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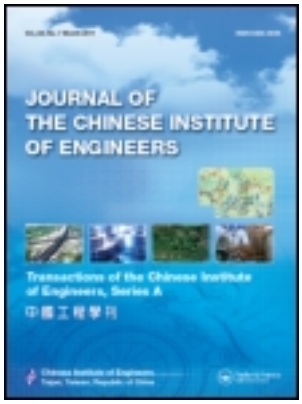

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Contractor selection by the most advantageous tendering approach in Taiwan

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Short Paper

CONTRACTOR SELECTION BY THE MOST ADVANTAGEOUS TENDERING APPROACH IN TAIWAN

Jyh-Bin Yang* and Wei-Chih Wang

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ABSTRACT

Construction clients usually tender their projects by either the lowest bid tendering method or the A-plus-B method to find a bidder that provides the lowest cost or highest profit. However, choosing a contractor that provides assured quality by examining his construction proposals along with his bid price and bid duration will compensate for the uncertainty in the lowest bid system, while retaining the advantages of the A-plus-B method. This paper presents a novel tendering method (the Most Advantageous Tendering approach) using a practical example in Taiwan. The rationales for contractor selection of the Government Procurement Law in Taiwan are reviewed herein. Several valuable issues regarding contractor selection in this case study are also presented.

Key Words: procurement, bidding, contractor selection, most advantageous tendering approach.

I. INTRODUCTION

It is known that many construction projects exceed the contract cost as well as the original bid price. Thus, using the bid price (lowest bid) solely for contractor selection cannot guarantee the lowest total construction cost. In addition, construction bid evaluation is one of the primary challenges for the public sectors. Its purpose is to choose the best-qualified contractor who can accomplish the project on time, within budget, and with the quality specified in the contract documents. In finding a best-qualified contractor, two terms, evaluation and selection, are commonly referred to in the literature. Holt (1998) defined contractor evaluation as the process of investigating or measuring contractor attributes, and contractor selection as the process of aggregating the results of evaluation to identify an optimum choice. This paper focuses on the issue of contractor selection of the best-qualified contractor.

In Taiwan, nearly all public construction projects are delivered based on the design-bid-build approach. In this delivery method, projects are awarded to the qualified bidder that has proposed the lowest total bid price. Since the economy of Taiwan currently has low economic growth or even decline, unscrupulous contractors sometimes bid a project with a less-then reasonable price only to obtain the project for their survival. Generally, this bad tendering environment results in delays, budgets overruns, and reduced quality. To counter this problem, an innovative tendering method, the Most Advantageous Tendering (MAT) approach, of the Government Procurement Law (Public Construction Commission, 1998) in Taiwan gives the procurement entity an alternative to select the best-qualified contractor without using the lowest cost tendering method. This paper gives an example using the MAT approach to illustrate its rationale for contractor selection and the benefits provided after its implementation.

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II. CONTRACTOR SELECTION METHODS

1. Lowest Bid Systems

The most commonly used contractor selection method in Taiwan, as well as internationally, is the lowest bid system, where bid price is the unique criterion in tendering since the bidder providing the lowest bid price is awarded the contract. Without prequalification, this method often results in an unscrupulous contractor being awarded the contract, but it is conducted as a result of free market competition. If each qualified bidder were to have a through estimate and sufficient planning prior to bidding, the lowest bid system would be a perfect method of contractor selection for an owner.

Herbsman and Ellis (1992a, b) proposed a contractor selection approach, the A-plus-B method, that used both construction cost and time as selection criteria. Because this method converts construction time into bid-related cost, with the award being made on the basis of the lowest total cost, it can be regarded as a modified lowest bid system. In the A-plus-B contracting environment, a bidder is motivated to bid the project at the shortest possible duration, with the potential of either wining a bond for early completion or paying liquidated damages for lateness (Fayek *et al*., 1999).

2. Average Bid Systems

Among average bid systems, one common method is to find the bid that is closest to the average of all bids received, by summing all bid prices and then dividing that number by the total number of bids. The winning bidder will be the one nearest to the average bid value or the closest one to the average bid value but less than it. In addition to this method, locating the limited bid by average bids and the owner's estimate is another approach. This method determines the winner with the bid price that is nearest to the average bid value, which does not exceed the owner's estimate (or budget). The basic drawback of the average-bid system is that it does not necessarily promote price competition that would lower the owner's cost (Ioannou and Leu, 1993). All average-bid systems have a common pitfall, which is that if a majority of bidders unite, their bid values will dominate the average bid value.

3. Multi-criteria Evaluation Systems

The multi-criteria evaluation method is broadly used as a means of alternative selection. To aid in selecting a contractor, Holt *et al*. (1995) developed a multi-attribute analysis method to evaluate construction bids and Alsugair (1999) proposed a framework of 36 evaluating factors grouped into nine classes. The method developed by Alsugair is convenient to execute because it uses a binary evaluation mechanism for each evaluating factor within a simple question. However, as the evaluations were conducted in Saudi Arabia, further examination is required before implementing it elsewhere.

4. Other Contractor Selection Systems

Diekmann (1981) applied the utility function to form a contractor evaluation model to aid contractor selection for a hybrid unti-price cost-plus contract. This model is appropriate in risky selection situations. Holt (1998) collected and reviewed other potential systems, including the Bespoke approaches, the multi-attributes analysis method, the multi-attributes utility theory, the cluster analysis method, the multiple regression method, the Fuzzy Set theory method and the multivariate discriminant analysis method. However, in general, these systems are more significant for research than for practice.

III. GOVERNMENT PROCUREMENT LAW IN TAIWN

The Government Procurement Law (GPL) in Taiwan was promulgated on May 27, 1988, and took effect one year later. This section describes the significant provisions of the GPL in contractor selection.

1. Tendering Procedure

For procurement, GPL contains three tendering procedures: open tendering procedures, selective tendering procedures, and limited tendering procedures. GPL has a published threshold of procurement value for publication, currently one million New Taiwan Dollars (NTD), to govern tendering procedures. Generally, an entity will apply the open tendering procedures to all procurements. Under the open tendering procedures, a public notice is issued to invite all interested suppliers to submit their bids.

An entity can apply the selective tendering procedures after obtaining the approval of its superior entity, when the procurement value reaches the threshold for publication and is in one of the following situations: having a recurring demand, requiring much time for bid review, having a high cost for the supplier in bid preparation, or having complicated qualification requirements for suppliers. Within selective tendering procedures, a public notice is issued to invite all interested suppliers to submit their qualification documents for prequalification evaluation. This

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is based upon specific qualification requirements that the client issues, and after the evaluation the qualified suppliers are invited to submit final bids.

An entity can apply limited tendering procedures by obtaining approval and reaching a threshold similar to the selective tendering procedures, and also by having complicated procurement situations. One common situation being suitable for limited tendering procedures is when there was no bid in response to an open or selective tender, or when the bids submitted were not in conformity with the tender requirements. However, the requirements of the initial tender are not substantially modified in the contract as awarded. Within the limited tendering procedures, multiple suppliers may be invited to compete or in some cases only one supplier is invited for tendering.

2. Award of Contracts

GPL has two categories of contract-awarding approaches: the Lowest Price Tendering approach (LPT) and the Most Advantageous Tendering approach (MAT). An entity must adhere to one of these approaches according to its procurement situation, and all information regarding the awarding of a contract is specified in published tender documentation.

If the LPT approach is adopted by a procurement entity, the following criteria will control an award. If a client estimate is established for the procurement, a bidder that adheres to the requirements set forth in the tender documentation, which has the lowest bid price within the client estimate shall be awarded. If a client estimate is not established for the procurement, a bidder which meets the requirements set forth in the tender documentation, has a reasonable price as reviewed by a procurement committee, and is also the lowest tender within the budget amount, shall be the winning bidder.

If a procurement entity adopts the MAT approach, the award will adhere to the following criteria. The bidder whose tender meets the requirements set forth in the tender documentation and is the most advantageous one, is the winning bidder. This tendering approach is allowed only if different bidders with distinct qualities exist, so the LPT approach is not suitable.

3. The MAT Approach in GPL

The MAT approach (Public Construction Commission, 1998) is an innovative tendering method in Taiwan. If an entity wants to adopt the MAT approach in tender section, it is necessary to first obtain the approval of its superior entity, if there is one. Subse-quently, a procurement committee is formed for setting tendering evaluation criteria and making an evaluation. Within the MAT approach, the evaluation criteria presented in the tender documentation include the technology, quality, function, commercial terms, or price of the bids. Detailed evaluation criteria are set by the procuring entity, and then reviewed and determined by the procurement committee according to the characteristics of each procurement project. The price offered or the price quotient divided by the score which resulted from comprehensive evaluation could be used as a sole item for evaluation or the criterion for award of a contract. If the bid price is regarded as one of the evaluation criteria, the weight of the bid price should not exceed 50% of all criteria.

There are three categories of evaluation in the MAT approach: the scoring method, the ranking method and the unit-price evaluation method (price divided by score). In the evaluation conference, the head of the procuring entity or the concurrence of the majority of the evaluation committee determines the winner regardless of which evaluation method was used to rank or score the criteria.

IV. CASE STUDY USING MAT APPROACH

1. Project Description

This project was a new connecting road that was roughly 5 kilometers long, including a bridge, for a new interchange on an existing highway. The project used a traditional design-bid-build procurement process and its design was completed prior to tendering for construction. The budget of this project was 1,116 million NTD and its planned construction duration was 670 calendar days. This project used open tendering procedures for procurement. A local municipal government agency solicited this project, which received financial support from a central government agency. The purpose of the local agent in tendering for this project was to shorten the duration and to lower the construction cost, while also assuring better quality. The project agent (an A/E consultant for project design) protects the owner's rights by employing certain bonds (see Table 1) that are significant factor to the bidder due to the cost of these bonds. This project was not open to foreign contractors. Under the GPL, some tendering information was prohibited for publication, so this paper reserves certain detailed information.

2. Contractor Selection Procedure

The contractor selection procedure was based on the MAT approach and the GPL provisions, as de-

Table 1 Project bonds

Name	Value
1. Bid bond	111.6 million NTD (10% of project budget)
2. Performance bond	10% of contract price
3. Difference bond	The difference between bid price and 80% of project budget when bid price is lower than 80% of project budget
4. Refund bond	The same as the prepayment (10% of contract price)
5. Guarantee bond	1% of contract settlement price

tailed below (see Fig. 1).

After selecting the MAT approach, the procuring entity must prepare draft selection methodology and documents, as well as establish a selection committee to review those drafts. Prior to publishing tendering documentation, the selection committee should have at least one conference to determine selection methodology. Based on the published documentation and the tendering procedure, interested bidders can procure tendering documents, prepare bids and then submit them. If the received bids are not above a minimum number of bidder (3 bidders for the first tendering process), revision and a new publishing procedure is required. If the number of bidders is acceptable, then the final selection procedure proceeds. Following a prequalification process that will eliminate unqualified bidder(s), there will be a selection conference that determines the contract winner.

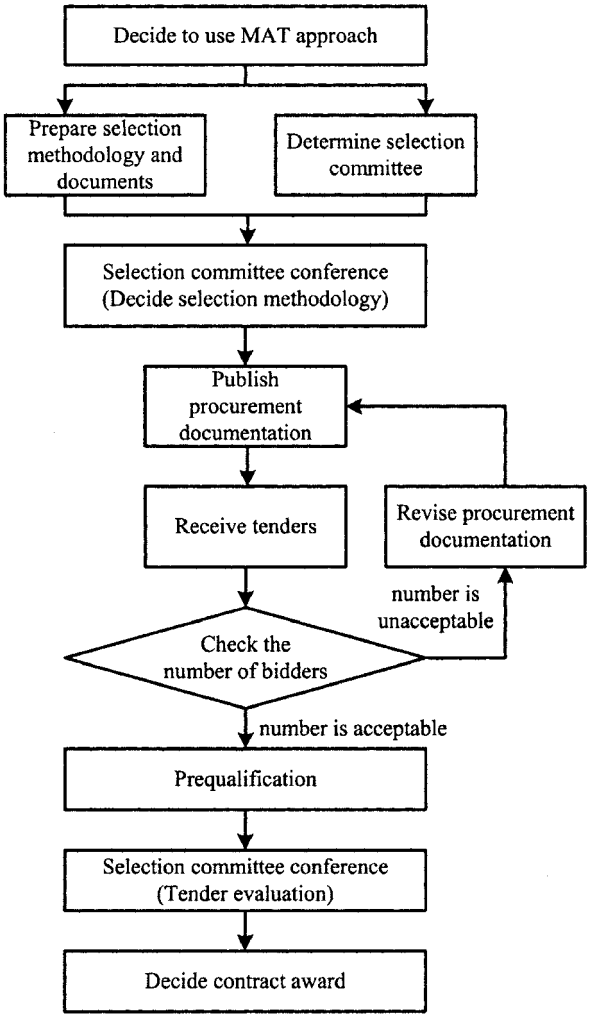

Fig. 1 Contractor selection procedure

3. Contractor Selection Committee

The selection committee established by the municipal government agency had 13 professionals. Its task was to approve the selection procedure and methodology, establish evaluation criteria with their weights, and implement selection. The chair of this committee could be the mayor of the municipal government or an agent, and any conclusion requires a majority concurrence of the evaluation committee. That is, the number of committee members present should exceed two thirds of the total and the number that concur should be not less than a half of the members present. A working panel was also established to assist in selection, particularly prequalification.

4. Prequalification

This project used a prequalification mechanism to eliminate unqualified bidders. The prequalification, implemented by a working panel, has two categories of qualification criteria: basic qualifications (business registration certificate, recent tax payment certification, and listing as a grade "A" contractor as evaluated by government agent, and not on the list that prohibits participation in the tendering of GPL provisions) and specific qualifications (financial capability proof, experience record, and financial credit).

5. Evaluation Methodology

The MAT approach employed herein combined the multi-criteria evaluation method and the A-plus-B method. Selection committee members evaluated submitted proposals to determine a contract winner, and the contract cost and duration were the bid values. Table 2 lists the evaluation criteria with their weights. Committee members individually assess the first five

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Table 2 Evaluation criteria

Feature	Weight
1. Construction proposal (understanding of the project, contruction and management methods, and additional suggestions benefiting owner)	7%
2. Reputation, similar experience and financial statement of bidder	7%
3. Financial plan for the project	7%
4. Experience of project manager and engineers	7%
5. Schedule network (time-scale and pure logic diagrams)	7%
6. Proposed construction duration	20%
7. Bid price	45%
Total	100%

features listed in Table 2. Each evaluation committee member present should score all qualified bidders between 0 and 100 according to the evaluation criteria, and then rank them sequentially. Thus, a more qualified candidate will receive a lower number.

All criteria listed in Table 2 are divided into three categories: quality, time and cost. Features 1 to 5 are quality-related, feature 6 is time-related and feature 7 is cost-related. Feature 1 is used to verify the bidder's construction ability. Feature 2 is used to ensure that the bidder has a good status in practice. Feature 3 is used to confirm that the bidder will have no financial problems during construction. Feature 4 is used to check that the bidder has the experienced personnel required for the project. Feature 5 is used to assess the planning and control ability of the bidder. Particularly, feature 5 is used to assess the bidder's ability, not to evaluate bidder's planning results (bid duration). Due to the upper limit of weight for price-related criteria being 50%, the selection committee decided that the weight of the cost feature should be 45%, the weight of the time feature should be 20% and the quality features share the remaining 35%.

As stated, the bidder with the lowest of all rankings is awarded the contract. If more than one bidder has the same ranking results, the bidder getting more top-ranking votes will be the winner. If the ranking results are still the same, the evaluation committee should re-vote to determine a final winner.

6. Evaluation Result

After the 28 days allotted for tender submission, 5 contractors submitted their bids. In a final evaluation conference, in order to eliminate the influence of the last two features (duration and price features)

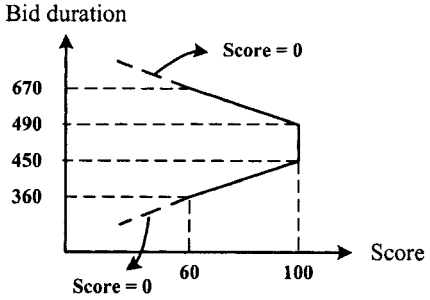

Fig. 2 Relationship between bid duration and score

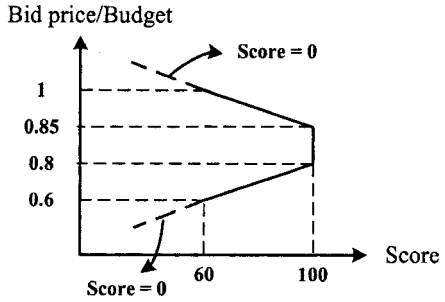

Fig. 3 Relationship between bid price and score

on the former five features (quality features) listed in Table 2, the committee determined that they would first evaluate the quality features, and then rate the time and cost features. All 5 bidders met the pre-qualification.

For evaluation, the committee used two algorithms to calculate scores for bid duration and price parameters. The relationship between bidder's values and scores on duration and price are illustrated in Figs. 2 and 3, respectively. The ranges and related scores in Figs. 2 and 3 were discussed in selection committee conference and accepted by all present committee members.

If a bidder's construction duration was between 450 and 490 calender days, the duration parameter score was 100. However, if a bidder's duration was lower than 360 calendar days or higher than 670 calendar days, the duration parameter score was 0. Otherwise, a simple linear calculation determined the score as being between 60 and 100. The key points in Fig. 2 have the following vital meanings. The 670-calendar-days is the announced planned duration, above which, bids were unacceptable for the procurement entity. The 450-calendar-days and 490-calendar-days were preferred by the procurement entity and were also reasonable to complete the project. The project's A/E consultant proposed 360-calendar-days; however, if a bidder's value was lower than that, the project could not be completed within the duration.

In Taiwan, most construction projects have a

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contract cost that is lower than 85% of the budget (Wang and Li, 1999). However, if a bidder's price is lower that 80% of the budget, a difference bond is required. Therefore, the selection committee determined that if a bidder's price ranges from 80% to 85% of the budget, a score of 100 is assigned to the cost parameter. If a bidder's price is lower than 60% of the budget, quality becomes a concern and thus a score of 0 is assigned. Similarly, if a bidder's price exceeds the budget, that value is unacceptable for the procurement entity, and a score of 0 is also assigned. Otherwise, a simple linear calculation determined the score in a range of 60 to 100.

After the evaluation conference, a contractor with a bid price of 948 million NTD and bid duration of 580 calendar days was awarded the project.

V. LESSONS LEARNED

1. Contract Cost

In Taiwan, typically the contract cost ranges between 75% and 85% of the procurement budget for a construction project (Wang and Li, 1999). The contract cost of this project was 948 million NTD, which was roughly 85% of the budget. Although the contract cost was not the lowest of all bidders, it was within the standard. For a procurement agency, the MAT approach cannot increase contract cost.

2. Contract Duration

Generally, an owner's planned construction duration will be the contract duration in Taiwan. However, the discussed project had the contract duration of 580 calendar days, which was roughly 87% of the planned construction duration. For a procurement agency, the MAT approach can result in shortened project duration that would be difficult to obtain otherwise.

3. Contractor Ability

In Taiwan, a construction proposal is commonly required after a contract is signed. Each bidder on this project should submit a construction proposal that includes bid price and duration. Moreover, a schedule network according to his proposal is also required, to demonstrate that his bid price and duration are reasonable. This mechanism forces an interested bidder to pre-plan thoroughly, hence resulting in an accurate estimate bid price and duration. Furthermore, it implies that an interested bidder is certain that he can complete a project within the projected cost and duration. The MAT approach can increase the probability of successful project completion, although it cannot guarantee it.

4. Evaluation Methodology

The MAT approach adopted herein is an innovative contractor selection method in Taiwan. Although the MAT approach is not robust enough to eliminate all drawbacks of other contractor selection methods, it creates an open, fair and professional competition, while preserving the merits of other methods.

5. Tendering Procedure

A three-stage bid evaluation process (evaluation of bidder's qualification, evaluation of technical proposals, and evaluation of competitive bids) is popular in Taiwan. Although this case differs somewhat, prequalification, proposal evaluation and evaluation of bid cost and duration, which have the same function, are completed. This tendering procedure is valuable for public construction projects under GPL.

VII. CONCILUSIONS

Contractor selection is a vital task for a client to have his project completed within budget, on schedule and with good quality. The discussed MAT approach, which retains the advantages of the lowest bid method, the A-plus-B method and prequalification, is a promising approach that creates a fair, competitive environment for contractor selection. The discussed project is one of the few available cases that employ the MAT approach as designated by the GPL; however the discussed case is the most valuable one since it concerns overall time, cost and quality. We assume that there will be other similar projects in the future.

Three future research directions are proposed:

1. Whether or not the perceptions of the discussed case are general, corresponding with the true relationships, between a contractor selection approach and a project's successful factors, is a matter for future study.
2. The weights of evaluation criteria need to be carefully examined to set a commonly acceptable standard or range. They should not be just determined by committee arbitrarily.
3. Because different evaluation methods (scoring, ranking or unit-price method) may produce different results, which one would be the best for the MAT approach must be evaluated.

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