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Do Greater Qualifications Imply Higher Bid Costs?

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This study examines the conventional assumption that higher qualifications in A/E consultants or contractors correspond to higher bid costs in the procurement process in construction. By analyzing data from 327 projects across the United States and Canada, encompassing architectural/engineering design and construction projects, including both design-bid-build and alternative delivery methods, the research focused on bid costs and three key qualification-based evaluation criteria: technical proposals, past performance, and interviews. Contrary to common perceptions, the findings, assessed using Spearman's rank correlation and frequency analysis, revealed no significant correlation between higher qualifications and higher bid costs. This finding carries implications for project owners, contractors, and policymakers, suggesting a reconsideration of the emphasis on bid costs alone in the selection process. The study advocates a more detailed approach, considering qualifications alongside bid costs for enhanced project outcomes and collaboration in the construction industry.

Keywords: Procurement, Best-Value, Qualification-Based Selection, Alternative Project Delivery, Bid Cost, Evaluation Criteria

Introduction

The U.S. construction industry's traditional reliance on Design-Bid-Build (DBB) methods and low-bid procurement for contractor selection has faced increasing scrutiny (El Asmar *et al*., 2010). Seeking enhanced project performance, owners are increasingly turning to alternative delivery methods like Design-Build (DB) and Construction Manager at Risk (CMAR) (El Asmar *et al*., 2016). This shift underscores the need for more robust evaluation criteria, leading to the adoption of Qualifications-Based Selection (QBS) and Best-Value (BV) approaches, particularly when project specifications are incomplete (Chini *et al*., 2018).

Extensive research highlights the benefits of considering qualifications alongside cost. Studies consistently demonstrate a positive correlation between multi-criteria evaluation and improved project outcomes. In response, BV procurement has gained traction, offering a systematic approach to balancing contractor qualifications with cost proposals, unlike the traditional focus on the lowest bid.

However, a critical question remains: within BV procurement, do higher contractor qualifications in the Architectural, Engineering, and Construction (AEC) industry inevitably lead to higher proposed project costs? Understanding this relationship is crucial for owners seeking to optimize project outcomes while navigating the inherent trade-offs between cost and quality.

This study delves into this essential question by analyzing 1572 proposals across 327 projects. We examine the evaluation characteristics of selected bidders and assess the relationships between their bid costs and qualification-based criteria. This research aims to advance our understanding of BV procurement's effectiveness in achieving project objectives by illuminating the influence of cost evaluations on selection outcomes.

Literature Review

Despite its shortcomings, low-bid procurement has historically been the dominant method for selecting construction contractors in the United States. The approach often results in the selection of contractors with unrealistically low bids, leading to issues such as change orders, schedule delays, and disputes during the construction phase (Ioannou & Awwad, 2010; Rosenfeld, 2014). Owners, particularly for complex projects, are increasingly wary of low-bid procurement and are turning to qualifications-based evaluation criteria such as the best-value procurement method to achieve better outcomes in terms of cost, time, and quality (Yu *et al*., 2013).

Past research emphasizes the necessity of a comprehensive approach to contractor selection, recognizing the significance of multiple factors beyond bid cost. Multicriteria decision-making, described by Chaphalkar and Shirke (2013) as a sophisticated tool in operations research, holds promise in evaluating various contractor qualifications alongside cost to identify the most advantageous proposal for a project (Balubaid and Alamoudi, 2015).

This paradigm shift is evident in the growing popularity of alternative contracting methods like Design-Build (DB) and Construction Manager at Risk (CMAR). These methods often leverage BV and qualifications-based selection (QBS), recognizing the value of considering factors beyond bid price alone. The Associated General Contractors of America (AGC) and the National Association of State Facilities Administrators (NASFA) define BV procurement as a process that integrates subjective considerations with bid prices, aiming for the most beneficial offer (AGC and NASFA, 2008). While QBS focuses solely on contractor qualifications, experience, and past performance, excluding price (Molenaar et al., 2009), BV integrates both bid costs and qualification factors in a weighted evaluation process.

This shift is supported by extensive research demonstrating the positive outcomes associated with BV procurement. Perrenoud *et al*. (2017) observed that BV-selected contractors with higher qualification scores exhibited superior project performance in areas like risk management, professionalism, quality, and owner satisfaction. Similarly, El Wardani *et al*. (2006) found that more qualified contractors chosen through BV processes in DB projects experienced lower schedule growth compared to those selected through other methods. This trend is further corroborated by Tran *et al*.'s (2016) study, which revealed improved project performance and reduced risk impacts in BV-procured DBB highway projects.

However, this growing emphasis on multi-criteria selection methods like BV presents owners with the challenge of balancing cost considerations with the need for qualified contractors. While research emphasizes the benefits of BV procurement, there remains a gap in understanding the effectiveness of

various evaluation criteria in differentiating amongst competing bidders within these alternative methods (Gransberg and Shane, 2015).

This is where this study enters the scene. This research aims to explore the relationship between contractor qualifications and proposed costs within BV procurement. Specifically, the study investigated whether the A/E consultant or contractor's qualifications correlate with the proposed cost as per the common assumptions by owners (Kashiwagi and Savicky, 2003). In essence, we ask: should owners anticipate higher cost proposals when selecting contractors with exceptionally strong qualifications compared to those with moderately strong or weaker qualifications? By addressing this critical research gap, we hope to provide valuable insights that can inform effective procurement strategies and optimize project outcomes in the era of BV-driven construction practices.

Research Methodology

Data Collection: Procurement information was collected from 327 Best-Value procured projects in the United States and Canada, including design and construction projects. 110 were architectural/engineering projects, 175 of the projects were design-bid-build, and the remaining 42 were executed using alternative project delivery methods (CMAR, CM as Agent, and Design-Build).

The following project records were collected for each project in the data set, which includes the project RFP, as well as the bid costs and qualification-based criteria which were used for the owner's evaluation of all competing bidders. The final data set consisted of 372 projects and 1572 competing bidders. Furthermore, all projects in the data sample used identical BV procurement procedures, including identical evaluation criteria, similar weighting schemes, and consistent evaluation scoring procedures in the owners' RFPs.

Evaluation Criteria: This study focused on four common evaluation criteria: bid cost, technical proposal, past performance information, and interviews Scores for each of these criteria were based on a scale of 0–100, with 0 denoting the lowest score possible.

- **Bid Cost:** The bid cost was evaluated based on the lowest bid. The bidder with the lowest cost was assigned an evaluation score of 100; the other bidders were rated using inverse linear proportions. The evaluation weights for the bid costs for all competing bidders were normalized on a per-project basis as the percentage relative to the average bid to achieve proportionality across all projects, preventing projects with larger bid costs from impacting the analysis. Normalization was necessary to compare cost proposals with other evaluation criteria, which otherwise would have been very difficult to compare due to inconsistent units (higher and lower volume projects and shorter and longer projects).
  The bid cost as a percentage of the average bid [percentage average (% Avg.)] for each project was calculated using the following formula:
  Cost (% Average) = (Average bid of the project - The proposed cost of the bidder)/ (Average bid of the project)
- **Technical Proposal**. Each bidder's technical proposal consisted of a brief written summary of the proposed execution plan, including the means and methods, potential project risks, and value engineering options. The evaluation team was responsible for scoring the technical proposal as part of the procurement process.

- **Past Performance Information:** Past performance regarded the bidders' previous experience with similar projects and clients. For this study, past performance was evaluated in terms of previous clients' satisfaction with the bidders.
- **Interview:** Interviews were conducted with key personnel in each short-listed bidder's proposed project team. Typically, the shortlists included the top three to five bidders. The evaluation team was responsible for scoring interviews for the procurement process.

Method of Analysis

The method of analysis considered for this study was based on the following research questions, considering the relationship between bid costs and the qualifications of competing consultants and contractors as shown below:

Research Question 1: There's a common perception that higher qualifications often lead to higher costs. To validate this perception, it is crucial to explore the potential relationship between qualifications and bid prices in the context of competing A/E consultants and contractors.

- Do higher qualifications, resulting from evaluating qualification-based criteria among competing A/E consultants and contractors, correspond with higher bid proposals?
- ***Null Hypothesis ($H1_0$):*** There is no relationship and statistically significant positive correlation between the qualifications of A/E consultants and contractors and the bid costs they propose.
- ***Alternative Hypothesis 1 ($H1_1$):*** There is a relationship and statistically significant positive correlation between the qualifications of A/E consultants and contractors and the bid costs they propose.

Research Question 2: When comparing the best-value procurement process to the low-bid procurement process, it is anticipated that the contract value would generally be higher due to the inclusion of qualifications in the evaluation and selection process. Therefore, it is imperative to explore the selection outcomes for chosen contractors by assessing how frequently they emerge as the lowest bidder. This analysis aims to determine the chances of the selected bidder being the one with the lowest bid cost from the 327 projects.

- To what extent does the inclusion of qualifications in the best-value procurement process influence the likelihood of selected contractors emerging as the lowest bidder compared to the low-bid procurement process?

Spearman's Rank Correlation Between Bid Costs and Qualifications-Based Criteria Scores

Spearman's rank correlation is a non-parametric correlation statistic tool that assesses the relationship and association between two variables, which can be either continuous or ordinal. To address the first research question and its corresponding hypothesis, the relationship between the bid cost proposed by each A/E consultant and contractor and their evaluation scores for each qualifications-based criterion,

which includes Technical Proposal, Past Performance information, and Interview was investigated. This statistical tool was employed instead of Pearson correlation because the data did not follow a normal distribution, as confirmed by both the Shapiro-Wilk and Kolmogorov-Smirnov tests for normality. The detailed findings from this analysis are discussed in subsequent sections.

Descriptive Analysis and Outcomes of the Selected Bidders

Descriptive statistics were used to analyze 327 projects to investigate the second research question. The evaluation scores for all projects were reviewed to identify how frequently the selected bidder emerged as the lowest bidder and best-qualified (best-value) bidder. This analysis consisted of frequency in percentage of selected low bidders and best-qualified bidders for all projects. Low bidders referred to selected A/E consultants and contractors who had bid the lowest cost among all competing bidders on a per-project basis. Similarly, best-qualified bidders referred to consultants and contractors who were best in qualification and were selected.

Results And Discussion

Relationship Between Bid Costs and Qualifications Criteria

The *p*-values obtained from both the Shapiro-Wilk and Kolmogorov-Smirnov tests indicated that the datasets for bid costs and qualifications, collected from the competing A/E consultants and contractors, did not follow a normal distribution. Specifically, all the p-values were found to be below the common significance threshold of 0.05, suggesting that these datasets exhibit skewness and non-normal distribution patterns (Mishra *et al*., 2019). This finding aligns with a critical assumption essential for opting not to employ Pearson correlation as a measure to assess the relationship and strength of association between bid costs and qualifications. Spearman correlation was chosen over the Pearson correlation due to its independence from the assumption of data normality.

Spearman correlation analysis was conducted to investigate the relationship between bid costs and the qualifications of bidders. Upon examining the datasets, the results from Spearman's rank correlation analysis indicated a lack of a direct relationship between bid costs and the qualifications of each of the competing bidders, as shown in Table 1. Specifically, the correlation coefficients between bid costs and Technical Proposal, as well as bid costs and Past Project Information, were calculated as $r = 0.026$ and $r = 0.033$, respectively, with no statistical significance observed. Although a statistically significant negative correlation was identified between bid costs and interviews, the coefficient value of -0.138 ($p < 0.01$) indicated a low correlation strength, rendering the association between bid costs and interviews negligible (Dancey and Reidy, 2007).

To enhance the robustness of the findings, the bid costs and qualifications of the selected bidders (327) were further investigated using normalized bid costs and raw qualification-based evaluation scores. As shown in Table 2, the correlation coefficients between cost and qualifications were $r= 0.264$, $p<0.01$ (technical proposal), $r=0.028$ (past project information), and $r=0.033$ (interview). The correlation coefficients between bid costs and past project information, and interviews were low and implied a poor association between bid costs and past project information, as well as bid costs and interviews (Chan, 2003). The results revealed high statistical significance in the relationship between bid costs and technical proposals; however, the low value of the correlation coefficient makes the association of insignificance.

The outcomes of these analyses further substantiate the earlier findings, confirming the absence of any discernible relationship between bid costs and the qualifications of A/E consultants and contractors. Hence, the alternative hypothesis, $H1_1$ indicating that higher qualifications of A/E consultants and contractors correspond to higher bid costs was rejected and the null hypothesis was retained.

Table 1: Spearman's Correlation of All Evaluation Criteria for All Competing Bidders

Evaluation Criteria	Cost	Technical Proposal	Past Performance Information	Interview
Cost	1	-	-	-
Technical Proposal	0.026	1	-	-
Past Performance Information	0.033	0.127**	1	
Interview	-0.138**	0.467**	0.115**	1

**Significant at the 0.01 level (2-tailed)

Table 2: Spearman's Correlation of All Evaluation Criteria for the Selected Bidders

Evaluation Criteria	Cost	Technical Proposal	Past Performance Information	Interview
Cost	1	-	-	-
Technical Proposal	0.264**	1	-	-
Past Performance Information	0.028	0.167**	1	
Interview	0.033	0.198**	0.093	1

**Significant at the 0.01 level (2-tailed)

Frequencies of Lowest Bid Cost Achieved by Selected Bidders

This section delves into the frequency with which the selected (best-value) bidder attained the lowest bid cost across the 327 projects. The results are comprehensively outlined in Table 3, which offers the frequency and count of the selected bidders in terms of cost and combination of all the qualifications-based evaluation criteria. Particularly, almost two-thirds of the selected proposers consistently secured either the first or second position in both cost proposals and qualifications.

Table 4 illustrates the selection outcomes for the 327 projects. 62% of the selected bidders secured the top two positions in both the bid cost and qualifications criteria. This percentage is calculated as the sum of 28.75% (first place in bid cost and qualifications), 11.93% (second place in bid cost and first place in qualifications), 15.29% (second place in bid cost and first place in qualifications), and 6.12% (first place in bid cost and second place in qualifications).

Table 3: Ranking Analysis for the Selected Bidders (n = 327)

	Qualifications				
Bid Cost	1st	2nd	3rd	>3rd	Total
1st	94	39	11	7	151
2nd	50	20	6	5	81
3rd	31	5	6	5	47
> 3rd	34	7	2	5	48
Total	209	71	25	22	327

Table 4: Ranking Analysis for the Selected Bidders in Percentage

	Qualifications

Bid Cost	1st (%)	2nd (%)	3rd (%)	>3rd (%)	Total (%)
1st	28.75	11.93	3.36	2.14	46.18
2nd	15.29	6.12	1.83	1.53	24.77
3rd	9.48	1.53	1.83	1.53	14.37
> 3rd	10.40	2.14	0.61	1.53	14.68
Total	63.91	21.71	7.65	6.73	100.00

Practical Implications for Industry

This study revealed no evidence that higher qualifications in A/E consultants or contractors necessarily translate to higher bid costs, as against the general perception (Yu *et al*., 2013). This finding holds significant practical implications for various stakeholders, providing a perspective that can improve industry practices.

For project owners, this finding prompts a reassessment of perspectives during the bidding and procurement phases. Understanding that higher qualifications do not correspond to higher bid costs allows client representatives and owners to make more informed decisions. The combination of competitive bid costs and enhanced expertise efficient project execution by these professionals.

The analysis of the 327 projects revealed that best-value bidders secured the lowest cost proposals with high qualifications in approximately 29% of cases, and they placed among the top two in cost and qualifications nearly 62% of the time. This aligns with research by Gaikwad *et al.* (2019), who found that 82% of 250 best-value projects awarded contracts to the lowest bidders. This consistency highlights the potential for best-value procurement to achieve both competitive costs and high expertise during selection.

This balance between cost and qualifications in best-value procurement can be attributed to the cost-effectiveness advantages brought by highly qualified A/E consultants and contractors through pre- and post-construction phases. They leverage their experience and technical expertise to streamline project execution, minimizing construction costs and reducing variations that could lead to cost escalations and change orders. Therefore, prioritizing qualifications alongside bid costs becomes crucial for effective consultant and contractor selection, ultimately leading to improved project outcomes.

Relying solely on the lowest bid cost approach may stifle innovation, directing focus towards cost rather than quality. This shift in emphasis can lead to reduced owner and client satisfaction (Pinto-Nunez *et al*., 2018). The study's findings align with Gransbery's (2020) research, highlighting the importance of best-value procurement. Clients associating better qualifications with higher bid costs might compromise long-term satisfaction for short-term procurement convenience, as offered by the low-bid approach (AGC and NASFA, 2008).

With alternative project delivery methods gaining prominence, clients should not forgo the benefits of a procurement system that includes qualifications-based evaluation criteria due to perceived higher bid costs. Project delivery methods like Progressive design-build (PDB) and Construction Manager at Risk (CMAR), emphasizing collaboration and team building, require departure from the low-bid process. This approach offers a less formal framework for team building, encouraging collaboration based on expertise and qualifications rather than strict cost considerations (MDOT, 2021). Given the inherently collaborative nature of construction projects, this approach can foster better working relationships and, ultimately, contribute to successful project outcomes.

Conclusion

As procurement processes that consider qualification continue to gain traction, it is important to clarify if the inclusion of qualifications in the evaluation can impact on cost proposals. This study sheds light on the perceived relationship between the qualifications of A/E consultants and contractors and their corresponding bid costs. Contrary to conventional perception, the findings reveal that higher qualifications do not necessarily translate into higher bid costs. The study's extensive analysis, encompassing 327 projects in the United States and Canada, demonstrates that the inclusion of qualifications in the procurement process can lead to more informed decision-making for project owners, contractors, and policymakers. Emphasizing the importance of considering qualifications alongside bid costs is crucial for effective consultant and contractor selection, ultimately contributing to improved project outcomes.

Limitations And Recommendations for Future Study

While this study provides valuable insights, it is essential to acknowledge its limitations for a comprehensive understanding. The geographical focus on the United States and Canada may limit the generalizability of findings internationally. Future research should include projects from diverse regions to ensure broader applicability. The study concentrated on specific evaluation criteria, potentially neglecting other influential factors in bid costs and qualifications. Future research should explore a broader range of criteria for a more holistic view.

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