Prioritization of Service Quality Dimension and Performance Indicators Using Analytic Network Process with the Approach of Balanced Score Card; a Case Study

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Abstract

Customer satisfaction is an important parameter of a hospital as a service organization. In this study, taking into account that service quality as a parameter that influences customer satisfaction; is in connection with performance indicators. The dimensions of service quality and performance indicators in Saadi hospital; Isfahan city; Iran; were prioritized using Analytic Network Process and with the approach of Balanced Score Card. To do this; the service quality in the surgery department of Saadi Hospital was measured using the standard questionnaire of SERVQUAL model; and service quality gap was determined in the five dimensions of service quality. The performance indicators were chosen with the approach of Balanced Score Card. Results showed that the empathy and responsiveness dimensions had the highest priority respectively and the internal processes; learning and growth indicators had the highest priority respectively.

Key words: Service quality dimensions; Customer satisfaction; Analytic Network Process; Balanced Score Card; hospital.

1. Introduction

Nowadays; better service delivery is more important because competition among organization has been increased. Obviously; service quality (SQ) needs to be considered and analyzed more and more in hospitals (Akan, 1995). In order to measure SQ in hospital; the SERVQUAL tool ( Parasuraman et al., 1988) is used and performance indicators with the approach of four perspectives of Balanced Score Card (BSC) have been selected which includes finance; customer; internal processes; learning and growth which is introduced by Kaplan and Norton in 1990. A mutual dependence between the criteria and options is possible. For prioritization; Analytic Network Process (ANP) is applied which is introduced by Saaty (1996). Yousef et al. (1995) studied customer satisfaction and quality services in the NHS hospitals in England using SERVQUAL instrument to measure patients' expectations. The results were very disappointing; especially in the reliability dimension. Chow and Luk (2005) proposed the strategic approach for service quality in restaurants using Analytic Hierarchy Process. The results implied that empathy; Tangibles; assurance; reliability and responsiveness have the highest priority from the customer’s view; respectively. Sivabrovornvatana et al. (2005) examined the relationship between technology and quality management to
improve service quality in a Thai hospital using The SERVQUAL model. The findings suggest that what service providers think is important for their service; is not necessarily viewed by customers as being equally important. Chowdhary et al. (2007) prioritized service quality in different type of services by using SERVQUAL tool. The results implied ranking of dimensions depends on the current state of the competition in a particular industry and varied from industry to industry within a service type. Arasli et al. (2008) developed and compared some determinants of service quality in both the public and private hospitals of Northern Cyprus using SERVQUAL tool. Results revealed that the various expectations of inpatients have not been met in either public or private hospitals. Lin et al. (2009) presented a framework for the process of making decisions about marketing strategy in private hotels in Taiwan by Analytic fuzzy network technique. Results showed that the abilities of the customer relationship are the most important factor in choosing a suitable strategy. Nejati et al. (2009) reviewed service quality factors of the airline industry and ranked these factors in Iranian society using SERVQUAL model and Fuzzy TOPSIS approach. The findings showed that “Flight safety”; “Good appearance of flight crew” and “Offering highest possible quality services to customers 24 hours a day” were considered as the most important quality factors for airlines in the perspective of Iranian customers. Jamali et al. (2009) prioritized the library service quality indicators from the students’ point of view at Ferdowsi University; Iran, using SERVQUAL and fuzzy TOPSIS. Results showed that having the ability to find information 24 hours a day has the most importance and a secure and safe place is the least important indicator for making a high quality library. The distinction of this study is integrating BSC and ANP in hospitals. The results can be useful for healthcare services; especially hospitals. It provides the framework for managers who want to improve their service quality in their hospitals and seeking to increase customer satisfaction and. In following some explanations of main research concepts such as SQ; BSC and ANP are presented. The methodology for our study is described in detail; followed by determining the sample society; sampling method; the applied instrument for gathering information (SERVQUAL questionnaire) and its reliability are presented. The research findings are analyzed by some statistical methods. Finally conclusions are discussed and some suggestions are offered for the hospital and also for future studies (based on the research limitations).

1.1. SERVQUAL
Parasuraman et al. (1985) stated that service quality is a function of the difference between expectations and service quality dimension performance. They presented a model based on gap analysis that included five gaps. According to this model; service quality is a function of perceptions and expectations that is expressed as follows:

$$SQ = \sum E_i - \sum R_i$$

This method was restored in 1988 and it was named "SERVQUAL" which for measuring customer perceptions of service quality is used (Parasuraman et al., 1988). In this study; 10 dimensions of service quality were decreased to five dimensions of service quality: reliability; responsiveness; tangibles; assurance (communication; competence; validation; courtesy and security) and empathy (access; and understanding / knowing the customer). Parasuraman et al. to measure the gaps based on the five dimensions of service quality designed a questionnaire with 22 questions. In this regard; researches associated with Parasuraman research (1985) were done. In following; other service quality models are presented:

- The technical and functional quality model (Gronoos, 1984)
- developed service quality model (Zeithaml et al., 1988)
- Model of service quality attributes (Haywood-farmer, 1988)
- The synthesized service quality model (Brogowicz et al., 1990)
- Performance model (Cronin & Taylor, 1992)
- The comprehensive list of service quality dimensions for air services (Shahin, 2007)
- P-C-P model (O’reilly, 2007)
- Shahin and samea (2010) reviewed and developed SERVQUAL. They offered a new model which compared to the traditional models; the proposed model involves five additional components and eight additional gaps.
1.2. Analytic Network Process

Analytic Network method has been introduced in 1996 by Saaty; it’s more general form of Analytic Hierarchy methods. The Analytic Network Process (ANP) provides a comprehensive and powerful method for accurate decision using experimental data or personal judgment of each decision makers. Saaty provided the Analytic Network methods to solve problems which criterions and options are not independent in it. Thus; The Analytic Network Process overcomes on the assumption of independence among criteria and options which is one of the limitations of the Analytic Hierarchy Process (AHP). AHP and ANP are multi criteria decision making tools that consider quantitative and qualitative components in decision making. AHP models have a hierarchical decision making framework that include several levels with one way communications. The ANP model has a network structure that considers internal dependent communications in a decision making framework (Cheng et al., 2005). Cheng et al., (2004) provided four qualitative stages and five quantitative stages explaining in following:

1- The expression of problem: expression of problem is the most important stage. In this stage; the different levels of problem structure are hydrolyzed and this process will be continued to choosing options in the final level.

2- Making sure that the decision making problem must be resolved with the ANP. As stated before; ANP use network structure structuring the decision making problem.

3- Restructuring the decision making problem: the decision making problem should be decomposed into measurable and managerial levels.

4- Determining decision makers: determining persons who are responsible for decision making and would complete the questionnaire.

5- Designing the questionnaire for data extraction: In this stage the appropriate questionnaire is used for paired comparisons to obtain more information for allocating weights to the elements.

6- Calculating eign vector of each developed matrix: In considering to upper levels of matrix; each decomposed level is formed. It is necessary to calculate eign vector for the elements of matrix.

7- Measuring the Consistency Rate (CR) of matrix: One of the best reasons to use a matrix of paired comparisons is determining the consistency of respondents to the questions. If the CR value is less than of the surface of Acceptance; it indicates that respondents have answered the questions accidentally or by mistake.

8- Creating super matrix using the eign vectors of sub matrices: eign vectors of developed matrix will be together for creating super matrix.

9- The created super matrix is multiplied to it for n times so that n (n is odd) tends to infinity.

1.3. Balanced Score Card

In 1990; Kaplan and Norton studied the twelve reputable companies to find new methods of performance evaluation. The motivation for this study was this growing belief that financial versions of performance are not effective enough for the modern business enterprises. The studied company and Kaplan and Norton were convinced that relying performance financial indicators affected their ability to create value. The team agreed on balanced assessment idea that its characteristic was performance indicators which covered over the company. Those issues were related to customer; internal business processes; employee’s activities and concerns of shareholders. This new tool is called Balanced Score Card method by Kaplan and Norton. Balanced Score Card was introduced by Kaplan and Norton. In fact; that was a revolution in performance evaluation methods. In fact the purpose of these methods was converting vision and strategy into goals in each organization through the key factors of success and key performance indicators. Kaplan and Norton announced that for a complete performance evaluation; the performance should be assessed of these four perspectives (Kaplan and Norton, 2001):

1- The financial Perspective
2- The customer perspective
3- The internal processes perspective
4- Learning and growth perspective
2. Methodology
In this paper; the study sample society was containing all patients who have been hospitalized at least one day in the surgery department of the Saadi Hospital at 2011 spring. For sampling; questionnaires were distributed among a sample size of 250 patients. In order to gather data; the SERVQUAL questionnaire is used. It contains 22 questions which asked patients’ expectations and perceptions about delivered service with (1-5) Likert spectrum. Prioritizing the SQ dimensions is done by using the ANP. Because the questionnaire used in this research had already been used in previous studies (parasuraman et al., 1988); its validity is confirmed. In order to test the reliability of the questionnaire; Cronbach’s alpha was found to be more than 0.7 for all of dimensions; which indicated that the questionnaire has high reliability. Also a paired comparing questionnaire (about BSC and ANP) and the SERVQUAL questionnaire were disturbed among 30 experts.

3. Findings
In order to analyze the results; the statistical analysis like mean for measuring SQ are applied; also for prioritizing service quality dimensions and performance indicators; ANP is used. To form a super matrix; Pearson correlation between SQ dimension together; between SQ dimension and BSC performances and between BSC performances together is applied.
MATLAB software is used to solve the ANP model.

3.1. Measuring SQ in surgery department of Saadi Hospital
Here; In order to measure the service quality gap in surgery department, the mean of patients’ expectations and perceptions in each dimension of service quality is calculated and then the SQ gap is obtained by their subtraction. The amounts of expectations (E), and perceptions (P) and SQ gap (G) is presented (table 1).

3.2. Prioritizing SQ dimensions and performance indicators in Saadi Hospital
As it was stated before; the ANP is used to prioritize the dimension of SQ and performance indicators. In this study; it is assumed that the dependences are mutual. It means that the weight of criteria depends on weight of the options and weigh the options depends on the weight of criteria. The criteria and option is not independent of each other. Figure 1 shows a communications network between options and criteria. In this survey, the criteria are five dimensions of SQ and the options are BSC indicators. According to the ANP algorithm, the super matrix (Table 2) should be formed. Therefore; each part of matrix (A; B; C; D; E; F) must be complemented.

To complete part A and D; using paired comparisons Questionnaire; the group matrix has been formed with respect to the grouping decision in the Analytical Hierarchy Process. In order to obtain a final matrix; the geometric mean is used. To complete part B; the correlation between the gaps of SQ dimensions together should be calculated in the surgery department. In this study; to determine the correlations; the Pearson correlation test is used. To complete part C and E; the correlation between the SQ dimensions and the BSC indicators should be calculated. For completing part F; the correlation between the BSC indicators together would be calculated.

4. Conclusion and suggestions
In this study; the SERVQUAL scale (Parasuraman et al., 1988) is applied to measure SQ in surgery department of Saadi Hospital and prioritized service quality dimensions using the ANP. According to the results; the gap between patients’ expectations and perceptions in service quality dimensions for surgery department is positive which implies that the patients’ expectations are more than their perceptions. The empathy has the highest amount of service quality gap (0.763) while the assurance has the lowest amount of gap (0.563). The results of prioritizing service quality dimensions and performance indicators using ANP reveal that empathy; responsiveness; reliability; assurance and tangibles dimensions have the highest priority respectively and internal processes; learning and growth; customer and finance indicators have the highest priority respectively (table 3). Compared with the findings of other studies; the obtained results are the same as the some results of jamali et al. (2009). In both of them; the responsiveness is more significant. Based on the results of this study, the following suggestions are offered for Saadi hospital. Because of the greater gap is related on empathy; reliability and responsiveness dimensions and also it appears from the results of prioritizing service quality dimensions that empathy; responsiveness and reliability dimensions have the highest priority; then the hospital should improve its service quality regarding the dimensions of empathy; responsiveness and
reliability to increase the patients’ satisfaction. Obviously; from prioritizing of performance indicators that hospital should improve their performance regarding the internal processes and learning and growth indicators to increase customer satisfaction and then profitability. In following; some suggestions (based on the research limitations) are proposed for the future studies. In this study; SQ is measured in one department of hospital and due to time limitations; therefore; it’s suggested to measure SQ in all departments of hospital to determine total SQ. As the results of this study are based on the sampling style in a given time; SQ can be measured in different time domains and then compare results all to gather. It’s suggested other methods of Multi Criteria Decision Making to be used for prioritizing dimensions of SQ and performance indicators and also other dimensions of service quality to be considered.
References


Annexure

Figure 1: Relation between options and criteria in ANP model

Table 1. The amounts of expectations (E), perceptions (p) and ISQ gap (G)

<table>
<thead>
<tr>
<th>Service Quality Dimension</th>
<th>E</th>
<th>P</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangibles</td>
<td>4.416</td>
<td>3.690</td>
<td>0.726</td>
</tr>
<tr>
<td>Reliability</td>
<td>4.513</td>
<td>3.758</td>
<td>0.755</td>
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<tr>
<td>Responsiveness</td>
<td>4.438</td>
<td>3.708</td>
<td>0.730</td>
</tr>
<tr>
<td>Assurance</td>
<td>4.570</td>
<td>4.006</td>
<td>0.563</td>
</tr>
<tr>
<td>Empathy</td>
<td>4.400</td>
<td>3.637</td>
<td>0.763</td>
</tr>
</tbody>
</table>
Table 2. Super matrix

<table>
<thead>
<tr>
<th>Goal</th>
<th>tangibles</th>
<th>reliability</th>
<th>responsiveness</th>
<th>Assurance</th>
<th>empathy</th>
<th>finance</th>
<th>Customer</th>
<th>Internal processes</th>
<th>learning and Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
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<td>C</td>
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<td>E</td>
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</tbody>
</table>

Table 3. Prioritization of SQ dimension and BSC performance indicators

<table>
<thead>
<tr>
<th>Options/criteria</th>
<th>Weight</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empathy</td>
<td>0.22007</td>
<td>1</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>0.21082</td>
<td>2</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.197460</td>
<td>3</td>
</tr>
<tr>
<td>Assurance</td>
<td>0.19373</td>
<td>4</td>
</tr>
<tr>
<td>Tangibles</td>
<td>0.17889</td>
<td>5</td>
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<tr>
<td>Internal processes</td>
<td>0.34489</td>
<td>1</td>
</tr>
<tr>
<td>Learning and Growth</td>
<td>0.33481</td>
<td>2</td>
</tr>
<tr>
<td>Customer</td>
<td>0.32029</td>
<td>3</td>
</tr>
<tr>
<td>Finance</td>
<td>$10^{-9} \times 1.9$</td>
<td>4</td>
</tr>
</tbody>
</table>