

Research on Intelligent Verification Technology of Bid Evaluation Results

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Abstract. Bidding is an important procurement method. By giving full play to the advantages of bidding enterprises and carrying out open and fair competition, it has realized the effective optimization of the market economic environment and significantly improved the benefits of engineering projects. The bidding of power engineering project is to realize the fair and transparent competition among bidding units. In order to improve the standardization and fairness of bid evaluation results and solve the final control problem of power bidding, it is particularly important to do a good job in the intelligent verification of bid evaluation results. This paper mainly studies the intelligent verification technology of bidding and bid evaluation results. By studying the bidding and bid evaluation process and standards, and using information intelligent technology, this project summarizes some standard laws and models for verifying the bid evaluation results, and develops the intelligent verification tool of bid evaluation results.

Keywords: Bid evaluation results; Calibration technology; Bidding.

1. The meaning of this research

At present, bidding is an important procurement method. By giving full play to the advantages of bidding enterprises and carrying out open and fair competition, it has realized the effective optimization of the market economic environment and significantly improved the benefits of engineering projects. The bidding of power engineering project is to realize the fair and transparent competition among bidding units.

There are two kinds of general project bidding: public bidding and invited bidding. No matter which kind of bidding, the bid evaluation is a very important procedure of the project bidding, playing a significant role. So the verification of the bid evaluation results is particularly important, and it can directly influence the bidding results and even the final results of the whole project.

To improve the standardization and fairness of the bidding results and resolve the critical problem of the electric power bidding, it is very important to do a good job in intelligent verification of bid evaluation results.

2. Research status

Bidding is a form of competition and transaction in economic activities such as construction projects and sales of goods under the market economy. China began to adopt this form before its liberation, and then changed to project contracting system based on the premise of administrative distribution of tasks after the founding of New China. After the implementation of the reform and opening up in 1980s, we began to introduce the bidding mechanism into China, and put it into practice in utilizing foreign loans, importing mechanical and electrical equipment, contracting out construction projects, allocating scientific research topics, allocating export commodity quotas and so on. After 2000, the promulgation and implementation of the Bidding Law of the People's Republic of China and a series of relevant laws and regulations represent that the bidding system and management of bidding in China have entered the legal track. The nature of state-owned enterprises and public infrastructure construction in the power industry makes the power industry one of the earliest industries to use bidding for procurement. Over the past 20 years, power grid operation enterprises have increasingly used bidding methods in power engineering construction, small-scale infrastructure and office supplies procurement. Bidding not only protects the national interests and

public interests, and guarantees the competitive interests of bidders, but also improves the procurement quality of power supply enterprises, saves procurement costs, and effectively prevents corruption. Bidding is not only the requirement of national laws and regulations, but also the conscious choice of power grid operation enterprises.

The electronic power supplies are the material foundation of power engineering construction as well as the material security for the safe and stable operation of power grid, and electronic power procurement is always an important part of power grid operation enterprises. Now bidding has become a main form of electronic power procurement, and bidding and tendering has become an important operating activity of all units of national power grid enterprises as well as the focus of the management work of State Grid Corporation, which is to improve the normalization, standardization and sequencing of enterprises, promote the all-round development of workforce and develop into a world-class power grid enterprise. State Grid Corporation of China has formulated and implemented a series of management systems and methods to standardize the bidding procedures and methods, such as the Measures for Administration of Bidding of the State Grid Corporation and Bidding Management Regulations on the Administration of Tendering and Bidding of State Grid Corporation. These systems and methods has established an expert database for bidding evaluation and the evaluation system of procurement suppliers, actively promoted the bidding agency mechanism, and established a supervision system and legal safeguard mechanism for company's bidding activities. In brief, the power grid operation enterprises have initially established the management system for bidding and purchasing of electronic power supplies.

3. Research content

According to the preset bid evaluation rules, the intelligent verification of bid evaluation results can import bidders' response information, and the system will automatically judge whether the response data meets the requirements of the bidding documents. If one item does not meet the requirements, the system will automatically conduct a preliminary evaluation and reject the bid; and for bidders who enter the detailed evaluation stage, the system will automatically score their response data according to the preset quantitative scoring rules. The system can also compare its evaluation result with that of the ECP system to determine the accuracy of the bid evaluation results.

The main functions of intelligent verification tool for bid evaluation results include:

(1) Data input and batch information maintenance

The intelligent verification toll supports to import standard file format of ECP systems, including bid opening status, technical and business score, price score table, total score sorting and other data. It can import these data according to bidding projects and store them uniformly, providing data sources for subsequent data calculation and verification.

It supports to add and edit the basic information of bidding project batches, and provides basic information for subsequent data calculation and verification. Batch information maintenance includes basic project information, sub-bid classification setting, sub-bid weight setting, price formula setting and so on.

(2) Verification of experts' scoring differences

It supports the verification of the experts' scoring differences in different dimensions.

When verifying the statistical tables of technical and business scoring (expert dimension), it can check the error deviation from the average score and give early warning when there are low scores (below 60 points), full scores (100 points), and errors in scoring statistical tables caused by the lack of initialization of technology and business.

The evaluation scoring table is verified according to the scores of groups (individual experts) and scoring statistical tables (expert dimensions).

The business scoring statistical table (expert dimension), technical scoring statistical table (expert dimension), price scoring table are verified according to the total score sorting table.

(3) Calculation and verification of price points

It supports to establish a price formula library, which can calculate the imported bid opening list, statistical table about bidders who don't enter the detailed evaluation and price scoring table according to different formulas and verify them with the results of this platform.

Take the interval compound average price method as an example:

M: the number of bidders entering the detailed evaluation

a. if $M < 10$, no quotation will be removed.

b. If $10 \leq M < 20$, then one highest bid evaluation price and one lowest bid evaluation price will be removed, and if the highest or lowest bid evaluation price is tied in the same package, only one of the highest or lowest bid evaluation prices will be removed when calculating the benchmark price, and so on.

c. If $20 \leq M < 30$, then two highest bid evaluation prices and one lowest bid evaluation price will be removed.

d. If $30 \leq M$, then three highest bid evaluation prices and two lowest bid evaluation prices will be removed.

Then it will calculate the arithmetic average value A1 of the bid evaluation prices of the remaining bidders (N); after that, it will reject (only for calculating the average value, not for rejecting the bid) quotations of bidders whose deviation between the bid evaluation price and the arithmetic average value A1 exceeds $[-20\%, 10\%]$, and then calculate the arithmetic average value A2 of the bid evaluation price of the remaining bidders (P) after the rejection; finally, it will calculate the arithmetic average value A3 of the lowest bid evaluation price among the P bidders and A2, and take A3 as the benchmark price; if there are N bid evaluation prices outside the arithmetic average A1 $[-20\%, 10\%]$ interval, then the arithmetic average A4 of the bid evaluation prices of all bidders (M) entering the detailed evaluation shall be taken as the benchmark price. The partial price score = $100 - 100 \times n \times m \times | \text{bidder's total bid evaluation price} - \text{benchmark price} | / \text{benchmark price}$; when the total bid evaluation price of the bidder $\geq$ the benchmark price, then $m=1$; when the total bid evaluation price of the bidder $<$ the benchmark price, then $m = [0.3, 0.8]$; when part of the calculated price score < 0 , then it will be counted as 0.

(4) Offline award and verification

It supports to establish a principle library of the award of bid, which can automatically analyze the bid-section data according to the award principle, and get award results and verification results accordingly. It also supports the summary and analysis of the award results, providing a basis for subsequent analysis of bidding strategy and research for the strategy before bid evaluation.

At present, the main evaluation methods are comprehensive evaluation method and the evaluated lowest bid price method. General goods with low degree of standardization and poor technical versatility and comparability are more suitable for the comprehensive evaluation method, while materials with higher degree of standardization and general technical and performance standards are more suitable for the evaluated lowest bid price method.

The comprehensive scoring method takes the technology, price and business into consideration. According to the weight of each item explicitly stated in the bidding documents, as well as the technical and commercial bid evaluation rules and price calculation methods, the bid evaluation committee will conduct comprehensive score according to the evaluation rules, form a ranking table by statistical summary, and recommend the winning candidates according to the public recommendation rules. According to the different categories of procuring goods, companies and their directly affiliated units will change their weight of business index, and accordingly, the price weight will also be changed.

The lowest bid price method is a method of evaluating bids based on price and other factors, and it can also be considered as an evaluated lowest bid price method that was expanded. Generally speaking, when taking this bid evaluation method into practice, with the tender offer as the base, we can quantify other factors (including both commercial factors and technical factors) other than quotation, and convert these factors into prices in currency. And then we can add or subtract these

prices to the bid price, which is formed into the bid evaluation price, and we can take the bid with the lowest bid evaluation price as the winning bid.

(6) Document report export and tender selection

It supports to export relevant forms and documents such as the records of bid opening, statistical tables of bidders who don't enter the detailed evaluation, the preliminary assessment of technology and business, multi-round receiving records, multi-round quotation tables, statistical tables of technology and business score, comprehensive ranking tables, tables of recommended bidding candidates, bidding result and so on.

The technical and commercial team is responsible for the bid section and they will classify electronic bidding documents; and it can select these electronic bidding documents according to the combination of the bidding results and the project units.

(7) The evaluation model based on the TOPSIS

1. It can standardize indexes at different levels. Based on the established evaluation index system of bidding documents, all indexes are divided into beneficial index and cost-based index according to their different attributes. Meanwhile, all indexes are standardized according to their types.

2. Tenderers and experts give weight to each index through Analytic Hierarchy Process(AHP), so as to get the standard weights.

3. Whether tenderers can participate in the bid evaluation process depends on the nature of the project. From the scores of evaluation participants, we can get the scores of each bidding document, and then we can normalize these scores, and then we can substitute the processed score matrix and the weight of each index into the TOPSIS model to solve. Thus, we get the TOPSIS project evaluation model based on AHP weight. Then, we can calculate the weighted Euclidean distance from the project to the positive ideal scheme and the negative ideal scheme according to the model. Finally, we can calculate the close degree of each evaluation scheme to the ideal scheme, by which we can get the ranking of the advantages and disadvantages of each bidding scheme, and then select the best contractor.

Analytic Hierarchy Process (AHP) is a multi-objective evaluation method combining qualitative and quantitative analysis. This method uses the basic principles of behavioral science to quantify the decision-maker's experience judgment. It is a very practical evaluation method when the evaluation object has complex target structure but lacks necessary data. The basic idea is to take the complex problems to be studied as a large system, and then analyze the factors affecting the operation effect of the system. After that, these factors will be arranged in an orderly hierarchy according to their mutual relations, and then, every expert will objectively and fairly judge every influencing factor at the same level. In this way, we can get the quantitative expression of the relative importance of each evaluation index, and then establish the analytic hierarchy model.

By calculating, we can get the weight of the relative importance of the influencing factors of each layer. Finally, we can make single hierarchy ranking and total hierarchy ranking according to the weight, and take the ranking results as the basis of management decision analysis.

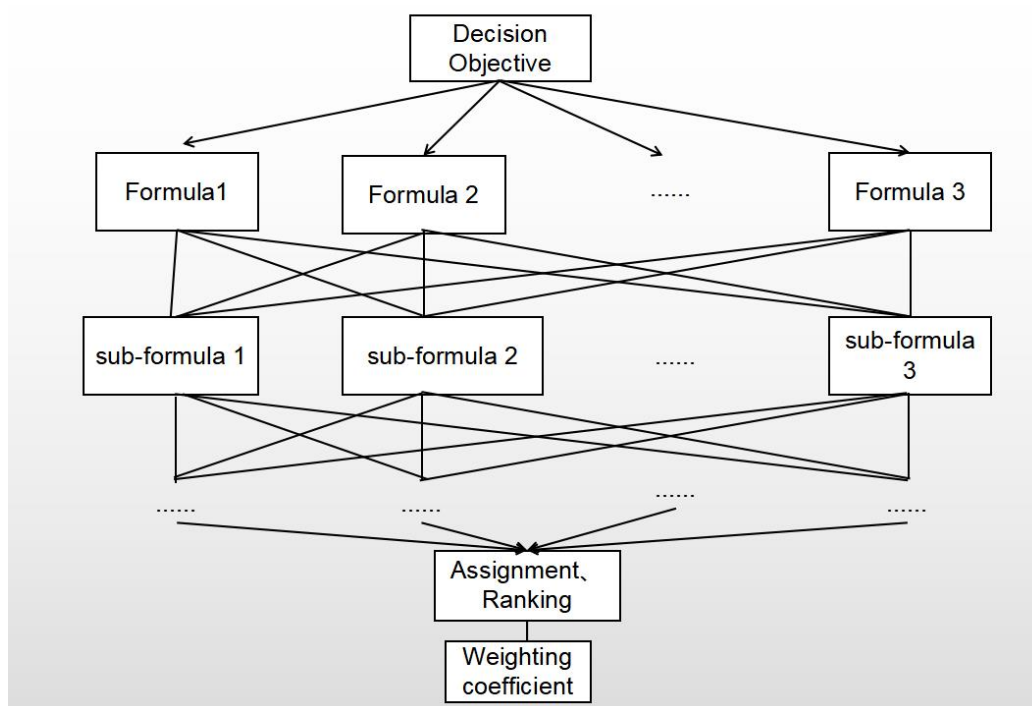


Fig 1. Analytic Hierarchy Process

4. The conclusion

As electricity supplies are in great demand and in a wide range, and its price is relatively high. It is beneficial to establish a scientific, advanced, reasonable, legal and operable bid evaluation method and a fair, equitable, scientific and merit-based bid evaluation process, which is beneficial to ensure the quality of bidding projects, reduce costs, improve economic benefits and make the bidding activities develop in a standardized and orderly direction.

The research and application of the intelligent verification technology for bid evaluation results can greatly improve the bid evaluation quality and ensure the bid evaluation results. In the continuous application, it can develop a virtuous circle of collecting, using and updating various cost information, and improve the efficiency of the whole bidding management of electric power materials. In the future, we will continue the improvement and research of the intelligent verification tool of bid evaluation results, which can better serve the bidding of materials.

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