s_i^2}{s_t^2}\right) \rightarrow (2)$$

Where:

K is the number of elements.

$\sum s_i^2$  is the total variance of elements.

$s_t^2$  is the total degree variation

The Cronbach's Alpha coefficients of tangibles, reliability, responsiveness, assurance, and empathy dimensions were 0.81, 0.87, 0.87, 0.86, and 0.92, respectively. Also, the Cronbach's alpha coefficient in expectation and perceptions were 0.95 and 0.96, respectively. These values are very high and indicate the high degree of validity and reliability of the questionnaire.

### Methodology:

The phrase "statistical quality control" refers to the application of statistical methods to monitor and evaluate systems and to determine whether changing key input variable settings is appropriate. Specifically, statistical quality control is associated with Shewhart's statistical process charting methods. These methods include several charting procedures for visually evaluating the consistency of key process outputs and identifying unusual circumstances that might merit attention could be better understood.<sup>11</sup> It is identified that there are two types of the control charts which are variables control "X-bar chart, R chart, s chart, X-bar and R chart, X-bar and s chart" and attributes control " p chart (proportion chart) and c chart (count chart)".<sup>12</sup> The x-bar chart is used for monitoring the mean of a characteristic in statistical quality control or is used to detect a change in the level of a process. Also the x-Bar chart shows how much variation exists in the process over time. A process that is in statistical control is predictable, and characterized by points that fall between the lower and upper control limits. When an X-Bar chart is in statistical control, the average value for each subgroup is consistent over time, and the variation within a subgroup is also consistent.<sup>13</sup>



**The Control Limits for X-Bar Chart are<sup>14</sup>:**

$$UCL_{\bar{X}} = \bar{\bar{X}} + A_2 \bar{R}, LCL_{\bar{X}} = \bar{\bar{X}} - A_2 \bar{R} \rightarrow (3)$$

Where:

- UCL = Upper Control Limit, LCL = Lower Control Limit

-  $\bar{\bar{X}} = \frac{\sum_{i=1}^n \bar{X}}{k}$ ,  $\bar{X}$  represents sample mean "Total values divided by its number",  
 $\bar{\bar{X}}$  represents mean of sample means. K represents Number of sample means

-  $\bar{R} = \frac{\sum_{i=1}^n R_i}{k}$ ,  $\bar{R}$  represents the mean of samples range "measures data dispersion  
by finding the difference between the largest and smallest value ", K represents  
number of samples.

-  $A_2$  is a factor obtained from special tables for control charts.

The Capability or Process Capability refers to the statistical position of the normal distribution compared to the product or process specification. A process is capable when a bell curve is created by +/- 3 Standard Deviation and fits easily inside the desired specification. Indicators of capability are calculated based on the number of Sigma or Standard Deviations fitting between the process Mean and the closest specification.<sup>15</sup>

Capability indicator  $C_p$  or  $C_{pi}$  is the measurement of the ratio of Six Sigma divided into the allowable specification.  $C_{pi}$  does not indicate how well the process is performing, rather how good it could be.  $C_p$  is calculated by using the following formula<sup>16</sup>:

$$C_p = \frac{USL - LSL}{6\sigma} \rightarrow (4),$$

Where:

$C_p$  = Capability Process, USL = Upper Specification Limit, LSL = Lower Specification Limit,  $\sigma$  = Standard Deviation "Measures data dispersion by finding the square root of the variance"

Capability indicator  $C_{pk}$  is a typical indicator used to describe actual process capability.  $C_{pk}$  is used to determine the number of defects that are being produced, even if none have been found up to this point. The  $C_{pk}$  is the capability on the K side of the distribution. The K factor, or side, has the most risk and therefore is the worst of two possible measurements in a bilateral specification.  $C_{pk}$  of 1.33 indicates 4 Sigma Capability or 4/3rds.  $C_{pk}$  of 1.67 indicates 5 Sigma Capability or 5/3rds. The greater the  $C_{pk}$  the less likely nonconformance will be present.  $P_{pk}$  is an index similar to  $C_{pk}$  but considers more sources of variation in the process over a longer period of time. A capability is often misunderstood or considered a difficult concept.



$C_{pk}$  is calculated by using the following formula<sup>17</sup>:

$$C_{pk} = \min \left[ \frac{USL - \mu}{3\sigma}, \frac{\mu - LSL}{3\sigma} \right] \rightarrow (5)$$

Capability indicator  $C_{pm}$  is a better measure than the  $C_{pk}$  measure used to measure the ability of unfocused operations.  $C_{pm}$  is calculated by using the following formula:<sup>16</sup>

$$C_{pm} = \frac{USL - LSL}{6\sqrt{\sigma^2 + (\mu - T)^2}} = \frac{USL - LSL}{6\sqrt{\frac{\sum_{i=1}^N (X_i - T)^2}{N}}} \rightarrow (6)$$

Where:

T is target value =  $(USL + LSL)/2$

N is observation number

$\mu$  is the population mean

Specification limits<sup>11</sup>:

Quality means that the product or "service" is suitable for the performance of the purpose designed for it to meet the wishes and requirements of the beneficiary, this can be achieved only by the existence of certain requirements (standard specifications) and follow-up and investigation to correct any deviation and defects in the product or service. Specification limits allowable spread of the individuals, are compared with the spread of the process to determine how capable the process is of meeting the specifications. The maximum value allowed for the quality characteristic called Upper Specification Limit "USL", and the minimum value allowed for the quality characteristic called Lower Specification Limit "LSL". In many real-world situations, the LSL and USL define the quality. There are three different situations when comparing specifications, like: The spread of the individual means is less than the spread of the specifications "The process is capable to meet the specifications limits", the process spread can be equal to the spread of the specification limits "The process is capable to meet the specifications limits", and the spread of the individual means is greater than the spread of the specifications "The process is incapable to meet the specifications limits".

One sample t-test:<sup>18</sup>

One sample t-test is a test used for comparing between a sample mean and a population Mean, the test is calculated by using the following formula:

$$t = \frac{(\bar{x} - \mu)}{s/\sqrt{n}} \rightarrow (7)$$

Where:  $\bar{x}$  is the sample mean,  $\mu$  is the population mean, s is the standard deviation of the sample, n is the sample size.



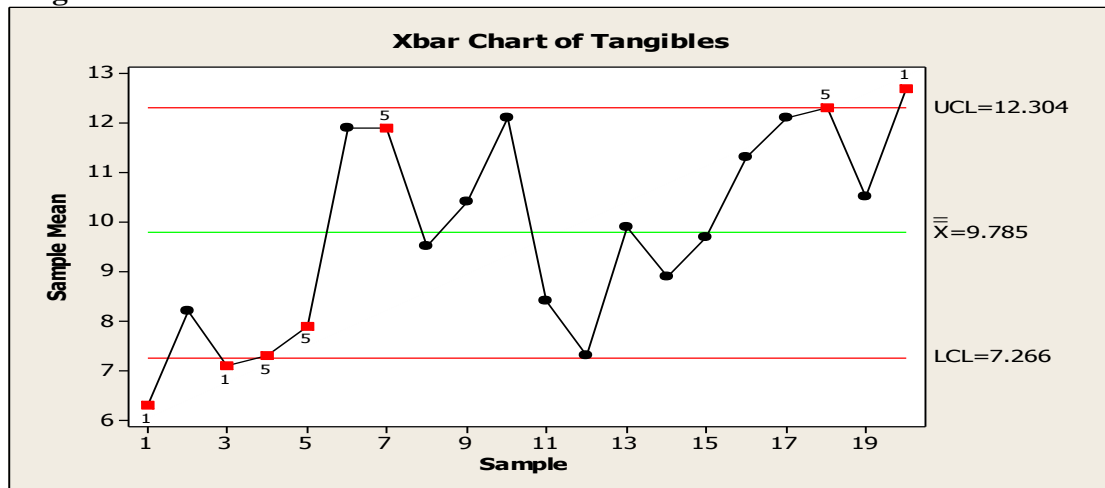


### Analysis and discussion:

The data is analyzed using statistical quality control charts through the arithmetic mean chart and indicators of service process capability of the scores of perceptions, expectation, and service quality gap as viewed by the students in various statements in all of the 5 dimensions using Minitab program. Additionally, statistical paired sample t-test is employed by using SPSS. The research uses the control chart for variable data because the ordinal data transformed to quantitative data is found to have normal distribution. The research focuses on the mean chart and the capability process.

The age of students limited between 18 to 25 years. 50% of students are male and 50% are female, taken from the four faculties Arts and Sciences in Mandag, Administrative and Financial Sciences, Arts and Humanities of Sciences in Aqiq, and Science in Aqiq.

Figure1: the arithmetic mean chart to adjust the actual services related to tangible elements dimension.

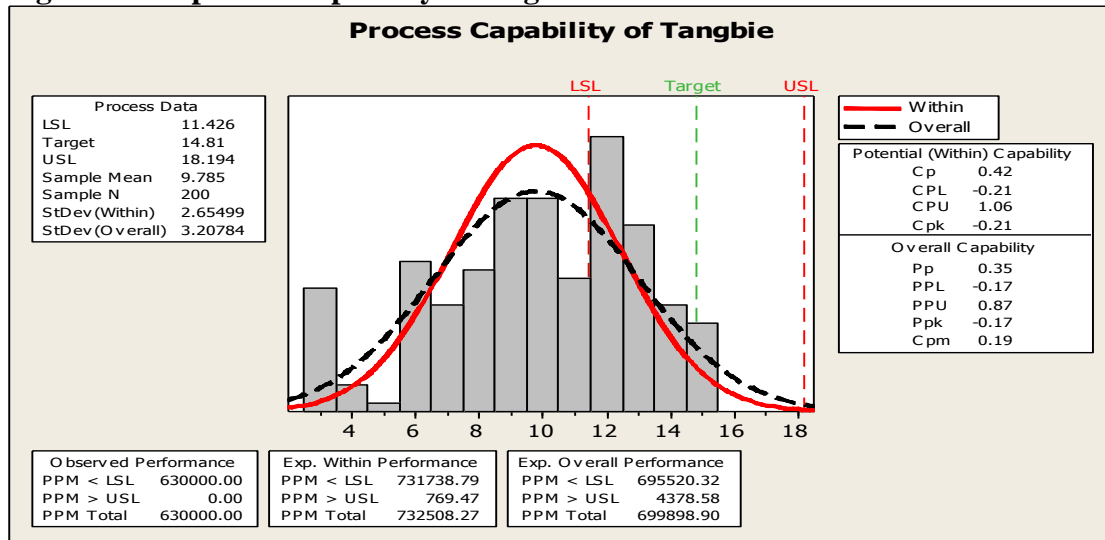


The chart in Figure 1 shows that the process of service for tangible elements is out of control because there are three points (partial samples) outside the control limits symbolized by the symbol 1, which means that the process does not pass the first test because some points fall outside the control limits. The reason of the departure from the control is in partial samples No. 1, 3 and 20 of the studied sample data. The samples No. 1 and 3 represent Preparatory Year and the fourth levels of Arts and Sciences in Mandag by a negative gap between the perceptions of students and their expectations for the service level, and No. 20 represents the eighth level of Faculty of Arts and Humanities of Sciences in Aqiq. In these samples, there is a positive gap between the perceptions of students and their expectations for the service level.

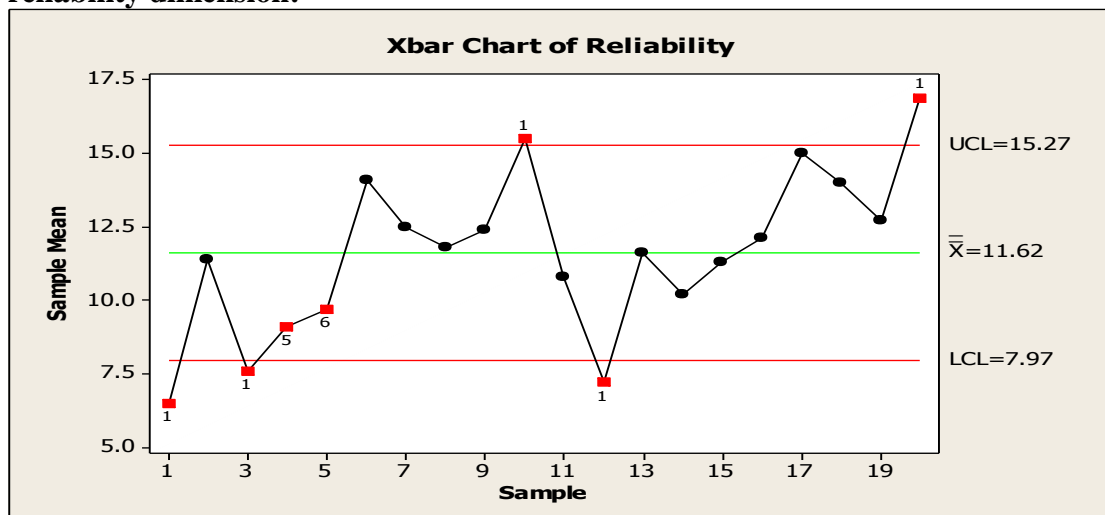




Figure 2: the process capability of tangible elements dimension:



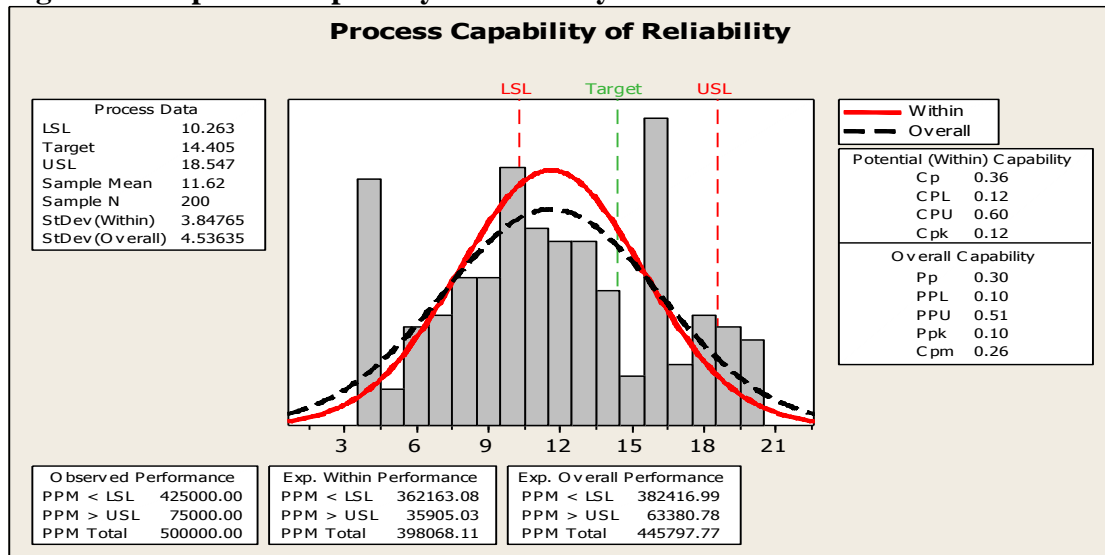
The fact that the value of  $C_p$  is equal to 0.42, which is less than 1, as shown in Figure 2, suggests that they are not able to meet the required specifications. From this, it is indicative that the service process on the tangible elements does not have the actual ability to provide the expected service to the students. But the nominal value or target of 14.81 differ from setting limits. The mean of 9.79 indicates that the process is off-center processed, so it is appropriate in this case to use the estimated index  $C_{pk}$  of -0.21, which is less than 1, thus revealing that the process is not capable of attaining acceptable quality control level. The result is consistent with the result of the capability indicator  $C_{pm}$  of 0.19, which is considered to be one of the best indicators used to measure the operation center. Figure 3: the arithmetic mean chart to adjust the actual services related to reliability dimension:





The chart in Figure 3 shows that the process of service for reliability elements is out of control because there are three points (partial samples) outside the control limits symbolized by the symbol 1, which means that the process does not pass the first test because some points fall outside the control limits. The reason of the departure from the control is in partial samples No. 1, 3, 10, 12 and 20 of the studied sample data. The samples No. 1 and 3 represent Preparatory Year and the fourth levels of Arts and Sciences in Mandag and No. 12 represent second level of Faculty of Administrative and Financial Sciences in Aqiq by a negative gap between the perceptions of students and their expectations for the service level, then No. 10 and 20 represent the eighth level of Faculty of Sciences in Aqiq and the Faculty of Arts and Humanities of Sciences in Aqiq respectively. In these samples, there is a positive gap between the perceptions of students and their expectations for the service level.

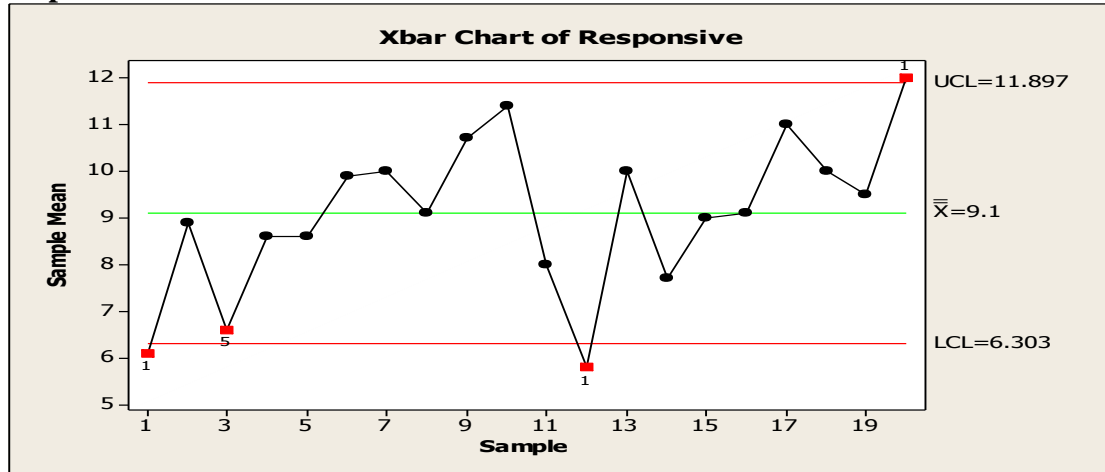
Figure 4: the process capability of reliability dimension:



The fact that the value of  $C_p$  is equal to 0.36, which is less than 1, as shown in Figure 4, suggests that they are not able to meet the required specifications. From this, it is indicative that the service process on the reliability elements does not have the actual ability to provide the expected service to the students. But the nominal value or target of 14.41 differ from setting limits. The mean of 11.6 indicates that the process is off-center processed, so it is appropriate in this case to use the estimated index  $C_{pk}$  of -0.12, which is less than 1, thus revealing that the process is not capable of attaining acceptable quality control level. The result is consistent with the result of the capability indicator  $C_{pm}$  of 0.26, which is considered to be one of the best indicators used to measure the operation center.

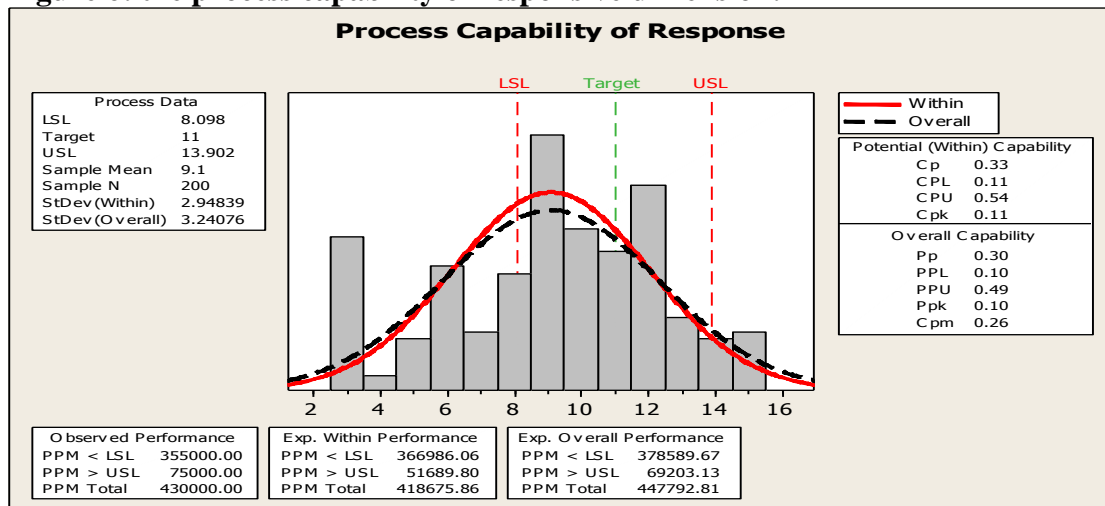


Figure 5: the arithmetic mean chart to adjust the actual services related to responsive dimension:



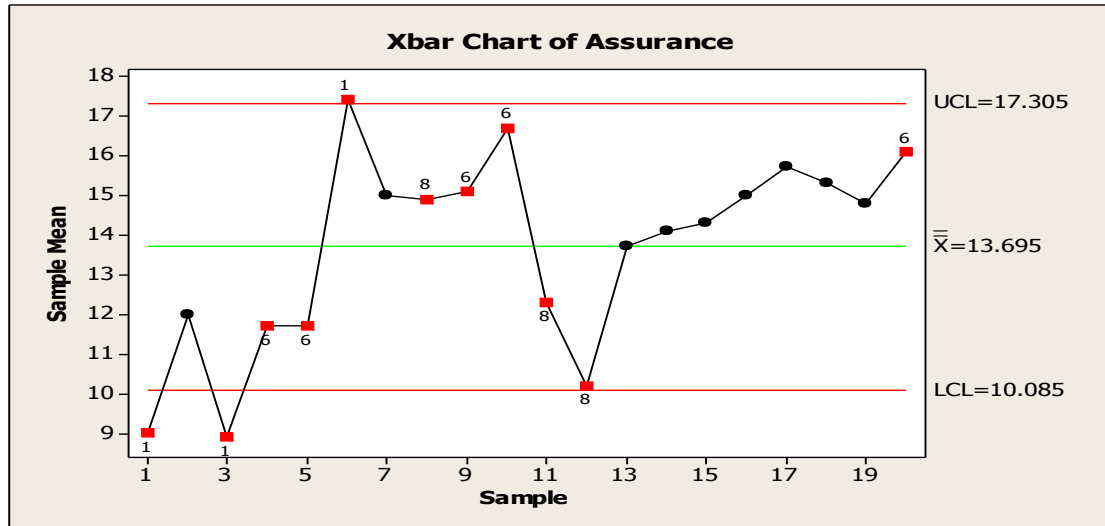
The chart in Figure 5 shows that the process of service for responsive elements is out of control because there are three points (partial samples) outside the control limits symbolized by the symbol 1, which means that the process does not pass the first test because some points fall outside the control limits. The reason of the departure from the control is in partial samples No. 1, 12 and 20 of the studied sample data. The samples No. 1 represent Preparatory Year of Arts and Sciences in Mandag and No. 12 represent second level of Faculty of Administrative and Financial Sciences in Aqiq by a negative gap between the perceptions of students and their expectations for the service level, then No. 20 represent the eighth level of Faculty of Arts and Humanities of Sciences in Aqiq. In these samples, there is a positive gap between the perceptions of students and their expectations for the service level.

Figure 6: the process capability of responsive dimension:





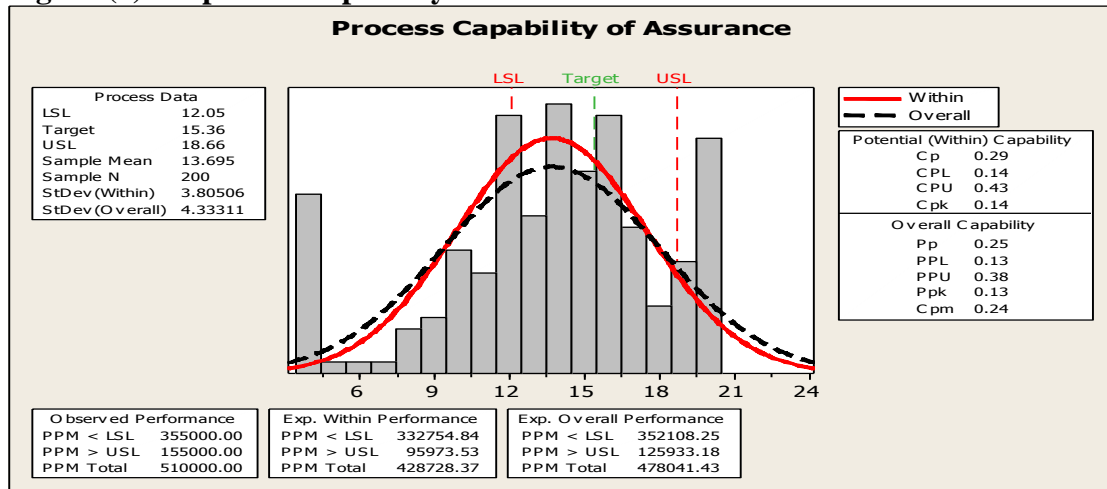
The fact that the value of  $C_p$  is equal to 0.33, which is less than 1, as shown in Figure 6, suggests that they are not able to meet the required specifications. From this, it is indicative that the service process on the responsive elements does not have the actual ability to provide the expected service to the students. But the nominal value or target of 11 differ from setting limits. The mean of 9.1 indicates that the process is off-center processed, so it is appropriate in this case to use the estimated index  $C_{pk}$  of 0.11, which is less than 1, thus revealing that the process is not capable of attaining acceptable quality control level. The result is consistent with the result of the capability indicator  $C_{pm}$  of 0.26, which is considered to be one of the best indicators used to measure the operation center. Figure 7: the arithmetic mean chart to adjust the actual services related to assurance dimension:



The chart in Figure 7 shows that the process of service for assurance elements is out of control because there are three points (partial samples) outside the control limits symbolized by the symbol 1, which means that the process does not pass the first test because some points fall outside the control limits. The reason of the departure from the control is in partial samples No. 1, 3, and 6 of the studied sample data. The samples No. 1 and 3 represent Preparatory Year and the fourth levels of Arts and Sciences in Mandag by a negative gap between the perceptions of students and their expectations for the service level, then No. 6 represents the Preparatory Year of Faculty of Sciences in Aqiq. In these samples, there is a positive gap between the perceptions of students and their expectations for the service level.

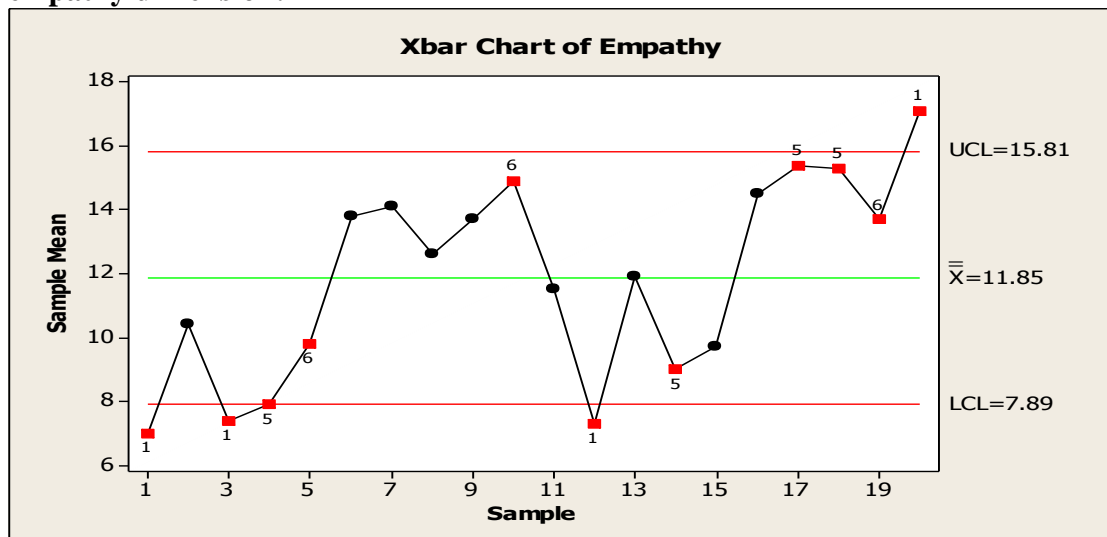


Figure (8) the process capability of assurance dimension:



The fact that the value of  $C_p$  is equal to 0.29, which is less than 1, as shown in Figure 8, suggests that they are not able to meet the required specifications. From this, it is indicative that the service process on the assurance elements does not have the actual ability to provide the expected service to the students. But the nominal value or target of 15.36 differ from setting limits. The mean of 13.7 indicates that the process is off-center processed, so it is appropriate in this case to use the estimated index  $C_{pk}$  of 0.14, which is less than 1, thus revealing that the process is not capable of attaining acceptable quality control level. The result is consistent with the result of the capability indicator  $C_{pm}$  of 0.24, which is considered to be one of the best indicators used to measure the operation center.

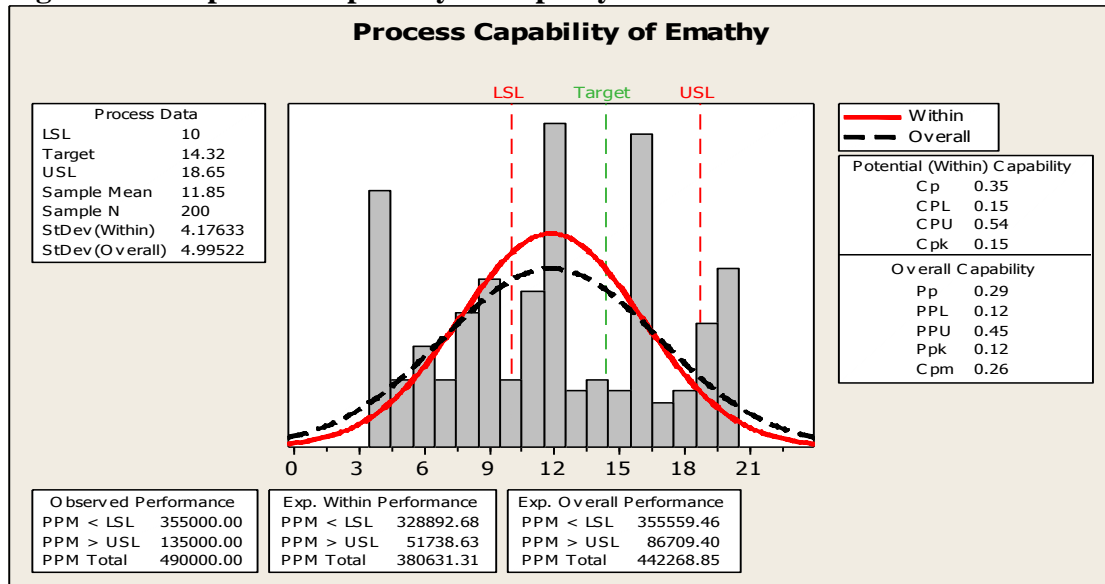
Figure 9: the arithmetic mean chart to adjust the actual services related to empathy dimension:





The chart in Figure 9 shows that the process of service for reliability elements is out of control because there are three points (partial samples) outside the control limits symbolized by the symbol 1, which means that the process does not pass the first test because some points fall outside the control limits. The reason of the departure from the control is in partial samples No. 1, 3, 12 and 20 of the studied sample data. The samples No. 1 and 3 represent Preparatory Year and the fourth levels of Arts and Sciences in Mandag and No. 12 represent second level of Faculty of Administrative and Financial Sciences in Aqiq by a negative gap between the perceptions of students and their expectations for the service level, then No. 20 represent the eighth level of Faculty of Arts and Humanities of Sciences in Aqiq. In these samples, there is a positive gap between the perceptions of students and their expectations for the service level.

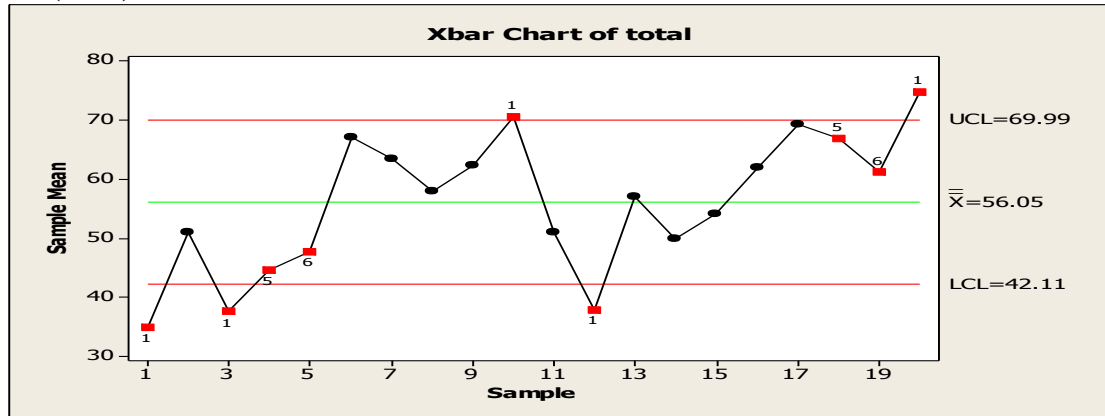
Figure 10: the process capability of empathy dimension:



The fact that the value of  $C_p$  is equal to 0.35, which is less than 1, as shown in Figure 10, suggests that they are not able to meet the required specifications. From this, it is indicative that the service process on the empathy elements does not have the actual ability to provide the expected service to the students. But the nominal value or target of 14.32 differ from setting limits. The mean of 11.85 indicates that the process is off-center processed, so it is appropriate in this case to use the estimated index  $C_{pk}$  of 0.15, which is less than 1, thus revealing that the process is not capable of attaining acceptable quality control level. The result is consistent with the result of the capability indicator  $C_{pm}$  of 0.26, which is considered to be one of the best indicators used to measure the operation center.

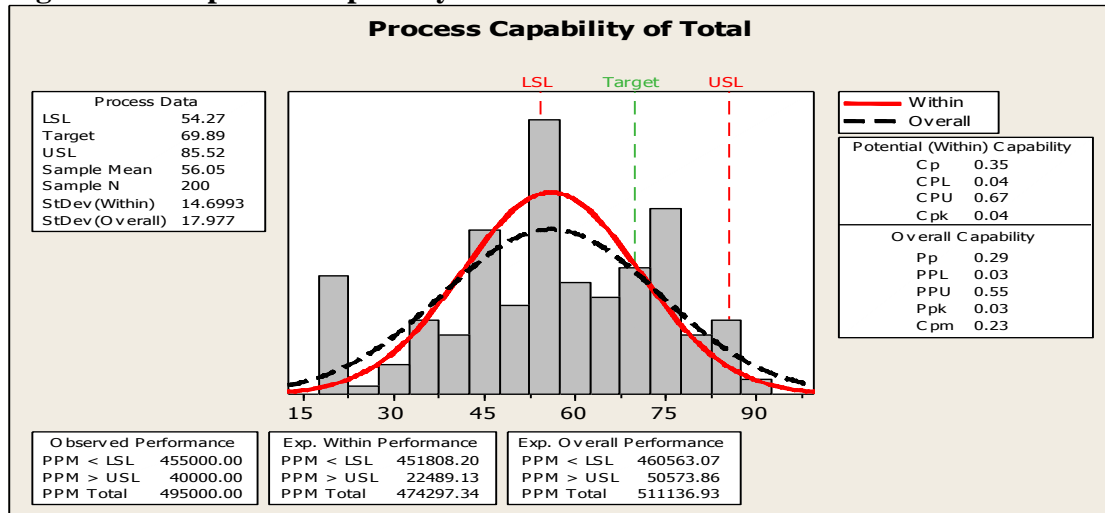


Figure11: the arithmetic mean chart to adjust the actual services related to for all (total) dimensions:



The chart in Figure 11 shows that the process of service for all (total) elements is out of control because there are three points (partial samples) outside the control limits symbolized by the symbol 1, which means that the process does not pass the first test because some points fall outside the control limits. The reason of the departure from the control is in partial samples No. 1, 3, 10, 12 and 20 of the studied sample data. The samples No. 1 and 3 represent Preparatory Year and the fourth levels of Arts and Sciences in Mandag and No. 12 represent second level of Faculty of Administrative and Financial Sciences in Aqiq by a negative gap between the perceptions of students and their expectations for the service level, then No. 10 and 20 represent the eighth level of Faculty of Sciences in Aqiq and the Faculty of Arts and Humanities of Sciences in Aqiq respectively. In these samples, there is a positive gap between the perceptions of students and their expectations for the service level.

Figure 12: the process capability of various statements in all 5 dimensions:







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The fact that the value of  $C_p$  is equal to 0.35, which is less than 1, as shown in Figure 10, suggests that they are not able to meet the required specifications. From this, it is indicative that the service process on the empathy elements does not have the actual ability to provide the expected service to the students. But the nominal value or target of 69.89 differ from setting limits. The mean of 56.05 indicates that the process is off-center processed, so it is appropriate in this case to use the estimated index  $C_{pk}$  of 0.04, which is less than 1, thus revealing that the process is not capable of attaining acceptable quality control level. The result is consistent with the result of the capability indicator  $C_{pm}$  of 0.23, which is considered to be one of the best indicators used to measure the operation center. Table 13: the t-test for measuring the quality gap between the perceptions of students and their expectations for the services level provided by Albaha University in all statements of 5 dimensions:

n	Dimensions	Expected mean	Perception mean	Difference mean	T-test	sig	Statistical significance	The proportion of the perception	Arranging dimensions according to the small gap
1	Tangibility elements	14.8100	9.7850	5.02500	-5.025	.000	sig	66.07	5
2	Reliability	14.4050	11.6200	2.78500	-2.785	.000	sig	80.67	4
3	Responsibility	11.0000	9.1000	1.90000	-1.9	.000	sig	82.73	2
4	Assurance	15.3550	13.6950	1.66000	-1.66	.000	sig	89.19	1
5	Empathy	14.3250	11.8500	2.47500	-2.475	.000	sig	82.72	3
*	All Dimensions	69.8950	56.0500	13.84500	-13.84	.000	sig	80.19	

It is clear from table 13 that the p-value of t-test is less than the level of significance 0.01 for all-dimensional, these indicates that the students perception for all dimensions are less than their expectations, which shows the existence of a negative gap between them, and the smallest gap between the expected and the perceived is assurance by mean difference is -1.66 with 89.19% proportion of the perception, then responding, sympathy, Reliability, and tangible elements in the last by the large gap of mean difference is -5.025 with 66.07% proportion of the perception from expected. This means that there is a clear difference between perception and expectations of students across the five determinants with negative gap.



### Results:

The results of statistical quality control charts reveal that the level of service quality in some subsamples fall outside the boundaries of quality control. . There result of exactly negative gap, where the level of service quality in this case falls under the lower control limit, is shown exactly for all dimensions in Preparatory Year; and for all dimensions except “Responsive” in the Fourth level of the Faculty of Arts and Sciences in Mandag; and in all dimensions except “Tangible” and “Assurance” for the Second level in the Faculty of Administrative and Financial Sciences. Moreover, the results also show that there is a positive gap, where the level of service quality fall above the upper limit, in “Assurance” dimension for the Preparatory Year; in the “Reliability” dimension for the Eights level in the Faculty of Science in Aqiq; and in all dimensions except “Assurance” for the Eighth level in the Faculty of Arts and Humanities of Sciences in Aqiq.

Furthermore, the results demonstrate that through t- test there is a negative quality gap in each of the five SERVQUAL dimensions. The least and the most negative quality gap means are observed in assurance (-1.66) and the tangible elements (-5.03) dimensions respectively. This indicates that students' expectations are beyond their perceptions. Hence, this research agrees with previous researches (Kebriaei and Roudbari, Rahim, M, Daneshmandi H, Choobineh A, 2008, and Aghamolaei T and Zare S, 2008) that provide evidence of negative quality gap of educational services in all dimensions the negative quality gap of educational services existed in all dimensions. However, it differs from them in the least and the largest gap results for dimensions.

### Conclusion:

The results of the statistical quality control charts show that the service level is outside the boundaries of quality control for Al Baha University. The finding is that there is a negative quality gap as well as positive quality gap depending upon different levels, faculties and dimensions of service quality. There is evidence of a negative quality gap for the Faculty of Arts and Sciences in Mandag, and in the Faculty of Administrative and Financial Sciences a positive quality gap for the Faculties of Arts and Humanities of Sciences in Aqiq, and the Faculty of Science in Aqiq. The results also, demonstrate that there was a negative quality gap in each of the five SERVQUAL dimensions, and the largest mean of the quality gap was related to “Tangible” element dimension, then “Reliability”, “Empathy”, “Response”, and “Assurance” dimensions.



The research reveals that expectations of students were higher than their perceptions of the current conditions and that their expectations were not satisfied. Therefore, it is recommended that there is a need for improvements in all dimensions, and to allocate more resources to improve the educational facilities and physical environment. Additionally, the institution should hold workshops on customer service, communication skills, and personnel's technical skills development. Finally, it would be suggestive to conduct similar research in the various faculties of the university to deduce the best understanding of the students' expectations and educational needs using other types of statistical quality control.

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**Statistical quality control charts for measuring educational service quality  
at Albaha University, Saudi Arabia, from the viewpoint of students**

**Appendix  
The SERVQUAL instrument**

Dear / student

I am an assistant professor from Faculty of Administrative and Financial Sciences at Albaha University. I am carrying out a research on measuring educational service quality at Albaha University from students' viewpoint. The research aims to use statistical quality control charts to measure the service quality level and the gap between the perceptions and expectations of students at Albaha University using the SERVQUAL questionnaire that require response on the following two situations:

Firstly, answering the questionnaire statements on the students' expectations of the services quality level provided by Albaha University for the part "Before starting university".

Secondly, answering the questionnaire statements on the students' perceptions of the services quality level provided by Albaha University for the part "After starting university studies".

Depending on your views on each statement, please respond carefully and objectively. In some parts your response would be putting the sign (√) where appropriate on the answer that best matches your opinion. In others, you will select the Likert scales that have been used to arrange your answer from strongly agree "5" to strongly disagree "1".

All your answers' will be treated anonymously confidence and will be used only for the purpose of this research. I thank you in advance for contributing in the research work by investing some of your precious time.

Regards  
The researcher

The primary data

1. Gender:

a) Male                      b) Female

2. Age:

(a) Less than 18 years (b) 18 to 25 years (c) Greater than 25 years

3. Faculty: .....

4. Level:

(a) preparatory (b) Second (c) Fourth (d) sixth (e) eighth



**Statistical quality control charts for measuring educational service quality  
at Albaha University, Saudi Arabia, from the viewpoint of students**

The basic data “The SERVQUAL instrument”

Questionnaire statements on the students' expectations of the services quality level provided by Albaha University for the part: “Before starting university.”

No	The dimension	statement	Direction				
			Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Tangibility Elements	The equipment is up-to-date.					
2		The available facilities are suitable and attractive.					
3		Employees are well dressed and appear neat.					
4		The study environment is adapted to the type of the service provided.					
5	Reliability	The university keeps their promises.					
6		The university sympathizes with the student when a problem occurs					
7		the problems are corrected as soon as discovered					
8		The services are provided at the appropriate time.					
9	Responsibility	Quick Services are provided.					
10		Employees are always willing to help students.					
11		Employees are not busy to respond to students requests promptly.					
12	Assurance	Employees at the university are trusted.					
13		Should feel safe in your transactions with the employees at the university.					
14		Employees have polite behavior with students.					
15		Employees provide adequate support to the students					
16	Empathy	The university gives student individual attention					
17		The university provides suitable studying hours adaptable to students' conditions.					
18		The university keeps students' best interests at heart.					
19		Employees are aware of students need.					



**Statistical quality control charts for measuring educational service quality  
at Albaha University, Saudi Arabia, from the viewpoint of students**

**Questionnaire statements on the students' expectations of the services quality level provided by Albaha University for the part: “After starting university Studies.”**

No	The dimension	statement	Direction				
			Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Tangibility Elements	The equipment is up-to-date.					
2		The available facilities are suitable and attractive.					
3		Employees are well dressed and appear neat.					
4		The study environment is adapted to the type of the service provided.					
5	Reliability	The university keeps their promises.					
6		The university sympathizes with the student when a problem occurs					
7		the problems are corrected as soon as discovered					
8		The services are provided at the appropriate time.					
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17		The university provides suitable studying hours adaptable to students' conditions.					
18		The university keeps students' best interests at heart.					
19		Employees are aware of students need.					





## خرائط ضبط الجودة الإحصائية لقياس جودة الخدمة التعليمية في جامعة الباحة بالمملكة العربية السعودية من وجهة نظر الطلاب

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### المستخلص

تم استخدام خرائط ضبط الجودة الإحصائية لتقييم جودة الخدمة التعليمية في جامعة الباحة، ويهدف هذا البحث إلى استخدام خرائط ضبط الجودة الإحصائية لقياس مستوى الجودة وفجوة الجودة بين توقعات الطلبة وإدراكاتهم لمستوى الخدمة الذي تقدمه جامعة الباحة. حيث تم اختيار عينة من 200 طالب وطالبة عشوائيا باستخدام العشوائية العنقودية من 4 كليات خلال الفترة 01 – 2015/30م، وجمعت البيانات من خلال استبيان جودة الخدمة الذي يقيس توقعات وإدراكات الطلاب للخدمة في خمسة أبعاد للخدمة والتي تتكون من الضمان، الاستجابة، التعاطف، الموثوقية، والملموسية. استخدم في البحث المنهج التحليلي الإحصائي بالتركيز على خرائط ضبط الجودة الإحصائية (الوسط الحسابي وعملية القدرة)، وقد أظهرت نتائج هذا البحث أن مستوى الخدمة كان خارج حدود ضبط الجودة في كل الكليات، وخاصة في كليتي الآداب والعلوم بالمدن والعلوم الإدارية والمالية بفجوة سالبة، وفي كليتي الآداب والعلوم الإنسانية بالعقيق والعلوم بالعقيق على التوالي بفجوة موجبة، كما أظهرت النتائج وجود فجوة سالبة في كل من أبعاد مقياس جودة الخدمة الخمسة وأقلها وأكبرها فجوة في بعدي العناصر السلامة والملموسية على التوالي.

**المصطلحات الرئيسية للبحث/** خرائط ضبط الجودة الإحصائية، جودة الخدمة، التعليم العالي.