POSSIBLE METHODOLOGY OF SELECTING THE MOST FAVOURABLE OFFER IN THE HYDRAULIC DEVICES PUBLIC PROCUREMENT PROCESS

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Abstract—Public procurement processes of goods or services are, almost as a rule, preceded by a decision method. It is especially specific for business systems with a majority share of the state capital. Decision method, in that case, is the selection of the most favourable offer because a wrong decision in practice implies a problem of dissatisfaction of the offerer. The problem then causes the deadlock in the public procurement process, and very often the repetition of the process. This all leads to the delay of the decision and it changes the planned activity flow of the business system. This method will, for example, show that procurement of hydraulic devices, of defined strength, will present the possible way to select the alternative offer with regard to previously adopted criteria.

Keywords—procurement, decision-making, criterion, offer, alternative, methodology.)

I. Introduction

PROBLEMS in public procurement processes mostly appears in: formulating, i.e. characterization of the criteria for evaluation of offers and implementation of the best offer selection process. Defining of the criteria represents the selection of certain criteria from a multitude of possibilities, which are of the highest importance for specific public procurement. The character of the selected criteria certainly affects the determining of mutual relations of importance.

Public procurement organizers or orderers differently observe the issue of the mutual significance of the adopted criteria. Some think that cost price i.e. offered price is extremely important criteria. The others think that what is cheap, it doesn't have to be the best, and therefore they support the idea that quality and technical and technological advantages are the most important criteria.

There are cases where the orderer is, primarily, satisfied with the timely delivery of some good or service, slightly neglecting the cost price, and very often the quality as well. In practice, offers with the expected nearly equal offered prices and quality and implemented. In that case, the advantage is most frequently given to the payment conditions criterion and, very frequently to cost effectiveness as well. For those orderers who do not want to be too burdened with technical aspects, one of the simplest principles is "look how the other people do it". In that case, reference is selected as the most important criterion. Here we took into consideration only a few criteria, based on which we can perform the evaluation of offers, and there can be several of them [1].

The second problem mentioned refers to the application of the models for selecting the most favourable offer. More precisely, the selection of procedure that will imply the solution with the highest accuracy. In practice, there are examples of using mathematical methods for calculating the "value" of offers. Those are methods of assigning weighted values by the criteria for each offer. They are based on simple mathematical procedures where the priority of the alternative is presented with the number of points, and the number of points is obtained as the sum of coefficients and weighting factors for each criterion given [1]- [5]. However, we must say that the greatest number of procedures in practice is still not based on experience and improvisation. For that reason, the authors of this paper will try to define a methodology for procurement of the defined strength components on a sample of virtual procurement, from the tender of a Serbian public company, with respecting legal and technical criteria.

II. How should the offers be evaluated

About the problems regarding public procurement, the authors have written in the paper, [1]. It is stressed that public procurement, whether it is about services, technical means procurement, technical means maintenance..., basically refers to the jobs ordered by a state-owned company (public companies). They are, for that reason, under continuous observation of the media due to possible manipulations and interest of economic subjects, because it would be a significant source „safe-guaranteed" funds from the part of the state.

As this was a new manner of doing business in almost all ex-socialist states, in which this wasn't a problem, because this field was under party jurisdiction and in

planning documents. For that reason, all the countries from this milieu had to regulate this field with new legal regulations. This is how the Republic of Serbia adopted the Law on public procurement, which has almost continuously been complemented and regulated with new articles and the alteration of the existing ones, [2].

In order to prevent corruptive activities, the legislator has set the tasks for the management that implement public procurement, and they refer to transparency and they „must be easy to understand even for those who are not familiar with the specific issue." Here is an example of the latest amendment of the Law on public procurement – a part of the article 43 (a version of the Law on public procurement that came into force on 1.1.2016.) which refers to electronic bidding, [2]. The call for submitting the offers consists of:

1. *Data that are significant for using the information system of the ordered,*
2. *Date and time of the auction,*
3. *Result of previous professional evaluation of the offer,*
4. *A mathematical formula that will be applied in an electronic auction that provides automatic determination of changes in ranking the offers based on new prices offered, i.e. other elements of the criteria for assigning the contract (hereinafter mathematical formula).*

A mathematical formula has to contain weighting factors for all the elements of the criteria that the orderer determined in the call for offers and competition documentation for evaluating the altered parts of the offer. The mathematical formula is basically a formula of multi-criteria analysis where the bidders suggest the ordered new conditions of their offers (e.g. lower price but they can also suggest the alteration of some technical characteristics – it is usually about the reduction of technical characteristics). It must automatically calculate the „suggestion", as well as to rank all the previous. In the case of most methods of multi-criteria analysis (MCA), the introduction of new offers makes a new order for previously given alternatives and it can happen that a selection of a certain method (MCA) (i.e. appropriate „mathematical formula") can favour some of the previous offers through „new ones"!

Methods in the case of which this is not possible are often either complicated for the application or simple but they favour one of the characteristics of the offer. However, in practice we most frequently use that simple method that favours one of the characteristics – offer price. It is lexicographic method that is easy to apply and it chooses the offer that has:

The lowest price (price criterion C_1), and if two offers have the same price we choose the one that is better by the criterion C_2, and better offer by the last criterion.

This method always gives the „optimal result", except in the case when two offers are entirely identical by all criteria. In that case, the selection had to be made by random pulling out of the hat or by the criterion of the first offer (the order of receiving the offers). In practice, everything ends in the first step, an i.e. criterion under a). This is simultaneously the most frequently used method of selecting the best offer, in the case of public procurement, in the Republic of Serbia.

Main anomalies, which appear in this case include the refusal of requests for technical characteristics of the offer, due to price reductions, so that in new versions of the Law on public procurement we can find an article in „unusually low price", article 92 and 93 (according to Law on public procurement).

In the Article 92:

The orderer can refuse the offer due to unusually low price. Unusually low price in the aspect of this law is the offered price that significantly varies in relation to market comparable price and it causes the doubt regarding the possibility of performing the public procurement in accordance with the conditions offered. If the ordered evaluates that the offer contains an unusually low price, he is obliged to require a detailed explanation from the offered regarding all the constituent parts he considers important, and especially the data about the economics of the manner of construction, production or selected technical solutions, in the aspect of favourable conditions that are available for the offered for execution of the contract or in the aspect of the originality of products, services or works that the offerer has to offer. Orderer must give an appropriate deadline for response to the offered in the case described in paragraph 3 of this article. The orderer must, upon receiving the explanation, verify the significant constituent elements from paragraph 3 of this article. The ordered especially verifies the meeting of obligations that come from legal regulations regarding safety at work, employment and work conditions, environmental protection and intellectual property protection from the part of the offerers or candidates and it can require the submission of appropriate evidence.

In the Article 93:

Ordered can require from the offered some additional explanations that will help him in observation, evaluation and comparison of offers, and it is also possible to perform the control (inspection) of the offered, i.e. his subcontractor. The orderer can require a confirmation of the obligation accepted the offer from the offered selected in the process of competitive dialogue. The orderer cannot require, permit or offer the change of offer elements that are significant for the application of the criteria for assigning the contract, i.e. the change that would make an inappropriate or unacceptable offer appropriate, i.e. acceptable, unless there is a different outcome from the nature

of public procurement process. The orderer can, with agreement from the offerer, perform the corrections of errors in calculations observed when considering the offer after the offer opening procedure was ended. In case there is a difference between the unit and total price, the unit price is taken into consideration. If the offerer does not agree with the correction of errors in calculations, the orderer will refuse his offer as unacceptable.

Therefore, the legislator also observed that this manner of selection can stultify the very institution of public procurement and make the entire system non-functional! This points out that methodology (MAC) must be carefully applied in such procurements in order to prevent abuses, on one hand, and possible errors that occur in uncareful applications, on the other. In addition, and the most important thing is to provide for the public procurement system to function and provide their work without entering frequent, complicated and expensive litigations.

Problems in public procurement procedures mostly appear in: formulating, i.e. characterization of criteria for offers evaluation and implementation od the most favourable offer selection process. Definition of the criteria represents a selection of certain criteria from many possibilities, which are of great significance for a specific public procurement. The character of the criteria selected affects the determination of their mutual relations of significance.

There are cases, as it is mentioned in the introduction, where the ordered, for example is satisfied with the timely delivery of some good or service, putting the cost price to a second place, and very often the quality as well. For that reason, the procurements with the expected nearly equal offered prices and quality is realized. Then,the orderer decides for the criterion of payment conditions, and very often for the cost effectiveness. In the practice, there also appears the case where the orderers do not want to be overburdened with technical aspects, but the simplest approach „look what the others are doing" is used. Then the references are the most important criteria for selection. Here, we have listed some of the criteria, based on which we can evaluate the offers, and there can be more of them [1]- [4].

The other, not less significant, are the problems that refer to applying the models for the selection of the most favourable offer. Or, to say it better, the selection of the procedure that will imply the solution with the highest accuracy. In the practice, there are a number of practical examples of using known mathematical methods for calculation of the „value" of offers. They are based on assigning weighting values, by previously adopted criteria, for each offer submitted. Based on this, through simple mathematical procedures, the priority of alternative is presented by the number of points, and the number of points is obtained as the sum of coefficients and weighting factors for each criterion given [1,2]. In practice, we must say, methods based on experience and improvisation are used.

For that reason, in this paper, on the examples of public procurement of hydraulic devices of defined characteristics, according to the needs of a public company, by MCA method, the recommendations are given for the selection of the most favourable offer, respecting previously adopted measures and set criteria. All of this has to be in accordance with the Law on public procurement, [3], [4].

III. ONE POSSIBLE METHODOLOGY FOR PUBLIC PROCUREMENT BASED ON MULTI-CRITERIA MODEL

For the analysis and implementation of the methodology adopted, a specific and frequent problem from the practice of public companies was selected, i.e. the selection of the most favourable offer for procurement of devices and parts required for maintenance of fixed assets. There is a similar problem in other systems as well, for example construction companies, transport logistics companies etc. The idea of work is the affirmation of the application of multiple criteria decision making (MCDM) in practical problems of decision making, and particularly the method for comparing and ranking the alternatives under the name compromise ranking method. In available literature there are numerous studies on multiple-criteria decision-making; general research [6], selecting the best environment plan [7], decision making based on fuzzy information [8], solving container selection problems [9]-[11], planning and design tenders selection [12]- [16].

Methodology that could successfully be applied in public procurement is given by the following scheme:

1) Criteria are defined.
2) Values expected by the criteria would have to be precisely defined.
3) Possible deviations from values by criteria are defined (wherever possible),
4) Points given for the values expected by the criteria are defined (where the criteria are defined).
5) Decreases for values lower than expected and increases for values better than expected are defined.
6) Points given for criteria values that do not have the expected value are defined (e.g.price is one of those criteria).
7) For each offer, by the methodology given in advance, the points are calculated and the offer with the greatest number of points is chosen.
8) If several offers have the same number of points –a new ranking list is made with a smaller number of criteria (some of previously mentioned are left out) and the offer with the highest number of points is selected.

9) *If again we have several offers with the sam enumber of points, we form a new ranking list with new criteria that are left out (again it is precisely defined) and the procedure continues until we reach the most important criterion for the orderer of public procurement.*

10) *If in the end we have more than one offer with the same number of points, then we approach the selection according to the day when the offer was delivered or „pulling out of the hat".*

If there were classical decision making, based on offers obtained, by using some of the methods of multiple-criteria analysis that refer to teh procurement of hydraulic devices (pumps, hydro-engines and cylinders). Technical system should meet the thrust of 50 kW and in this case teh following criteria can be formed:

1) *Maximum strength expressed with maximum adopted work pressure (C1):*
2) *For the pressure 400 bar*   10
3) *For the pressure 350 bar*   8
4) *For the pressure 300 bar*   6
5) *For the pressure 250 bar*   4
6) *For the pressure 200 bar*   2
7) *Minimum weight of components kg/kW (C2):*
8) *(0,25 to 0,35)*   5
9) *(0,35 to 0,45)*   4
10) *(0,45 to 0,50)*   3
11) *(0,50 to 0,60)*   2
12) *(0,60 to 0,80)*   1
13) *Noise level (C3):*
14) *Barely acceptable*   1
15) *acceptable*   2
16) *good*   3
17) *very good*   4
18) *excellent*   5
19) *reliability in work and procurement price eur/kg (C4):*
20) *classical toothed program ~ 40 eur/kg*   4
21) *Piston or winged program (with no regulation) ~ 70 eur/kg*   3
22) *Piston program (with regulation) ~ 100 eur/kg*   2
23) *Deadline (C5):*
24) *15 days*   5
25) *30 days*   4
26) *45 days*   3
27) *90 days*   1
28) *Reference (C6):*
29) *Barely meet criteria*   1
30) *Satisfies and some recommend it*   2
31) *Entirely satisfies with significant recommendations 3*
32) *Entirely satisfies and majority recommends it 4*
33) *Entirely satisfies and everyone recommend it 5*

In order for the above-mentioned numeric values to serve for valuation of the offer, i.e. alternative, as orientation for orderer of public procurement and

selection of optimal spot, according to multi-criteria model, it is required to add, i.e. subtract a certain number of points for deviations from the optimal spot.

IV. CONCLUSION

The suggested methodology would be applicable similarly as a lexicographic method, but it will certainly give a better result than in the case of the lexicographic method.

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