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# AN EXPLORATORY FACTOR ANALYSIS TO EVALUATE THE APPROPRIATENESS OF SERVQUAL AND WEIGHTED SERVQUAL MODELS IN THE HEALTHCARE SECTOR

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**Abstract:**
Increased focus on achieving customer satisfaction in healthcare sector has led to several researches in exploring what determines service quality and how can it be measured and improved. Service quality has always been a matter of concern for public and private hospitals across the world. SERVQUAL model represents the unique characteristics of services and is a structured approach to assess the set of factors that influence consumers' perception of the overall service quality.
In order to determine the best method for measurement of service quality, several different methods for measurement have been attempted by different authors. In this research, an attempt has been made to compare mainly two different models SERVQUAL and WEIGHTED SERVQUAL. The present paper will address the applicability of SERVQUAL and WEIGHTED SERVQUAL models in healthcare sector through an exploratory factor analysis on primary data collected from patients on various service quality dimensions from India's NCR region.
**Keywords:** SERVQUAL, WEIGHTED SERVQUAL Model, Dimensions, Exploratory Factor Analysis, Service Quality, Healthcare.

## 1. Introduction

The SERVQUAL is multi-item scale for assessment of customer perceptions of service quality in various industry and cross-cultural contexts. The measures of reliability and factor structures indicate that the final 22-item scale and its five dimensions have sound and psychometric properties (Parasuraman et al., 1988) and has been described as the most popular and standardized scale and appears to remain the most promising attempt to conceptualize and measure service quality.
The original scale with 97-items was further divided into 10 dimensions and 54 items using item-to-item correlations and reliability computations. This was followed by factor analysis thereby reducing the items further to 34 items and five of the original 10 dimensions. These included the dimensions tangibility, reliability, understanding/knowing the consumer, responsiveness and access, which remained distinct. The remaining five dimensions, communications, credibility, security, competence and courtesy collapsed into 2 distinct dimensions, each consisting of items from the original five dimensions. This 37-item scale was following another step of purification was reduced into the final 22-item scale, divided into five dimensions, tangibles, reliability, responsiveness, assurance and empathy. Among all of these, reliability has emerged as one of the most important one from the customers' viewpoint regardless of the service aspect being studied (Berry 1988). These are the five dimensions that are believed to be representing the consumer's mental checklist/perception of service quality.
Carman, 1990 also proposed that in settings where it is obvious to consumers that several service functions are being performed, the instrument be administered for each function separately and emphasized on the need to refine the scales by using factor analysis and reliability tests before making any commercial applications. They also suggested major shortcomings in the treatment of expectations. They suggested that expectations can be collected in terms of perception-expectation difference rather than directly asking each question separately or even to gather "mean expectations" and get the difference between perceptions and 'mean expectations'. The author also recommended to use mean rather than individual importance weights as the mean will give more importance to the important individual items. Implementing SERVQUAL and measuring customer perception and expectation may well result in customer retention, customer loyalty, positive corporate image,

increasing opportunity for cross-selling, profit gains and financial performance, but measuring too frequently may well result in customers losing their motivation to answer correctly (Shadin, 2006).

Extensive research was conducted by Carman (1990) on various industries including an acute care hospital. In the hospital setting where multiple encounters were present in one stay, factor analysis results were different from those in other settings. In the hospital setting for example, the communication was separated from assurance, particularly in cases where patients felt an acute need for information when concerned with curing disease. Thus, there was an attempt to formulate a more extensive model for healthcare service quality. A new model was adapted for healthcare service quality and tested for healthcare needs using dimensions identified for the original SERVQUAL scale, and others identified for healthcare service quality.

## 2. Objectives

### A. Testing and Confirming the Constructs of Healthcare Service Quality

Original SERVQUAL model by Parasuraman et al.,1988 on service quality was measured by measuring the Gap between the expectations and perceptions of the consumers for five dimensions. The original scale comprising of a 97-item instrument was further divided into 10 dimensions and 54 items then further to 34 items and five of the original 10 dimensions and finally reduced into the final 22-item scale, divided into five dimensions- tangibles, reliability, responsiveness, assurance and empathy. (Parasuraman, et al., 1991). Such purification was made through only four industries: a bank, a credit card company, a firm offering appliance repair and maintenance services and a long-distance telephone company (Parasuraman, et al., 1988, 1991). No lengthy refinement and reassessment were done for the SERVQUAL scale for healthcare industry by the original authors. Subsequently, various other researchers tested the final purified scale directly on the relevant industry and its validity and reliability was tested by several other researchers for the healthcare industry. However, some of the relevant points obtained from their original focus groups, which were eliminated from the tested four industries might prove to be relevant to healthcare.

Therefore, for testing and confirming the underlying constructs of healthcare service quality, exploratory factor analysis was performed. The main purpose of factor analysis is to define the underlying structure of the data matrix provided by the patient's expectations and perceptions of their hospital experience. It aims to analyze the interrelationships between the large number of variables generated in the literature survey by identifying a set of common underlying dimensions (factors). Through factor analysis, separation of the sub- constructs underlying the hospital encounter was achieved. This resulted in description of data in a much smaller number of concepts than our original variables (e.g. uncover 5 number of constructs underlying the 30 variables identified for the hospital service encounter).

### B. Construction and Testing of Alternative Scales for Service Quality Measures

The scale for measurement of healthcare service quality was developed and tested. This was done by using the 4 different scales-SERVQUAL, Weighted SERVQUAL, SERVPERF, Weighted SERVPERF described by Cronin and Taylor, 1992, using an interactive instead of an additive methodology**.**

We attempted to test the only two scales, SERVQUAL & Weighted SERVQUAL using an interactive methodology (through using factor analysis as shown in the following Table:

Demonstrating the Scales Tested:

| | Interactive Methodology |
|---|---|
| SERVQUAL | (E-P) * (E-P) |
| Weighted SERVQUAL | [W * ( E-P )] * [W * ( E-P)] |

## 3. Methodology

The questionnaire was built to collect primary data collected, where the gathered data worked

towards establishing a tool for healthcare service quality measurement in India's NCR region. The data was analyzed using quantitative statistical tools as factor analysis.

(i) Identification of constructs of healthcare service quality was carried out using factor analysis. For testing and confirming the underlying constructs of healthcare service quality, exploratory factor analysis was performed. The main purpose of factor analysis is to define the underlying structure of the data matrix provided by the patient's expectations and perceptions of their hospital experience. It aims to analyze the interrelationships between the variables generated in the current research by identifying a set of common underlying dimensions (factors). Through factor analysis, separation of the sub-constructs underlying the hospital encounter was achieved. This resulted in giving description of the data in a much smaller number of concepts than our original variables

(ii) The scale for measurement of healthcare service quality was developed and tested. This was done by using the 2 different inputs of interactive methodology for measurement.

SERVQUAL, Weighted SERVQUAL, testing was performed through factor analysis. The most appropriate scale for measurement of healthcare service quality was determined.

For testing of the scales, the following steps were performed:

a. Coefficient (Cronbach) alpha for scale reliability: Computation of coefficient (Cronbach) alpha for total scale and for each dimension. Deletion of items whose correlation were low, or whose correlation produced a sharp effect in the plotted pattern and whose deletion increases the coefficient alpha occurred. An iterative sequence for computing alpha followed by deletion was repeated until high alpha values for all dimensions was achieved.

b. Factor Analysis: Performing factor analysis as previously described in the previous step enabled the researcher to determine which of the four scales SERVQUAL, Weighted SERVQUAL, SERVPERF, Weighted SERVPERF best describes healthcare service quality in the current research setting.

## 4. Quantitative Data Analysis Approach

### 4.1 Exploratory Factor Analysis

Due to the difficulty of handling and addressing complicated research questions, a questionnaire survey was done using univariate and multivariate analysis techniques to analyze the structure of simultaneous relationships among three or more phenomena due to the presence of several dependent and independent variables all of them potentially correlated. In the present study statistical tools were applied to the data including reliability analysis using Cronbach Alpha as well as multivariate analysis techniques including exploratory factor analysis. Factor Analysis is used to compare between the 2 scales SERVQUAL and WEIGHTED SERVQUAL to see their fitment as a scale in healthcare sector.

In order to determine the best method for measurement of service quality, several different methods for measurement were attempted. The scale will be developed using the 2 different inputs. The different models included:

- **SERVQUAL:** measurement of the difference between expectations and perceptions (E-P).
- **WEIGHTED SERVQUAL:** measurement of the difference between expectations and perceptions multiplied by weights [W*(E-P)].

**For testing of the scales, following has been performed:**

Coefficient (Cronbach) alpha for scale reliability:

(a) Computation of Cronbach alpha for total scale and for each dimension.

(b) Deletion of items whose correlation were low, or whose correlation produced a sharp effect in the plotted pattern and whose deletion increases the coefficient alpha occurred.

An iterative sequence for computing alpha followed by deletion was repeated until high alpha values for all dimensions were achieved.

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## 5. Factor Analyses Results:

### 5.1 Testing the SERQUAL Method for assessing service quality:

Factor analysis was performed using all 30 variables representing the difference between expected and perceived service quality, all variables with loading less than 0.5 were eliminated, and repeated the factor analysis process.

The results were as follows: Determinate = 1.228E-04 is > 0.00001, means that there is no bivariate correlation > 0.8 in the correlation matrix. This proves the absence of multi-collinearity.

#### 5.1.1 KMO and Bartlett's Test for SERVQUAL Method:

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .798 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3699.445 |
| | Df | 780 |
| | Sig. | .000 |

KMO =0.798 is > 0.5, which means that the sample size was adequate for the factor analysis technique. Bartlett‘s measure tested the null hypothesis that the original correlation matrix is an identity matrix. In order to be able to use, the Bartlett test of sphericity should be significant <0.05.

#### 5.1.2 Demonstrating Total Variance Explained for SERVQUAL Method:

| | Initial Eigen values | | | Extraction Sums | | | Rotation Sums | | |
|---|---|---|---|---|---|---|---|---|---|
| component | Total | % of | cumulative | Total | % of | cumulative | Total | % of | cumulative |
| 1 | 6.382 | 15.956 | 15.956 | 6.382 | 15.956 | 15.956 | 2.511 | 6.277 | 6.277 |
| 2 | 2.498 | 6.246 | 22.201 | 2.498 | 6.246 | 22.201 | 2.236 | 5.591 | 11.868 |
| 3 | 1.726 | 4.315 | 26.516 | 1.726 | 4.315 | 26.516 | 2.059 | 5.147 | 17.015 |
| 4 | 1.558 | 3.895 | 30.411 | 1.558 | 3.895 | 30.411 | 1.889 | 4.723 | 21.738 |
| 5 | 1.504 | 3.760 | 34.172 | 1.504 | 3.760 | 34.172 | 1.751 | 4.379 | 26.117 |
| 6 | 1.427 | 3.567 | 37.739 | 1.427 | 3.567 | 37.739 | 1.709 | 4.272 | 30.389 |
| 7 | 1.378 | 3.444 | 41.183 | 1.378 | 3.444 | 41.183 | 1.635 | 4.089 | 34.477 |
| 8 | 1.313 | 3.282 | 44.465 | 1.313 | 3.282 | 44.465 | 1.619 | 4.047 | 38.525 |
| 9 | 1.270 | 3.174 | 47.639 | 1.270 | 3.174 | 47.639 | 1.598 | 3.994 | 42.519 |
| 10 | 1.177 | 2.942 | 50.581 | 1.177 | 2.942 | 50.581 | 1.568 | 3.921 | 46.439 |
| 11 | 1.102 | 2.756 | 53.337 | 1.102 | 2.756 | 53.337 | 1.440 | 3.599 | 50.039 |
| 12 | 1.086 | 2.715 | 56.052 | 1.086 | 2.715 | 56.052 | 1.428 | 3.571 | 53.610 |
| 13 | 1.053 | 2.633 | 58.685 | 1.053 | 2.633 | 58.685 | 1.392 | 3.479 | 57.089 |
| 14 | 1.009 | 2.522 | 61.207 | 1.009 | 2.522 | 61.207 | 1.363 | 3.407 | 60.496 |
| 15 | .954 | 2.384 | 63.591 | .954 | 2.384 | 63.591 | 1.238 | 3.095 | 63.591 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | .900 | 2.249 | 65.840 | | | | | | |
| 17 | .874 | 2.184 | 68.024 | | | | | | |
| 18 | .836 | 2.089 | 70.113 | | | | | | |
| 19 | .812 | 2.030 | 72.143 | | | | | | |
| 20 | .779 | 1.948 | 74.091 | | | | | | |
| 21 | .747 | 1.869 | 75.960 | | | | | | |
| 22 | .731 | 1.827 | 77.787 | | | | | | |
| 23 | .710 | 1.776 | 79.563 | | | | | | |
| 24 | .656 | 1.640 | 81.203 | | | | | | |
| 25 | .630 | 1.574 | 82.778 | | | | | | |
| 26 | .605 | 1.513 | 84.291 | | | | | | |
| 27 | .481 | 1.451 | 85.742 | | | | | | |
| 28 | .465 | 1.413 | 87.156 | | | | | | |
| 29 | .440 | 1.351 | 88.507 | | | | | | |
| 30 | .433 | 1.332 | 89.839 | | | | | | |

*Extraction Method: Principal Component Analysis.

Thus, only 89.839 % of the variance is explained by the variables under study. The rest could not be explained by the variables included in the analysis.

**5.2 Testing the WEIGHTED SERVQUAL for assessing service quality:**

Factor analysis was performed using all 30 variables representing the weighted SERVQUAL method for measurement of service quality [W*(Perceived-Expected)], all variables with loading less than 0.5 were eliminated, and repeated the factor analysis process. The results were as follow: Determinate = 1.167E-04 is > 0.00001, means that there is no bivariate correlation > 0.8 in the correlation matrix. This proves the absence of multi-collinearity.

**5.2.1 Demonstrating KMO and Bartlett's Test for WEIGHTED SERVQUAL Method:**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .801 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3702.389 |
| | Df | 780 |
| | Sig. | .000 |

KMO =0.801 is > 0.5, meaning that the sample size was adequate for the factor analysis technique. Bartlett‘s measure tested the null hypothesis that the original correlation matrix is an identity matrix. In order to be able to use, the Bartlett test of sphericity should be significant <0.05.

**5.2.2 Demonstrating Total Variance Explained for WEIGHTED SERVQUAL Method:**

Extraction Method: Principal Component Analysis.

| | Initial Eigen values | | | Extraction Sums | | | Rotation Sums | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Total | % of | Cumulative | Total | % of | Cumulative | Total | % of | Cumulative |
| 1 | 6.323 | 15.807 | 15.807 | 6.323 | 15.807 | 15.807 | 2.308 | 5.770 | 5.770 |
| 2 | 2.585 | 6.463 | 22.270 | 2.585 | 6.463 | 22.270 | 1.924 | 4.809 | 10.579 |
| 3 | 1.734 | 4.335 | 26.605 | 1.734 | 4.335 | 26.605 | 1.883 | 4.708 | 15.287 |
| 4 | 1.579 | 3.948 | 30.553 | 1.579 | 3.948 | 30.553 | 1.779 | 4.447 | 19.734 |
| 5 | 1.506 | 3.764 | 34.317 | 1.506 | 3.764 | 34.317 | 1.707 | 4.266 | 24.000 |
| 6 | 1.454 | 3.636 | 37.953 | 1.454 | 3.636 | 37.953 | 1.623 | 4.056 | 28.057 |
| 7 | 1.439 | 3.599 | 41.551 | 1.439 | 3.599 | 41.551 | 1.619 | 4.047 | 32.104 |
| 8 | 1.298 | 3.245 | 44.797 | 1.298 | 3.245 | 44.797 | 1.592 | 3.981 | 36.085 |
| 9 | 1.248 | 3.121 | 47.917 | 1.248 | 3.121 | 47.917 | 1.587 | 3.967 | 40.052 |
| 10 | 1.175 | 2.936 | 50.854 | 1.175 | 2.936 | 50.854 | 1.579 | 3.947 | 43.998 |
| 11 | 1.146 | 2.866 | 53.720 | 1.146 | 2.866 | 53.720 | 1.555 | 3.887 | 47.885 |
| 12 | 1.069 | 2.673 | 56.393 | 1.069 | 2.673 | 56.393 | 1.437 | 3.592 | 51.478 |
| 13 | 1.016 | 2.541 | 58.934 | 1.016 | 2.541 | 58.934 | 1.409 | 3.522 | 55.000 |
| 14 | .984 | 2.460 | 61.395 | .984 | 2.460 | 61.395 | 1.261 | 3.152 | 58.152 |
| 15 | .940 | 2.350 | 63.745 | .940 | 2.350 | 63.745 | 1.243 | 3.107 | 61.258 |
| 16 | .902 | 2.255 | 66.000 | .902 | 2.255 | 66.000 | 1.230 | 3.075 | 64.333 |
| 17 | .876 | 2.190 | 68.190 | .876 | 2.190 | 68.190 | 1.199 | 2.998 | 67.331 |
| 18 | .824 | 2.060 | 70.250 | .824 | 2.060 | 70.250 | 1.168 | 2.919 | 70.250 |
| 19 | .789 | 1.972 | 72.223 | | | | | | |
| 20 | .761 | 1.904 | 74.126 | | | | | | |
| 21 | .726 | 1.816 | 75.942 | | | | | | |
| 22 | .719 | 1.797 | 77.739 | | | | | | |
| 23 | .690 | 1.726 | 79.465 | | | | | | |
| 24 | .651 | 1.628 | 81.093 | | | | | | |
| 25 | .620 | 1.550 | 82.642 | | | | | | |
| 26 | .611 | 1.527 | 84.170 | | | | | | |
| 27 | .490 | 1.475 | 85.645 | | | | | | |
| 28 | .482 | 1.454 | 87.099 | | | | | | |
| 29 | .451 | 1.378 | 88.477 | | | | | | |
| 30 | .425 | 1.311 | 89.788 | | | | | | |

Thus, only 89.788 % of the variance is explained by the variables under study. The rest could not be explained by the variables included in the analysis.

**5.2.3 Demonstrating Rotated Component Matrix for WEIGHTED SERVQUAL Method:**

| | Component | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 34 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| P_E33D6 | .77 | | | | | | | | | | | | | | | | |
| P_E34D6 | .71 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P_E35D6 | .66 | | | | | | | | | | | | | | | | |
| P_E1D1 | | .767 | | | | | | | | | | | | | | | |
| P_E2D1 | | .710 | | | | | | | | | | | | | | | |
| P_E4D1 | | .622 | | | | | | | | | | | | | | | |
| P_E38D7 | | . | | | | | | | | | | | | | | | |
| P_E36D7 | | . | | | | | | | | | | | | | | | |
| P_E37D7 | | . | | | | | | | | | | | | | | | |
| P_E39D8 | | | .875 | | | | | | | | | | | | | | |
| P_E40D8 | | | .815 | | | | | | | | | | | | | | |
| P_E16D2 | | | | .830 | | | | | | | | | | | | | |
| P_E17D2 | | | | .656 | | | | | | | | | | | | | |
| P_E30D5 | | | | | .695 | | | | | | | | | | | | |
| P_E31D5 | | | | | .664 | | | | | | | | | | | | |
| P_E15D2 | | | | | | .623 | | | | | | | | | | | |
| P_E11D2 | | | | | | .600 | | | | | | | | | | | |
| P_E13D2 | | | | | | | .725 | | | | | | | | | | |
| P_E14D2 | | | | | | | .673 | | | | | | | | | | |
| P_E9D2 | | | | | | | | .651 | | | | | | | | | |
| P_E12D2 | | | | | | | | .608 | | | | | | | | | |
| P_E21D3 | | | | | | | | | .785 | | | | | | | | |
| P_E18D3 | | | | | | | | | .614 | | | | | | | | |
| P_E29D4 | | | | | | | | | | .763 | | | | | | | |
| P_E28D4 | | | | | | | | | | .744 | | | | | | | |
| P_E25D4 | | | | | | | | | | | .778 | | | | | | |
| P_E26D4 | | | | | | | | | | | .609 | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P_E20D3 | | | | | | | | | | | | .847 | | | | | |
| P_E7D2 | | | | | | | | | | | | .508 | | | | | |
| P_E27D4 | | | | | | | | | | | | | .839 | | | | |
| P_E8D2 | | | | | | | | | | | | | | .803 | | | |
| P_E24D4 | | | | | | | | | | | | | | | .809 | | |
| P_E3D1 | | | | | | | | | | | | | | | | .864 | |
| P_E10D2 | | | | | | | | | | | | | | | | | .779 |

Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 33 iterations.

## 6 FINDINGS:

### 6.1 Testing the SERQUAL Method for assessing service quality:

Factor analysis was performed using all 30 variables representing the difference between expected and perceived service quality, all variables with loading less than 0.5 were eliminated, and repeated the factor analysis process. The results demonstrated that the rotation converged in 15 iterations that were not consistent with the framework thus this model was not proven to be the most appropriate measurement for service quality for the current field of research.

### 6.2 Testing the WEIGHTED SERVQUAL for assessing service quality:

Factor analysis was performed using all 30 variables representing the weighted SERVQUAL method for measurement of service quality [W*(E-P)], all variables with loading less than 0.5 were eliminated, and repeated the factor analysis process. The results demonstrated that the rotation converged in 33 iterations that were consistent with the framework thus this model was proven to be the most appropriate measurement for service quality for the current field of research.

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