Weighted Analysis on Evaluation Criteria of the Most Advantageous Bid

Han-Chen Huang
Department of Leisure Management, Yu Da University, Taiwan.

Abstract:
In procurement operations, if the lowest bid proposed by a vendor is accepted as the awarding criterion that is less than the base price, it is not uncommon that the bidder may first offer an unreasonably low price to gain the right to supply, and then provide low-quality products in the future. Regardless of whether this fraudulent behavior can be identified, the company or agency inviting the bid is consequently impeded from receiving products that meet their needs. To address this issue, the most advantageous bid (MAB) method can be adopted as an alternative awarding criterion. However, when practicing MAB, the weighting of evaluation criteria and sub-criteria frequently presents a challenge for companies or government agencies offering an invitation for bid. Based on extant literature on supplier evaluation theories, this study conducts interviews with experts to determine evaluation criteria and sub-criteria for MAB, and analyzes the weights of evaluation criteria and sub-criteria. A fuzzy analytic hierarchy process (FAHP) is performed to analyze the obtained MAB evaluation criteria and sub-criteria. The results of the study provide a reference for any company or government agency seeking to evaluate MAB.

Keywords: Lowest Bid, Most Advantageous Bid, Fuzzy Analytic Hierarchy Process.

1. Introduction

Numerous companies or government agencies that engage in procurement activities adopt the lowest bid qualifying for the minimum specifications required as the awarding criterion. This approach frequently causes overly low-priced bidding and impedes tenderees from receiving products that meet their requirements. A solution to this issue is to adopt the most advantageous bid (MAB) system [1,2], which enables tenderees to select the optimal bidder by comprehensively evaluating its technology, quality, functionality, commercial terms, and prices based on pre-specified evaluation criteria [3].

The biggest difference between MAB and the lowest price bid approach is that MAB is awarded through "establishing an evaluation committee to rate each of the evaluation criteria and sub-criteria, so as to select suppliers that are most suitable for the purchaser's needs or most favorable to the purchaser." Therefore, the establishment of an impartial evaluation committee and an appropriate weighting of the selection criteria and sub-criteria are critical preliminary tasks [4]. When adopting the MAB method, the absence of appropriate evaluation criteria and sub-criteria weights may result in incorrect evaluation results. Therefore, this study reviews extant research on supplier evaluation theories [4-9] and conducts interviews with experts to determine suitable evaluation criteria and sub-criteria for MAB, and analyzes the weights of the determined evaluation criteria and sub-criteria using a fuzzy analytic hierarchy process (FAHP) [10-13]. The results of the study provide a reference for any company or government agency seeking to evaluate MAB.

2. Research Results

The purpose of this study is to construct an evaluation model for MAB. After reviewing extant literature [4-9], the preliminarily evaluation criteria and sub-criteria are determined. The Delphi method is applied to establish the hierarchy for the evaluation model that comprises three levels. The first level is the target level; the second level contains the evaluation criteria, comprising seven items (technological capabilities, management system, prices and costs, cooperative abilities, delivery and warranty, performance of prior contract fulfillment, and quality control abilities); and the third level is sub-criteria comprising the 29 indicators shown in Fig. 1. The questionnaire and telephone interviews were conducted with people who have been responsible for MAB operations in private Taiwanese companies and government agencies. Fifty-one responses were collected, among which 41 are considered valid and can be used to calculate the weights of the determined evaluation criteria and sub-criteria.

The weights and sorting of the evaluation criteria and sub-criteria are shown in Table 1. The evaluation criteria are sorted in descending order of significance (i.e., weight) as follows: "Quality Control Capabilities", "Performance of Prior Contract Fulfillment", "Price and Cost", "Technological Capabilities", "Delivery and Warranty", "Management System", and "Cooperative Abilities". The first five evaluation criteria account for 90.1% of the total weight, indicating that product quality, delivery and warranty, price, production technology, and performance of prior contract fulfillment receive the most attention. The weights of the "management system of the contractor and the cooperative abilities combined account for only 9.9%, indicating that these two categories receive only minor attention.

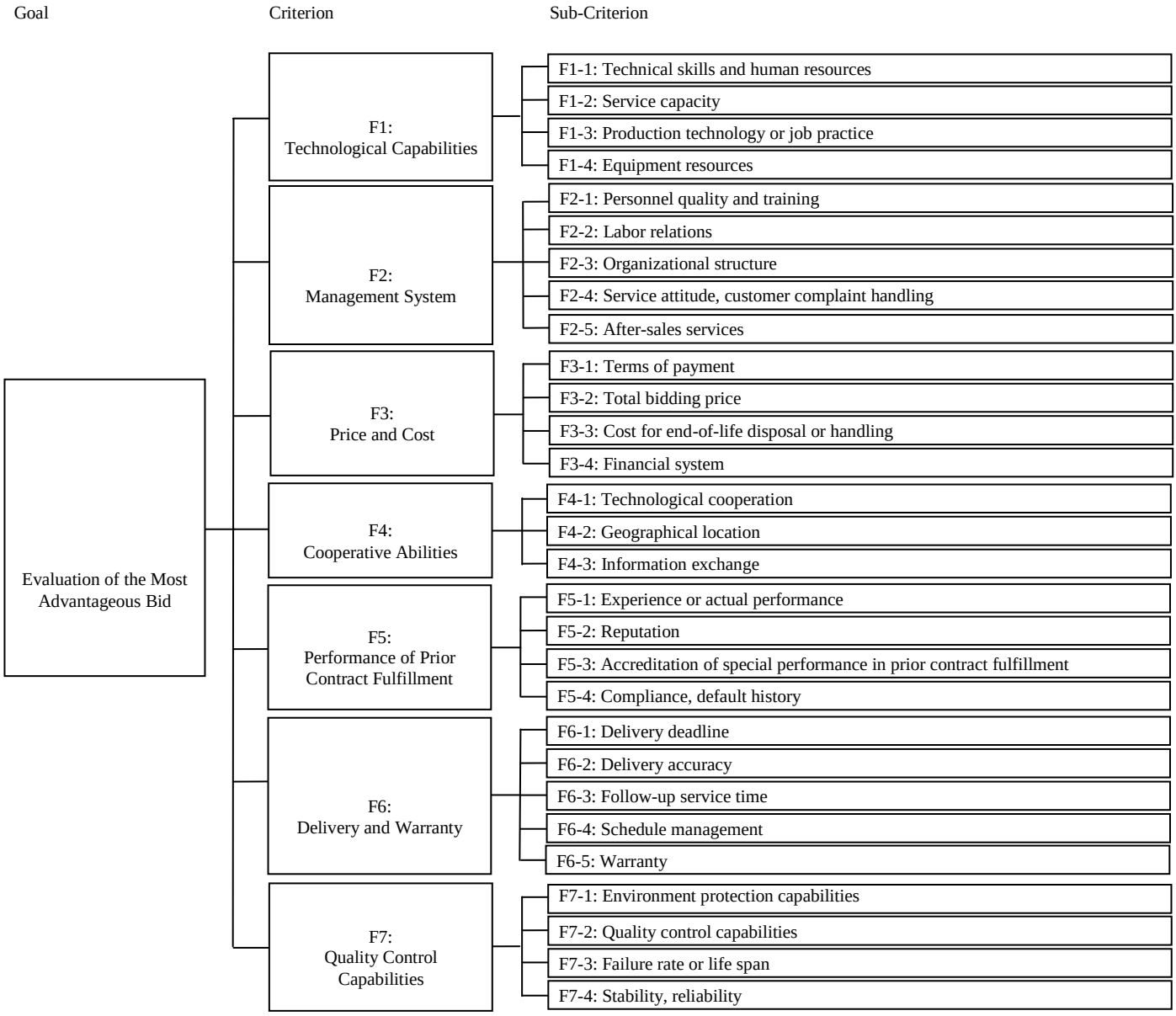

Figure 1. Hierarchy of the proposed MAB evaluation model

Among all evaluation criteria, the weight of "Quality Control Capabilities" accounts for 26.57% of this evaluation, and that of the "Price and Cost" accounts for 18.65%, indicating that the MAB procurement method can shift the award of contracts from the lowest price oriented approach to a quality oriented approach, in which the price proposal is considered as secondary. This enables purchasers to buy products with the best possible quality within the allocated budget, thereby making optimal use of available funds. To sort the sub-criteria in descending order of their significance (i.e., weight), the first five items are: "Stability, reliability", "Failure rate or life span", "Total bidding price", "Delivery accuracy", and "Terms of payment", and the final five items (in ascending weight order) are: "Organizational structure", "Personnel quality and training", "Labor relations", "Information exchange", and "Geographical location".

Table 1. Local weight and global weight for each criterion

Criterion [A]	Local Weights[B]	Ranking	Sub-Criterion[A]	Local Weights[B]	Ranking	Global Weights[C]	Ranking
F1	0.1387	4	F1-1	0.2393	3	0.03319	14
			F1-2	0.2931	2	0.04065	8
			F1-3	0.3120	1	0.04327	7
			F1-4	0.1556	4	0.02158	18
F2	0.0552	6	F2-1	0.1116	4	0.00616	28
			F2-2	0.1184	3	0.00654	27
			F2-3	0.1084	5	0.00598	29
			F2-4	0.3261	2	0.01800	22
			F2-5	0.3355	1	0.01852	21
F3	0.1865	3	F3-1	0.2654	2	0.04950	5
			F3-2	0.4461	1	0.08320	3
			F3-3	0.1735	3	0.03236	15
			F3-4	0.1150	4	0.02145	19
F4	0.0438	7	F4-1	0.3915	1	0.01714	23
			F4-2	0.3298	2	0.01444	25
			F4-3	0.2787	3	0.01220	26
F5	0.0987	5	F5-1	0.4008	1	0.03957	10
			F5-2	0.1949	3	0.01924	20
			F5-3	0.2376	2	0.02346	17
			F5-4	0.1667	4	0.01646	24
F6	0.2114	2	F6-1	0.3279	1	0.06932	4
			F6-2	0.1472	5	0.03112	16
			F6-3	0.1715	3	0.03623	12
			F6-4	0.1881	2	0.03976	9
			F6-5	0.1723	3	0.04578	6
F7	0.2657	1	F7-1	0.1477	4	0.03924	11
			F7-2	0.3254	2	0.08646	2
			F7-3	0.3546	1	0.09422	1
			F7-4	0.2393	3	0.03319	14

A. For An Explanation of the Codes, Please Refer to Fig. 1.
B. Local Weight is Determined based on Judgments of a Single Criterion.
C. Global Weight is Determined by Multiplying the Weight of the Criteria.

3. Conclusions

Based on supplier selection theory, this study conducted interviews with experts to formulate evaluation criteria and sub-criteria for the MAB approach. The obtained seven evaluation criteria and 29 sub-criteria can provide a reference for companies or government agencies engaged in processing the MAB. This study applied FAHP to determine the weights of evaluation criteria and sub-criteria of the MAB approach. The results show that the weights of the evaluation criteria are as follows: "Quality Control Capabilities"(0.2657), "Delivery and Warranty"(0.2114), "Price and Cost"(0.1865), "Technological Capabilities"(0.1387), "Performance in Prior Contract Fulfillment"(0.0987), "Management System"(0.0552), and "Cooperative Abilities"(0.0438). The first five items account for 90.1% of the total weight, whereas the combined weight for "Management System" and "Cooperative Abilities" only accounts for 9.9%. Enterprises or government agencies that need to formulate their evaluation criteria and sub-criteria for MAB may refer to the results of this study. Alternatively, they may apply the method proposed by this study to construct their own MAB evaluation model to improve the accuracy of supplier selection.

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