

EXTENDED ABSTRACT

Optimization of Contractor Selection Process in Iranian Law of Tenders Utilizing VIKOR Method (Case Study: Water Industries in East Azerbaijan Province)

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1. Introduction

Contractor selection for a construction project is among the most important factors in achieving the project's success. In Iran, contractors for construction projects in public sector are mainly selected according to Tender's Law. Despite the fact that a quality assessment is implemented through a prequalification phase, however, in the final phase of the tender process, "the lowest bid price" criterion reigns and the contractor with the lowest proposed price is considered as the eligible contractor to whom the contract of the project is awarded. The prequalification phase eliminates many incompetent contractors from the competition process, but this does not lead to a considerable improvement in the quality of construction because no responsibility is established for a better performance and the winner of the contract keeps meeting the minimum requirements.

Contractor selection by the lowest tender is one of the main reasons for quality shortcomings, weak performance of the contractor, cost and time overruns, increasing in change orders and claims, conflicts, dissatisfaction of the client, increasing in life-cycle costs and other disorders and may finally lead to the project failure (Zavadskas et al., 2008, El-Sayegh et al., 2019, Hasnain and Thaheem, 2016, Scott, 2006). To overcome this, some multi-criteria decision-making methods have been proposed by many researchers. As a proposal for reforming the tenders' process in the context of Iran, in this paper, VIKOR method is used for ranking of the alternatives in which "the proposed price" criterion is added to the assessment criteria which are commonly used in the prequalification phase. An illustrative example from water industries in East Azerbaijan province confirms the applicability of the proposed method.

2. Methodology

2.1. VIKOR Method

In general, there may be no contractor who encompasses all the necessary conditions that match the client's and/or project's requirements. In these situations, a compromise solution is preferred to the optimum one that actually does not exist. On the other hand, the assessment criteria may be of conflicting nature such as "price" and "quality" and also have different dimensions. VIKOR method is a powerful method to deal with such conditions and is utilized for ranking of a set of alternatives in the presence of conflicting and/or

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incommensurable criteria. It uses a special measurement called “the closeness to the ideal solution” for ranking purpose (Opricovic and Tzeng, 2004, Opricovic and Tzeng, 2007). The proposed method in this paper utilizes the VIKOR method for ranking of the alternatives in the final phase of the contractor selection process and for this purpose, uses a set of criteria that consists of a combination of the prequalification criteria according to Tenders’ Law of Iran and “the lowest price” criterion. The performances data and scores of contractors in each criterion are determined via prequalification rules according to Tenders’ Law and for the criterion of “the lowest price”, the proposed prices of contractors are considered as their scores. The weights of the criteria are determined by decision-makers. In the case of arising any difficulties in the weighting procedure, methods based on pairwise comparisons such as AHP, BWM or other methods could be used to facilitate this process for decision-makers, but this issue is beyond the scope of this paper and is not discussed here. In Fig. 1 a comparison between the traditional and the proposed methods of contractor selection was illustrated. In this paper the results of VIKOR method were also compared to those of TOPSIS method.

2.2 Sensitivity analysis and weight stability intervals

An illustrative example was used to show the applicability of the proposed method in practice. For this aim, a past tender process in a water channel project in East Azerbaijan province was reconsidered, the proposed method was implemented and the results compared to the original tender. Different values for the weight of “the proposed price” criterion were assigned while the proportions of previously determined weights of other criteria were kept unchanged and thus, the variations in the ranking of the alternatives were detected. Furthermore, stability interval for each criterion was determined using the procedure explained in the Extended VIKOR method (Opricovic and Tzeng, 2007).

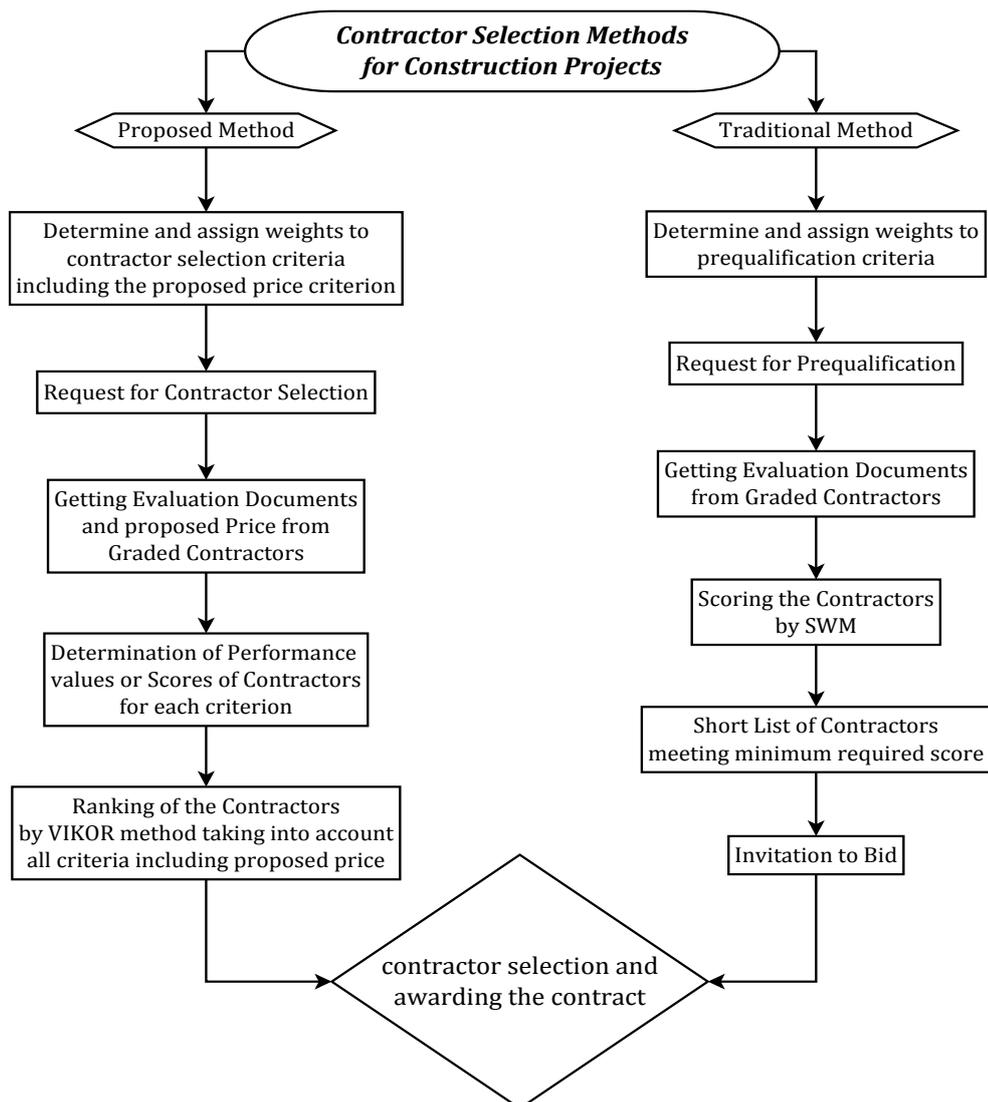


Fig. 1. Comparison between traditional and the proposed methods of contractor selection

3. Results and discussion

In the illustrative example of this paper, 4 alternatives or contractors were ranked in terms of different values of the weight of “the proposed price” criterion. The variation of the ranks among these alternatives shows that if no weight or importance was assigned to the “the proposed price” criterion, the ranking would be $A > D > B > C$. This ranking shows that alternative A has superiority over all other alternatives in terms of all criteria except “the proposed price” criterion, a fact that can be verified by comparing performance data of the four contractors. On the other hand, alternative C is the worst one in terms of the same criteria. However, if the importance of “the proposed price” criterion is elevated to about 0.65, the alternative C comes to the first rank and the ranking becomes as $C > A > D > B$. This shows that allocating too much importance to “the proposed price” criterion, may lead to the weakest contractor to be the winner of competition and awarded the contract. It is worth mentioning that in the original tender of the project that was held some years ago by following the traditional method of the Tenders’ Law, contractor C had become the winner.

In this paper two sensitivity analyses regarding stability intervals of criteria weights and the “ v ” parameter, known as the weight for the strategy of the majority of criteria in the VIKOR method were also implemented. The conformity of the results of the analyses with the performance data of alternatives, verifies the correctness of the proposed method.

4. Conclusions

In this study, a method based on multi-criteria decision-making was proposed as a transitional phase in moving from traditional method to modern methods of contractor selection in Iran. In the proposed method, the familiar criteria from the prequalification phase of tenders were used and “the proposed price” criterion was added to them to constitute a set of suitable criteria. Provided that the legal restrictions are removed, the adopted criteria may cause the least aversion among the clients and hence, the application of the proposed method may lead to more competent and more capable contractors to be surrendered the responsibility of the construction projects. The application of the proposed method in a real project as an illustrative example in this paper, verified the applicability of the method. Furthermore, it was indicated that allocating too much importance to “the proposed price” criterion may end up a weak contractor taking the responsibility of the project and hence jeopardizing the success of the project. Sensitivity analyses in the illustrated example, confirmed the validity of the proposed method. A comparison of the results between VIKOR and TOPSIS methods proved that the application of TOPSIS method may lead to the weakest alternative to be the winner of the competition in a wider range of the weight of the proposed price criterion than the application of VIKOR method.

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