A methodology to select the price criterion in public procurement

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Abstract

The construction sector is a key driver for economic growth in any nation and public procurement is one of its pillars – hence the importance of the study and investigation of its mechanisms, especially tendering criteria. Price is the main deciding factor for most tenders and projects must have an appropriate base price relative to market price to avoid problems during the execution of the project.

Most research on price criteria has been developed from the point of view of bidders and has discussed the development of tools and methodologies for determining the optimal bid price.

In this paper we propose a methodology for public procurement procedures from the point of view of the administration. The methodology enables setting all aspects of the price criterion based on the size of the project budget, the nature of the work, and the number of bidders.

Key words: public procurement, tendering, contracting authority, scoring system, public works, selecting contractors

1. Introduction

The construction sector is a key driver for economic growth in every nation [1] and public procurement is one of its pillars [2-4]. The public procurement of construction projects differs in practice from the private sector [2, 5] and is more complex [6-8]. Research on the characteristics of public procurement has focused on the selection of tendering criteria and the development of tools to assist bidders make decisions.

Research on tendering criteria has traditionally focused on developing optimal bidding price prediction models or bidding strategies [9-12] and less attention has been paid to the analysis of other criteria or attributes [13-18].

The decision about whether to participate in a tender is complex, and the decision factors and their relative importance vary between businesses [7, 19-24]. Models have been developed that assist decision making based on: neural networks [25-28]; AHP-ANP techniques [29-30]; game theory [31]; DEA techniques [32-33]; or a combination of several techniques [34].

Other researchers have developed mathematical models that assist in making decisions as to whether or not to tender, and if so, determine the optimum value based on several criteria including risks for bidders [18, 35-36]. Other researchers have taken into account only price criteria and have developed prediction models based on the historic time series of auctions and tenders in a given public body [3, 37].

Many of these investigations have been developed from the point of view of bidders, regardless of the fact that the state administrations and governing legislation evolve slowly, and that each public agency (national, regional or local) has certain preferences (sometimes non-explicit) when selecting criteria for public tenders [38].

The aim of this work is to develop a methodology that enables the contracting authority to set the price criterion during the preparation of a tender (i.e., select the weighting of price against other criteria such as abnormal pricing and scoring formulae) depending on the characteristics of the contract.

2. Background

Directive 2004/18/EC [39] regulates public procurement in the European Union. The directive describes two tendering procedures, the first of which is used when only the price criterion is applied. The second procedure is used when several criteria are applied – including price

The evaluation criteria used can be divided into two groups: criteria evaluated using formulae; and criteria evaluated by value judgments. For the first group, various predetermined formulae can be employed that include aspects such as price, delivery time, etc. However, scores for criteria evaluated using value judgment will always contain some subjective bias that reflects on the individual who performs the evaluation.

Directive 2004/18/EC requires that criteria assessable by value judgment are evaluated before the criteria for evaluation by formula are known – so lessening the possibility of fraud. Both best practice and the directive specify that criteria evaluated by formula must be given greater weight than criteria evaluated by value judgment.

Administrative and technical bid terms define the weight of each of the evaluation criteria and the scoring formula for each criterion (for the price criterion as known economic scoring formulae, ESF). Any abnormally low bid criteria (ALBC) must also be stated.

There are previous works on ESF [17, 38, 40-42] analyzing tender operation and offering guidelines or recommendations for use. Abnormally low bid criteria have been less studied, although interest has increased in recent years as these criteria provide the first filter for detecting inadequate bids or a bids that could endanger the project [4, 43-47].

3. Basic Definitions

This study will primarily use terms and concepts used in the European and Spanish construction industries. To help improve understanding some concepts as described below.

The economic value of the tender is the contract execution budget (CEB) plus value added tax (VAT). CEB reflects the investment required to implement a project and is composed of the material execution budget (MEB), overheads (OH) and profit (P).

MEB reflects the cost of implementing the various units that make up the project, while OH reflects a percentage of between 13% and 17% of the MEB that covers the structural, financial, tax, and other costs that fall on the contractor. The contractor's profit is seen as a percentage of MEB – and is usually 6%.

The cost or price of each of the project work units consists of direct costs (DC) and indirect costs (IC). DC includes the labour (LAB) directly involved in the execution of the work unit, materials on site (MAT), as well as the staff costs, fuel and energy used operating machinery and equipment, and depreciation and maintenance of equipment and facilities (MACH). These costs are reflected formally in the budget document known as the simple pricing table (labour, materials and equipment). Additionally, all units of work usually include a small percentage called supplementary direct costs (SDC) that includes small items of equipment or tools that are difficult to quantify.

Some work units may include other simple work units called ancillary prices: such as mortar and cement. These are defined in the budget document in the simple pricing tables and in the present study are termed AP.

IC includes installation costs for on-site offices, communications, construction of warehouses, workshops, temporary building for staff, laboratories, costs of technical and administrative staff assigned exclusively to the work, and contingencies. IC is usually computed as a constant percentage of DC for all project work units – depending on the nature of the work, the total budget, and the expected project completion time.

In short, we can calculate that the material execution budget (MEB) is equal to:

$$MEB = MACH + LAB + MAT + AP + SDC + IC \quad (1)$$

4. Proposed methodology

The proposed methodology represents a control and price justification tool for public contractors and helps officials make safer, more objective, and less arbitrary decisions regarding weighting criteria, possible cases of abnormal pricing and scoring formulae.

The methodology should be applied from the beginning of the tendering process and is divided into four phases:

A. Economic study of the construction project

B. Determination of the weighting of the price criterion

C. Selection of abnormally low bid criteria

D. Selection scoring formula for price criteria

4.1. Phase A: Economic study of a construction project

The first phase involves an economic review of the project (Figure 1). From the project budget the following indices are calculated:

- Percentage of the amount of equipment used in the project compared to the material budget – here in after referred to as % MACH.
- Percentage of the amount of labour employed in the project compared to the material budget – here in after referred to as % LAB.
- Percentage of the amount of materials used in the project compared to the material budget – here in after referred to as % MAT.

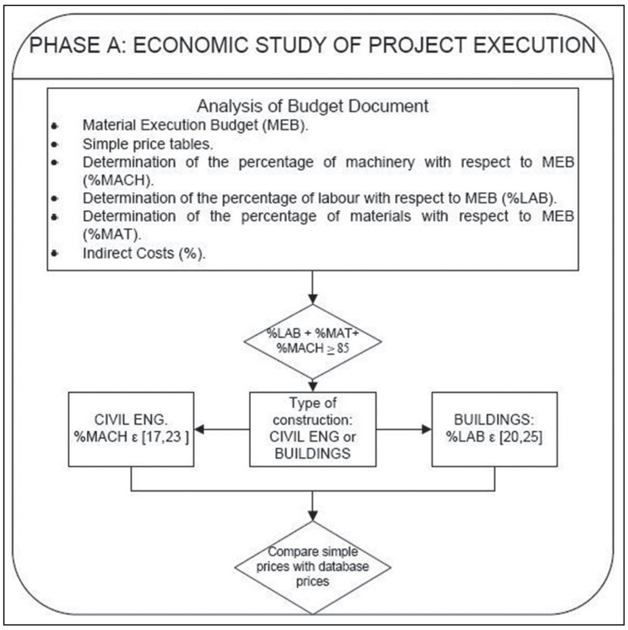

Figure 1. Phase A: Economic study of the project

The calculated values enable the following equation to be completed in terms of percentages (1):

$$MEB\ (100\%) = \%MACH + \%LAB + \%MAT + \%AP + \%SDC + \%IC \quad (2)$$

An analysis of a sample of 100 construction tenders [4, 38] showed the following equation to be fulfilled in 70% of the projects studied:

$$\%MACH + \%LAB + \%MAT \geq 85\% \quad (3)$$

If this requirement is not met then the project should be referred to the project oversight office of the contracting body (or a departmental specialist) for a review of the project and budget.

Secondly, after fulfilling (3) a distinction is made between civil engineering and buildings projects. According to the analysis of the sample, the following conclusions can be made for defining the parameters and ranges of each type of project (Table 1):

- Materials are generally the largest part of the budget both in civil engineering and building projects.
- The percentage of labour with respect to building project budgets is generally around 20% to 25%.
- The percentage of labour with respect to civil engineering budgets is generally between 10% and 20%.
- The percentage of the machinery budget in civil engineering budgets is usually between 5% and 25% with major fluctuations that can mean the machinery budget can sometimes exceed the materials budget.

Table 1. Labour and machinery ranges

Project Type	Parameter	Range
Buildings	Labour (%LAB)	20 – 25
Civil Eng.	Machinery (%MACH)	17 - 23

Certain types of civil engineering and building projects can produce changes in these percentages – for example, the construction of a tunnel using a boring machine would mean that the machinery component would have greater weight than is usually found in civil engineering projects. Another example is the construction of a precast structure in which the labour component would have exceptionally little weight. In any case, out of range values reflect the uniqueness of a construction process, or the project itself, and this information may help the contracting authority validate or reject the material execution budget for the project.

The last step of this first phase consists in verifying the total project price according to market prices – and this is achieved by checking the basic prices included in the project with the basic database prices for the geographical area.

The last step is divided into several tasks:

T1. Selection of basic prices of the materials, labour, and machinery with the greatest economic weight in the project.

Prices are selected from basic price tables using a total of ten units from each category (labour, machinery and materials).

T2. Check basic prices of materials, labour, and machinery on the reference database.

The sample of selected prices is considered valid when at least 20 basic prices (of the 30 selected) from the project are compared with 20 basic prices from the reference database.

The acceptance criterion for basic prices is that there is no more than a 15% difference above or below database prices.

T3. Project qualification from the price standpoint.

A project is considered valid from the price point of view when at least 70% of basic prices (namely, 14 items) have been accepted after comparison with the reference prices.

If a project is deemed valid, then the contracting authority will consider that the cost of the project matches market prices and so the project will be advanced to Phase B of the methodology. If a project is considered invalid, the project will be returned to the project team for an analysis of the proposed solution with respect to market prices (including materials used and construction process).

Projects involving implementation processes, organisational processes, technologies, materials, or locations that are unusual may be regarded as special projects and the contracting authority, having submitted the project to the corresponding economic analysis described above, must decide on the viability of the project. If the project is declared invalid economically but the contracting authority decides to make it viable because of its special characteristics, then this decision must be appropriately justified with an explanatory document placed in the project file.

4.2. Phase B: Determination of the weighting of the price criterion

In the second phase (Figure 2) the weighting of the price criterion is selected. Firstly, we must distinguish between an auction (where price is the sole criterion) and tendering (various criteria employed). In auctions the price weighting is 100%.

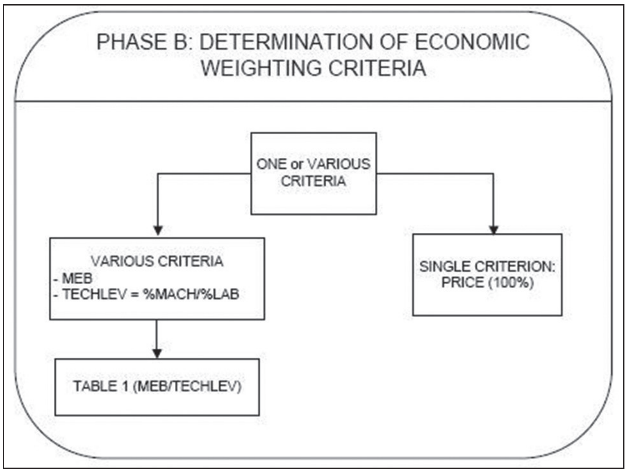

Figure 2. Phase B: Determination of price weighting

If the tendering process involves several criteria then the technological level (TECHLEV) of the project is now determined, meaning the need for machinery or equipment to execute the project is compared with the amount of labour needed. The technological level can be expressed as the ratio between the percentage of machinery (% MACH) and the amount of labour (% LAB) used in the project.

$$TECHLEV = \frac{\%MACH}{\%LAB} \qquad (4)$$

The technology level is expressed as one, and the range of possible values is then defined:

– Construction, TECHLEV ε [4 - 0].

The maximum value of 4 corresponds to the assumption that the value of % MACH is equal to 80 and the value of %LAB is equal to 20, a situation that corresponds to the unlikely situation of a project that does not require any material (% MAT = 0).

The minimum value of 0 corresponds to the assumption that the value of % MACH equals 0 and that the value of % LAB equals 25 (or any mathematical value), a situation that corresponds to the unlikely situation of a project that does not need any machinery (% MACH = 0) and only requires labour and materials.

– Civil engineering TECHLEV ε [2.88 - 2.13].

The maximum value of 2.88 corresponds to the assumption that the value of %MACH equals 23%

(maximum range value of Phase A of verification) and the %LAB is 8% (10% is the average value obtained from the analysis of the sample of procurement specifications corrected with a 0.8 safety factor for possible deviations below this value).

The minimum value of 2.13 corresponds to the assumption that the value of %MACH equals 17% (minimum verification range value of Phase A) and the value of %LAB is equal to 8% (10% is the average value obtained from the analysis of the sample of procurement specifications corrected with a 0.8 safety factor for possible deviations below this value).

Once the technological level and the material execution budget are determined, a weighting table is used (Tables 2 and 3) to calculate the price criteria within a competitive tender.

The weighting table is applied in the following manner:

- A high level of technology (for example, a very high percentage of machinery in comparison with the labour force employed) together with a small execution budget (in this case, less than €500,000) characterises a simple project with little coordination needed. Accordingly, the weight of the price criteria within the set of objective criteria is high (meaning the procedure resembles an auction).
- A high level of technology and a large budget (in this case more than €5 million) characterises a highly complex project with specific technologies (such as dredgers, retaining walls, and tunnelling equipment) with a high level of organisation and coordination needed. This would result in a low price criterion weighting – given that the description and organisation of the construction process (which will eventually lead to quality results) means that quality, price, and delivery time are together more important than just the price.
- A low level of technology combined with a small budget supposes a relatively simple project with low or medium levels of organisation and coordination needed – resulting in a low price criterion weighting.
- A low level of technology with a large budget (in this case, more than €5 million) is a simple project with a high level of organisational and coordination needs – meaning a very low price criteria because the organisation and coordination of the process, labour force, and technical equipment is more important than the price and construction process.

The numerical ranges associated with each of the results in the weighting table are shown in Table 4.

Table 2. Weighting table for determining price weighting for building tenders

		TECH LEVEL			
		[4.00 – 3.01]	[3.00 – 2.01]	[2.00 – 1.01]	[1.00 – 0.00]
MATERIAL EXECUTION BUDGET (euros)	**MEB < 500.000**	VERY HIGH	HIGH	MEDIUM	LOW
	500.000 ≤ MEB < 2.000.000	HIGH	HIGH	MEDIUM	MEDIUM
	2.000.0000 ≤ MEB < 5.000.000	MEDIUM	MEDIUM	LOW	LOW
	MEB ≥ 5.000.000	LOW	MEDIUM	LOW	VERY LOW

Table 3. Weighting table for determining price weighting for civil engineering tenders

		TECH LEVEL			
		[2.88 – 2.74]	[2.73 – 2.53]	[2.52 – 2.32]	[2.31 – 2.13]
MATERIAL EXECUTION BUDGET (euros)	**MEB < 500.000**	VERY HIGH	HIGH	MEDIUM	LOW
	500.000 ≤ MEB < 2.000.000	HIGH	HIGH	MEDIUM	MEDIUM
	2.000.0000 ≤ MEB < 5.000.000	MEDIUM	MEDIUM	LOW	LOW
	MEB ≥ 5.000.000	LOW	MEDIUM	LOW	VERY LOW

Table 4. Summary of price weighting criteria

PRICE WEIGHTING		
Value	**Numerical value (%)**	**Situation**
VERY HIGH	66-70	High technological level Small budget
HIGH	61-65	High technological level Small/medium budget
MEDIUM	51-60	High technological level and medium/large budget. Medium technological level and medium budget
LOW	46-50	Low technological level and small budget. Medium/high technological level and medium/large budget Technological level medium/low and medium/large budget
VERY LOW	40-45	Low technological level Large budget

4.3. Phase C - Selection of abnormally low bid criteria

In this section the criteria to evaluate abnormally low offers are selected. These criteria should only be used with bids and not with rejected offers. The limits of abnormality should not be based on the tender price [4] and the contracting body should be aware of the possibility of price rigging by bidders [42].

This phase, regardless of the type of project, will depend on the number of bidders and the material execution budgets. We have set two tests for abnormality, the first is based on the calculation of the average of the bids submitted (B_m) and is to be used when the number of bidders (N) is less than or equal to 10; and the second test is based on the calculation of a reference base rate based (B_R) on the arithmetic average and standard deviation of the bids submitted. This second test is used when the number of bidders exceeds 10.

The first test considers an offer as abnormal when it is less than an 'X' percentage of the arithmetic average of the bids submitted; while the second test considers an offer abnormal when it is less than an 'X' percentage of the reference base rate. Both methods behave very similarly for a low number 'N' of bidders, so the first test is chosen in cases when there are fewer than 10 bidders because it is quicker and easier to apply. For a larger number 'N' of bidders, the calculation of the reference base rate enables a more precise evaluation.

It will not be known which method will be applied until the envelope containing the criteria for evaluation by formulae is opened. However, the contracting authority will have determined the 'X' differential with respect to the bid average or reference base rate during the preparation of the administrative and technical bid terms and published this figure in the tender document. The value of 'X' is selected on the basis of the margin that bidders will have as determined by the material execution budget (Table 5).

Table 5. Table for selecting the 'X' percentage

		'X' (%)
MATERIAL EXECUTION BUDGET (euros)	MEB < 500.000	5
	500.000 ≤ MEB < 2.000.000	7
	2.000.0000 ≤ MEB < 5.000.000	10
	MEB ≥ 5.000.000	15

The criteria selected to determine abnormal offers are further specified below:

For N < 10:

The average of the bids (B_m) is calculated according to:

$$B_m = \frac{\sum_{i=1}^{n} B_i}{n} \quad \text{..........................} \quad (5)$$

Depending on the 'X' differential selected, the price limit (P_L) that determines the initial feasibility of the bids is calculated according to the following expression:

$$P_L = B_m \cdot (10\,0 - X) \quad \text{.......................} (6)$$

All of the bids are collated. Offers above the price limit calculated are considered acceptable, and those below the limit are considered abnormally low and the contracting body should seek an explanation from the bidder.

where:

B_i is the Bid (expressed in monetary values)

B_m is the Mean Bid (expressed in monetary value)

n is the Number of bidders

P_L is the price limit (expressed in monetary values)

X is the percentage according to Table 5

For N >10:

The average of the bids (B_m) is calculated according to:

$$B_m = \frac{\sum_{i=1}^{n} B_i}{n} \quad \text{...........................} (7)$$

The standard deviation of the bids is calculated according to:

$$\sigma = \left[\frac{\sum_{i=1}^{n} (B_i)^2 - n \cdot (B_m)^2}{n} \right]^{1/2} \quad \text{..................} (8)$$

To calculate the reference base rate (B_R), those bids n' that meet the following condition will be taken into account:

$$\left| B_i - B_m \right| \le \sigma \quad \text{...........................} (9)$$

The reference base rate is calculated using the following formula and taking account the bids that have met the previous condition.

$$B_R = \frac{\sum_{h=1}^{n'} B_h}{n'} \quad \text{.........................} (10)$$

Depending on the 'X' differential selected, the price limit that determines the initial viability is calculated according to the following expression:

$$P_L = B_R \cdot (100 - X) \quad \text{.......................} (11)$$

All of the bids are collated. Offers above the price limit calculated are considered acceptable, and those below the limit are considered abnormally low and the contracting body should seek an explanation from the bidder.

where:

B_i is the Bid (expressed in monetary values)

B_m is the Mean Bid (expressed in monetary value)

B_R is the base rate (expressed in monetary value)

B_h is the bid that satisfies condition (9) (expressed in monetary value)

n is the Number of bidders

n' is the number of bidders that satisfies condition (9)

P_L is the price limit (expressed in monetary values)

σ is the Standar deviation

4.4. Phase D - Selection scoring formula for price criteria

In this final phase, the scoring formula is selected according to the principle of proportionality of bids and with a moderate to high score gradient, so that the weighting of the price criteria is the target weight specified in the administrative and technical bid terms and not less [38, 48].

The price score formula is selected, both for civil engineering and construction projects, depending on the weighting of the price criteria (Table 6).

Table 6. Table for selecting the formula for price scoring

		SCORING FORMULA
PRICE CRITERIA WEIGHTING	VERY HIGH	I
	HIGH	I
	MEDIUM	I
	LOW	II
	VERY LOW	II

The scoring formula or criterion termed 'I' in this methodology consists of:

– The maximum score for the lowest normal bid.
– The minimum score (0 points) for all bids that have made an offer at base price, that is, bids that are not lower than the tender price.
– Bids between the lowest bid and the base price scored according to Figure 3.

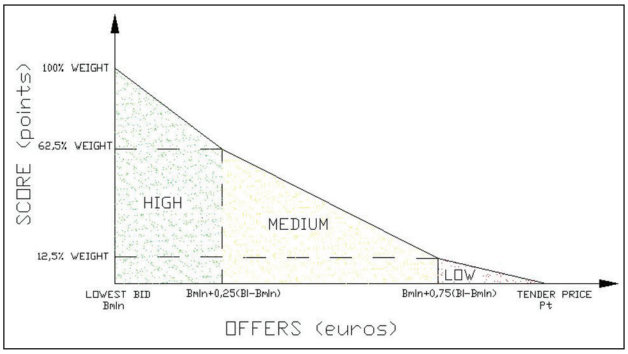

Figure 3. Chart for scoring offers according to scoring Formula I.

The first section of the curve is between the maximum score and 62.5% of the weighting of price criteria (determined in phase B of the methodology) and corresponds to bids between the lowest bid (B_{min}) and the lowest bid plus 25% of the difference between the tender price (P_t) and the lowest bid [B_{min}+0.25·(B_i-B_{min})].This zone is defined as the HIGH scoring zone (i.e. those bids with the largest reductions in the base price are scored highest).

The second section of curve is between 12.5% and 62.5% of the weighting of the price criteria and corresponds to bids between the lowest bid plus 25% of the difference between the tender price and the lowest bid [B_{min}+0.25·(B_i-B_{min})] and the lowest bid plus 75% of the difference between the tender price and the lowest bid [B_{min}+0.75·(B_i-B_{min})].This section is defined as the MEDIUM scoring zone (i.e. those bids that deviate from the base price are given lower scores).

The final section is between 12.5% of the weighting of the price criteria and a zero score corresponding to bids between the lowest bid plus 75% of the difference between the tender price and lowest bid: i.e. [B_i+ 0.75·(B_i-B_{min})] and the tender price (P_t).This section is defined as the LOW scoring zone (i.e. those bids that are near to the base price are valued with a low score).

Scoring criteria under Formula II in this methodology can be summarised as:

– The maximum score is for the lowest normal bid.
– The minimum score (0 points) is awarded to all bids that have made an offer at base price.
– The bids between the lowest bid and base price, are awarded a proportional score according to the following formula:

$$S_i = W \cdot \frac{P_t - B_i}{P_t - B_{min}} \quad \text{.....................} \quad (12)$$

where:

B_i is the bid (expressed in monetary values)

B_{min} is the minimum bid (expressed in monetary value)

P_t is the Tender price (expressed in monetary values)

S_i is the scoring of the bidder i (expressed in points)

W is the weighting given to price criteria, as determined in phase B

5. Results and discussion

The proposed methodology was applied to a sample of 39 projects in which data was available regarding bids. These 39 projects were part of an initial sample of 100 projects that were the subject of a study on criteria for scoring formulae and abnormally low bids [4, 38].

In the study sample (39 projects), only 21 (or 53.85%) showed a breakdown in the budget for the basic prices of materials, labour, and machinery.

Of the projects with a breakdown in the material budget, only 12 satisfied the condition %MACH + %LAB + %MAT ≥ 85% (3), meaning 57.14% of the projects with a financial breakdown, or 30.77% of the overall simple.

Of the 12 projects that satisfy (3) a comparison was made of ten main prices of machinery, labour, and materials. In only 8 of the 12 projects (66.67%) was the sample of compared prices considered valid (20.5% of the overall sample). There were two main factors explaining the result: firstly, these projects include some very specialist works (such as improving the outer harbour and docks at a port in Malaga, whose prices were not reflected in traditional construction databases); and secondly, the non-use of building material databases that were developed and checked by local agencies – so that comparison became difficult and sometimes impossible because of differences in coding, measurement units, and concept description.

Of the eight samples of valid prices we then checked those basic prices that differed from the basic database price (above or below) by 15% or less. We needed to find at least 14 prices to validate the project from the price standpoint. Only one sample satisfied this condition, representing 12.5% of the valid samples and 2.56% of the overall sample – meaning just one of the 39 submitted projects complied with Phase A. The remaining projects should be returned to the bidders and, where appropriate, to the offices of the administration supervising the projects for a formal review, and if necessary, a review of the solutions adopted in order to make the project financially viable according to market prices.

One of the conditions for applying Phase B is that is that the project achieved validation in Phase A. In this case, Phase B could only be applied to one sample project. To further validate the methodology and study the overall behaviour of abnormally low bidding criteria and scoring formulae, we selected all the projects that were not given a low price weighting in Phase A, in accordance with Table 4 (with a score of 50 out of a total of 100). For the single project that satisfied Phase A, a high weighting criteria was applied with a score of 65 points.

In Phase C, the most frequently selected X differential was 7% (18 of 39) followed by a 15% differential (12 of 39) and a 10% differential (8 of 39).The X differential = 5% was only selected once. Finally, in phase D, and in accordance with the weighting of the price criteria, the single offer that satisfied Phase A was evaluated using Formula I and the remaining projects were evaluated using Formula II.

Once bids are available, the contracting authority should initially assess for abnormally low offers and then score the bids in accordance with the formulae previously selected. In the study sample, the 'B' criterion of abnormality was used in 37 of the 39 cases because there were more than ten bidders. In the present study, all the bids considered abnormal according to the criteria applied were excluded from the scoring phase.

Performing an overall economic balance with the proposed methodology produced a positive balance of €274,775.85 for the contracting administrations. When an analysis was made according to project size: for projects with budgets above €2 million the positive balance for the administration was €1,158,004.61; while for smaller projects under €2 million, the negative balance for the administration was €883,228.75.

A comparison was made of the positions held by the bidders with the highest score on price criterion when applying the methodology – with the positions these same bidders held under the original administrative and technical bid terms. There are three possible results: winning bids that were previously deemed abnormal; winning bids that were previously also winning bids; and finally, winning bids that did not win under the previous terms. The percentage of winning bids that were not previously winners (41%) is greater than the other two possible results: some 31% were in the same position as previously; while 28% were previously deemed abnormally low.

In projects with budgets above €2 million euros, the proposed methodology produced the highest score for 40% of bids that previously were previously deemed abnormal; and for 35% of the previously winning bids. In projects below €2 million euros: the proposed methodology produced the highest score for 26% of bids that were previously successful and 58% of bids that were previously ranked in lower positions.

6. Conclusions

The presented methodology has been defined for application in public procurement procedures by administrations and enables the determination of all aspects of price criterion.

A project budget should be appropriate for market prices. It can be concluded from the sample that more care should be given to budget by both bidders and the supervisory offices of the contracting administrations.

Tenders below market prices generate problems during implementation, such as delays, claims, contradictory pricings, complementary projects, and even paralysis and non-completion of projects.

The weighting of price criteria depends on both the project budget and the level of technology, which means the relationship between machinery and labour provides a qualitative index of the technological difficulty and organisational needs for project implementation.

The abnormally low bid differential criteria were selected on the basis of the economic cost of the project. By using abnormality criteria and scoring formulae, the suggested methodology enables riskier bids to be presented for projects with budgets over €2 million. However, the methodology behaves more conservatively for projects with smaller budgets.

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