Site Selection for Franchise System of Service Industry using Fuzzy Theory

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Abstract—Because the site-selection process concerns human being’s subjective judgment, measurement is usually fuzzy and those subjective opinion can therefore be described as triangular fuzzy number. This study extends the evaluation of site-selection applications to fuzzy environment and presents a linguistic decision-making approach to evaluate the site-selection problem with fuzzy numbers. By following the probability of fuzzy sets defined by Zadeh [17], the membership function of triangular fuzzy number determined by each manager with respect to each evaluation item is first calculated, and the ratio of that either on satisfied-level or on unsatisfied-level can then be calculated. For each evaluation item, the degree of each satisfaction-level can be obtained by summarizing all the ratios of all surveys in the corresponding level and the confidence index can be obtained. An example is conducted to illustrate the effectiveness of the presented approach.

Keywords—site selection, service industry

I. INTRODUCTION

With the prosperous development of franchise system of service industry, the evaluation of site-selection becomes one of the most determinant factors for franchise system of service industry [1][2]. Store location sometimes contributes as much to a retailer’s brand value as some forms of marketing [3]. Proper site selection can be a strategic tool that not only can attract their customers and increase customer profitability, but also can catch the opportunities of marketplace development and improve market share growth [1][2]. While improper site location may cause ill effects which can hardly be offset by other strategies [4].

The franchise arrangement has assumed a prominent place in modern business practices [20]. Successful franchisors not only sell products and services, but also perfect a business system and sell the know-how and benefits of the business system to prospective franchisees and subsequently to customers [19]. One of the keys to franchise system success would be site-selection. A number of papers addressed the site-selection problems for crisp data [3] [6]-[9] [12]. Regression, checklist, analogy, and even personal knowledge are the conventional ways to solve site-selection problems, however, the conventional approaches can only provide a set of systematic steps for problem solving without considering the relationship between the decision factors globally [1]. Furthermore, using crisp data to evaluate site-location is unrealistic. In practice, owing to the evaluation concerns human being’s subjective judgment, crisp data cannot well describe the environment when evaluating site-locations.

Fuzzy theory is an effective method for tackling fuzzy data. Adep [13] first introduced the concept of fuzzy set theory. By fuzzy sets theory, when data described as linguistic variables can be presented by membership function. Dubois and Prade [14][15] further presented the concept of fuzzy theory to make the application of membership function being more widely. Immerrmann [16] presented that it is most proper by using fuzzy number to deal with the decision-making problem with subjective or fuzzy information.

Owing to human being’s subjective judgment, measurement of site-selection is usually fuzzy. A number of papers addressed the site selection problem applying fuzzy methods [1][2][10][11][18]. Liang and Wang [18] tackle the facility site selection problem by using a fuzzy multi-criteria decision-making method. Liang and Wang [18] treat different weights as linguistic variables, and use trapezoidal fuzzy number to express the linguistic variables. However, in those linguistic variables, the value and range are pre-defined, for example, the trapezoidal fuzzy number for high is expressed as (0.5, 0.7, 0.7, 1). Since perception of high would be different for different persons, this method can be too rigid.

This study presents a decision-making approach for evaluating site-location problem with fuzzy numbers. An example is conducted to illustrate the effectiveness of the presented approach. The evaluated results can help managers make decision when evaluating site locations.

II. THE DECISION-MAKING PROCEDURE

In this section, we present a decision-making procedure which is to evaluate site-location by manager surveys. Following the probability of fuzzy sets defined by Adep [17], the membership function of triangular fuzzy number determined by managers with respect to each evaluation item is first calculated, and the ratio of that either on satisfied-level or on unsatisfied-level can then be calculated. For each evaluation item, the degree of each satisfaction-level can be obtained by summarizing all the ratios of all surveys in the corresponding level. Finally, the confidence index can be obtained and be the bases when making strategies of site selection.