Fuzzy Measures for Service Quality of Fuzzy Numbers

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Abstract — In order to increase a company’s competition edge, the main focus of a management strategy is to improve service quality. Identifying the dimensions of the service quality would definitely help managers in the challenge of improving the service quality. This study is to presents a fuzzy approach to evaluate service quality. Two evaluation indices, optimistic-expectation index (OEI) and pessimistic-expectation index (PEI), are used to evaluate the true perception of service quality from customers. This presented approach is very flexible since the value and domain of the triangular fuzzy number are defined by customer themselves. An empirical study is conducted to illustrate the effectiveness of the presented approach.

Keywords — service quality, linguistic variable, triangular fuzzy number, fuzzy sets.

I. INTRODUCTION

In the consumers’ consciousness rising era, good service quality has become the core value of management topic in most industries. Companies need to continuously improve service quality to differentiate their services from those of their competitors in order to get competition edge.

Good service quality has the great effect on customer satisfaction and customer loyalty, while poor service quality may cause ill effects which can hardly be offset by other strategies [1]-[3]. In the process of evaluating service quality, it is very difficult to be described or be measured precisely due to its intangibility, heterogeneity, and inseparability [4] [5]. Moreover, because the measurement of service quality usually determined by customers’ subjective judgment [6], the evaluation of service quality is much difficult.

A number of papers addressed service quality evaluation problem owing to the prevalence and importance in the practical applications [1] [2] [7]-[16]. The service quality level can be measured by customer survey. Likert scale is one of the most popular approaches for evaluating service quality. The analysis is based on the crisp data obtained by Likert scale. However, crisp data cannot well describe the degree of customer’s perception owing to the fuzziness and subjective of service. In addition, data obtained by Likert scale would be lack of flexibility and unreal, because the differences between every two levels in Likert scale all equal to one point. The other concern is that the degree of perception may be different even though two persons give equal-score. Therefore, fuzzy number of the fuzzy theory can be properly describe customers’ judgment of service quality in order to actually reflect their fuzziness and subjective.

Fuzzy theory is an effective method for tackling fuzzy data. Zadeh [17] first introduced the concept of fuzzy set theory. Dubois and Prade [18][19] further presented the concept of fuzzy theory to make the application of membership function being more widely. Zimmermann [20] presented that it is most proper by using fuzzy number to deal with the decision-making problem with subjective or fuzzy information.

This study is to present a fuzzy approach for service-quality evaluation problem. In the presented fuzzy procedure, two evaluation indices are used to survey customer service levels, optimistic-expectation index (OEI) and pessimistic-expectation index (PEI). With the consideration of different personality of customers, some being conservative and some others being optimistic, the value and domain of the triangular fuzzy number are defined by customer themselves. In this way, the present approach can be much flexible. An empirical study of a computer-information company is conducted to illustrate the effectiveness of the presented approach. The evaluation results would help company better indentify their service quality domain for improvement.

II. THE DECISION-MAKING PROCEDURE

In this section, we present a fuzzy procedure which is to evaluate service quality by customer surveys. Based on the probability of fuzzy sets defined by Zadeh [21], the membership function of triangular fuzzy number determined by each customer with respect to each evaluation item is calculated. In the fuzzy procedure, two evaluation indices are used to survey customer service levels, optimistic-expectation index (OEI) defined as the degree of customers’ positive expectation for service quality and pessimistic-expectation index (PEI) defined as the degree of customers’ negative expectation for service quality.

For each evaluation item, OEI and PEI can be obtained by calculating the ratios. Those indices can be the bases when making strategies of improving service quality.

The analysis procedure is described as follows.

Step 1: The design of questionnaire

Because the service quality attributes is context-dependent [10], in order to reflect the service environment investigated, the questionnaire is