IMPLEMENTING BEST-VALUE PROCUREMENT FOR DESIGN-BID-BUILD HIGHWAY PROJECTS

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ABSTRACT

State departments of transportation (DOTs) have typically used low-bid procurement to deliver design-bid-build (D-B-B) highway projects. While low-bid procurement has provided predictable results for state DOTs, it does not always result in the best performance during and after construction. Thus, state DOTs are increasingly using alternative methods such as best-value procurement to assure project quality and enhance project performance. In essence, best-value procurement incorporates price with other factors to achieve specific project goals. Compared to low-bid procurement, best-value procurement offers several advantages that can include opportunities to improve project quality, promote innovation, and enhance project performance. To date with a couple of exception, state DOTs have only used best-value procurement for design-build (D-B) projects. This paper explores the procedures and existing practices for implementing best-value procurement in D-B-B project delivery. Data were collected from a literature review, a survey questionnaire, and case studies. Three best-value D-B-B projects from Michigan, New York State, and Oregon DOTs are presented. The research results showed that the use of best-value procurement for D-B-B project delivery can provide other benefits to state DOTs in addition to what was found in the literature such as emphasizing non-price factors that align with project objectives, reducing risk and saving cost.

INTRODUCTION

State departments of transportation (DOTs) have historically used a low-bid approach to procure traditional design-bid-build (D-B-B) projects. Under the low-bid approach, price is a sole competitive factor. Non-price factors such as qualifications, experience, technical approaches, and innovative solutions are not considered. Typically, state DOTs award a contract based on the lowest responsive bid. Research has identified several advantages of using low-bid procurement including: potential for monetary savings (*1*), easy and simple implementation, reduced protests and disputes (*2*), a long-standing legal precedence and enhanced competition (*3*), and a transparent selection process (*4*). However, low-bid procurement does not always offer the best performance during and after construction. Because past performance is not a factor in low-bid awards, contractors with a record of delivering high quality projects are less likely to be awarded the contracts in low-bid contracting (*5*, *6*). In the words of one author, this creates a situation where the agency is in effect subsidizing marginal performance, which in turn reduces the incentive for excellent performers to continue their superior performance (*6*). As a result, a number of DOTs are increasingly using best-value procurements.

In contrast to the traditional low-bid procurement, best value aims at enhancing the long-term performance through selecting the contractor with an offer most advantageous to the owner when selection factors other than price are also considered (*3*). These other factors may include items such as technical solutions, managerial merits, financial health, and past performance. Time, cost, image, aesthetics/appearance, operation and maintenance, managerial safety, and environment aspects can also be relevant factors in best-value procurements depending upon unique project goals (*7*, *8*). Best-value procurement places emphasizes on efficiency and effectiveness, quality, value of money, and performance standards (*9*). The core benefits of using best-value procurement are twofold. First it requires the contractor to develop detailed project and procurement plans in the early phase of the project development process. Second, it necessitates procurement solicitations that encompass accurate selection criteria and rating systems (*7*). Research has shown that the main goal of using best-value procurement for transportation projects is to select the contractor who has the optimum combination of price and technical capabilities (*10*). Molenaar and Johnson (*10*) stated that "When used correctly, a best-value selection rewards those who propose innovative concepts that enhance product quality or lower the price for providing quality. When used incorrectly, owners may introduce inappropriate biases into the selection process or add cost to the procurement."

National Cooperative Highway Research Program (NCHRP) Project 10-61, "Best-Value Procurement Methods for Highway Construction Projects," developed best-value framework that has been referred to by most state DOTs who are implementing their best-value procurement (*3*). Figure 1 presents the best-value concept at an operational level. The overall process includes four distinct concepts: best-value parameters; evaluation criteria; evaluation rating systems; and award algorithms. The interpretation and recommendations for applying these concepts were presented in detail in NCHRP Report 561 (*3*).

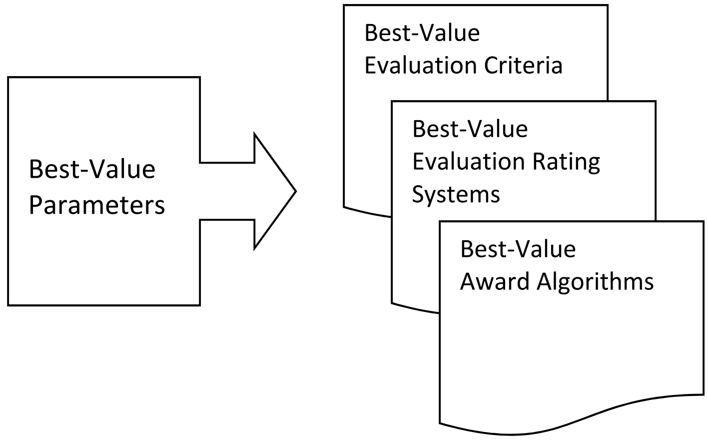

FIGURE 1 Best-value concepts (Adapted from NCHRP Report 561)

It is important to note that although best-value procurement is increasingly in use for highway projects, it is most frequently applied in conjunction with design-build (D-B) project delivery. A comprehensive review of literature found that while a number of guidance documents are available for implementing best-value procurement on D-B projects, limited guidance is available for the use of best value on traditional D-B-B highway projects. Minnesota DOT's manual for the best-value procurement published in 2013 is perhaps the only document explicitly addressing the application of best-value procurement on D-B-B project delivery (*11*). The Minnesota DOT manual provides a concise approach for implementation, but it also indicates that future research is needed to expand the D-B-B best-value approach (*11*).

Building upon relevant literature, the objective of this paper is to examine how to apply best-value procurement in highway D-B-B project delivery. The following sections provide background, present the study methodology, and discuss the research results and findings in detail.

BEST-VALUE LEGISLATION AND REGULATORY FRAMEWORK

Legislation and regulations for public sector construction at the federal and state levels are moving towards greater use of contracting approaches to achieve the "best-value" for dollars expended. In some cases, particularly at the state level, statutes specifically address the use of best-value selection in conjunction with competitive sealed bidding. The Federal Acquisition Regulation (FAR), Part 15: Contracting by Negotiation, sets forth best-value concepts under a competitive acquisition (*12*). Best-value under the source selection process might entail the selection of the lowest-priced technically acceptable proposals or it may consist of a trade-off between price and other factors, resulting in the section of a proposal without the lowest price.

Many federal and state agencies have implemented various source selection methods and have developed instructions or procedures for development and implementation of these methods. At the federal level, the U.S. Postal Service, the Army, the Navy, the Department of Veterans Affairs, and the Federal Bureau of Prisons have developed procedures and guidelines for source selection contracting applicable to their construction programs (*13*). Though federal legislation has not explicitly directed the use of best-value for highway construction, the Federal Highway Administration (FHWA) has for many years allowed alternative procurements using best-value concepts embedded in trial or experimental contracting methods for selected highway projects through its Special Experimental Project (SEP-14) initiative. For example, *Title 23 U.S.C. 112(b)(3)* provides the FHWAs statutory requirements for the design-build project delivery method in which best-value selection is allowed to select the most appropriate contractor.

At the state level, various statutes have addressed best-value under both competitive sealed bidding and alternative contracting for public works contracts. Statutes addressing best-value in the context of competitive bidding are of particular interest for this research. Minnesota enacted a law that enables public agencies to select proposers based on best-value in 2007. This legislation includes: "Any personnel administering procurement procedures for a user of best-value procurement, or any consultant retained by a local unit of government to prepare or evaluate solicitation documents must be trained, either by the department or through other training, in the request for proposals process used for best-value contracting for construction projects" (*11*). It is noted that this best-value authority does not extend to D-B contracting. Minnesota DOT's authority for D-B best value contracting is provided in separate state statutes 161.3410 through 161.3428 (*11*).

The Delaware Code (29 Del. C § 6962) allows the use of best-value procurement for large public works contracts in conjunction with a determination of responsiveness through pre-qualification. In Delaware if an agency elects to award based on best-value, the agency must first determine that the successful bidder is responsive and responsible. The determination of best-value is then based upon objective criteria that have been communicated to the bidders in the invitation to bid. Objective criteria are assigned a weight consistent with the following: (1) price must be at least 70% but no more than 90% and (2) schedule must be at least 10% but no more than 30%.

Similarly, many other state DOTs allow the use of best-value procurement for their transportation projects. Through a national survey conducted in 2014, NCHRP Synthesis 471, "Practices for Developing Transparent Best Value Selection Procedures," reported that 24 state DOTs have best-value legislation. However, it is important to note that some best-value legislation is specific to the highway sector while other legislation is more general for all state construction projects. In fact, much of the best-value legislation reported in NCHRP Synthesis 471 was tied to D-B project delivery (*4*). For traditional D-B-B projects, state DOTs are required to submit their work plan for FHWA SEP 14 approval of using best-value procurement.

RESEARCH APPROACH

The research approach included three primary tasks:

1. Conducting a literature review—synthesizing existing documentation related to best-value procurement;
2. Performing data collection—gathering information on current practice and identifying agencies that warrant additional investigation using a survey questionnaire and communication with state DOT representatives; and
3. Conducting case studies—empirically investigating, analyzing and verifying the results and conclusions. The following sections describe these tasks in detail.

Literature Review

The research team conducted a comprehensive literature review of related best-value documents. The goal of this effort was twofold. The research team searched academic literature, industry publications, state DOT websites, and government reports to find the most current trends and practices in best-value procurement. Additionally, the team searched archival information to describe the origins of best-value procurement and how it has evolved into the current state-of-practice. The literature review was conducted by using TRB Transportation Research Information Systems, general internet search engines, academic databases, ASCE civil engineering database, and the FHWA research library.

As previously mentioned, while a number of best-value documents are available for state DOTs to implement best-value for the D-B delivery method, there is a limited availability on the use of best-value procurement for traditional D-B-B projects. To better understand the opportunity of implementing best-value in conjunction with the D-B-B delivery method, the research team conducted a national survey of state DOTs.

Data collection

The research team developed a questionnaire based on the finding from the literature review and conducted a survey of state DOTs. The questionnaire was developed base on the principles suggested by Oppenheim (*14*). The survey questionnaire was distributed in a web-based form to the members of the AASHTO Subcommittee on Construction and the AASHTO Subcommittee on Design in all 50 states, the District of Columbia, and Puerto Rico. The committee members were asked to forward the survey to the person best qualified to respond from an overall departmental basis. After two follow-up requests, the research team received responses from 46 state DOTs (88% response rate). It is important to note that the survey questionnaire asked the participants to describe not only their state of practice related to the best-value D-B-B approach, but their perception regarding the use of best-value procurement for D-B-B projects.

The survey results indicated that 19 state DOTs currently use, or are able to use, best-value with D-B-B delivery. Based on these responses, the research team contacted the representative of these 19 state DOTs to further investigate how best-value procurement can be implementing with the D-B-B delivery method. From the information provided, the authors chose best-value D-B-B projects for case studies that aligned best with the goals of this study.

Case Studies

According to Yin (*15*), case studies are the preferred research method when: the research problem is on a contemporary phenomenon within a real-life context; dealing with “how” and “why” research questions; and the researcher has little control events. In addition, the case study approach is more explanatory in this research due to the lack of existing frameworks on implementing best-value procurement for D-B-B delivery methods. As a result, the case study approach is a suitable research methodology (*15*) and is a main research tool for this study.

In this step, the research team conducted phone interviews with DOT representatives. Due to length constraints in this paper, the authors chose cases from Michigan, New York, and Oregon DOTs because they best illustrate the state of practice. During the interview, guidance documents, templates, tools, and checklists, and other transmittals were obtained to enhance validity. In each case study, the research team followed a rigorous case study protocol including:

1. project description;
2. the rationale of using best-value procurement;
3. best-value legislation;
4. best-value evaluation criteria;
5. selection methodology; and
6. case summary.

Once case study interviews were completed, the raw information and relevant documents collected were analyzed and integrated with data from other sources. A detailed description of each case study is presented below.

CASE STUDY ANALYIS AND RESULTS

Table 1 provides a description and some key features of the case studies analyzed in this paper. As previously mentioned, the case studies were selected based on the national survey and communication with state DOT representatives. Table 1 indicates that all three case projects were rehabilitations. The contract award varied approximately from $49 million to $146 million. Adjusted bid and weighted criteria were two best-value algorithms used for these three case study projects. Best-value algorithms are the steps taken by the owners to combine best-value parameters, evaluation rating systems, and evaluation criteria to make a final award recommendation. In the adjusted bid algorithm, technical proposals are scored first and the price proposals are opened. The project price is adjusted by the technical score. The project is awarded to the proposer with lowest adjusted bid. The contract price is based on the amount listed in the price proposal. In the weighted criteria algorithm, the technical proposal and the price proposal are evaluated individually. The technical evaluation factors and the price are assigned weights depending on their importance. The total score of the proposal is calculated by the sum of these evaluations and the project is awarded to the proposal with the highest score. While it cannot be completely attributed to the best-value process, it is notable that all projects were bid below the engineer's estimate. The remainder of the paper details the case studies.

TABLE 1 Case Study Project Summary

Case Study Projects	State DOTs	Location	Construction Type	Engineer's estimate ($ million)	Contract award ($ million)	Best-value algorithm
M-39 Southfield Freeway	Michigan	Detroit, Michigan	Roadway reconstruction	77.3	71.3	Adjusted Bid
Patroon Island Bridge Project	New York	Albany, New York	Interstate, bridge rehabilitation	174.1	145.8	Weighted Criteria
I-84 Sandy River - Jordan Road Project	Oregon	Multnomah, Oregon	Bridge replacement	65.4	48.5	Weighted Criteria

Michigan DOT: M-39 Southfield Freeway Project

The major work of this project included reconstruction of the roadway and rehabilitation of 28 bridges. The project, completed in 2011 was on a major urban freeway that is primarily a commuter route, linking western suburbs and the city, and interchanging with other major urban freeways, such as I-94, I-96 and M-10, and other principal urban arterials. The engineer's estimate at the time of project advertisement was $77.3 million. The project was awarded using best-value selection with the cost of $71.3 million.

Best-value rationale

The majority of the project work had a significant impact on a residential area northwest of Detroit. In recognition of the importance of the roadway to the adjacent community and other stakeholders, and the impact the freeway and its rehabilitation has on the neighborhoods, Michigan DOT engaged extensively with the local community. Additionally, the Michigan DOT conducted a very thorough public involvement process the design phase to understand and address the community's needs, concerns, and ideas for the project. Three public meetings were held to provide information relating to the project and to solicit ideas and feedback from the community. Outreach with the community and other stakeholders revealed several "Quality of Life" concerns consistently cited (*16*). As a result, Michigan DOT decided using best-value procurement as a means to establish acceptable criteria for the quality of life issues.

Best-value legislation

Michigan DOT received an SEP-14 approval for this project in October 2010. In the original SEP-14 document, Michigan DOT proposed to select the contract based on the best-value weighted criteria algorithm. The final score was calculated by using a weighted average method giving 60% weight to the bid price and 40% weight to the technical proposal score. As the SEP-14 document was being finalized, it was determined that the best-value adjusted bid algorithm would be used (*16*). Michigan DOT also engaged the Michigan Attorney General's office to obtain feedback on the risk and legality of the specifications before advertising the project.

Best-value evaluation criteria

As previously mentioned, the quality of life concern was of paramount in this project. As a result, the evaluation criteria related to this concern were assigned significant weight. Specifically, the best-value evaluation criteria consisted of the following issues: (1) general construction concerns, including the impact of construction activities on air quality, noise, traffic, utility, and damage to neighborhood property; (2) local contractor and workforce participation; (3) safety and mobility; and (4) schedule. Table 2 provides more information on these criteria along with their maximum scores.

TABLE 2 Summary of Evaluation Criteria - Michigan DOT

Evaluation Criteria	**Maximum Score**
Air quality	40
Noise	40
Restricting construction truck traffic on neighborhood streets	40
Maintaining utilities to homes during construction	40
Avoiding damage to adjacent property from vibration.	40
Local Contractor and Workforce Participation	150
Safety & Mobility	100
Schedule	50

It was noted that during the development of the best-value special provisions, the Michigan DOT met with the FHWA and members of the construction industry to solicit feedback on the language and logistics of what the Michigan DOT was asking of the industry. For example, for the air quality and noise concerns, the Michigan DOT worked with the Michigan Department of Environmental Quality, and other experts to establish baseline measurements for particulate matter in the air, and ambient decibel levels. In addition, Michigan DOT hired an independent third party review of the specifications and project plans to ensure bidability and constructability (*16*).

To enhance objectivity and consistency of the best-value selection process, the Michigan DOT included a detailed instruction to score the evaluation criteria. The evaluator was asked to provide comments on each component of evaluation criteria. The Michigan DOT also recommended that "determining in advance the details of the scoring procedures the team will use, such as what the starting score for each factor where minimum requirements are met will be, and would include this information in the special provision for best-value selection" (*16*).

Best-value selection process

The Michigan DOT used the adjusted bid algorithm (composite score) to select the contractor for this project. The composite score was calculated by dividing the contractor bid amount by their technical score. The consensus scoring process was structured to be as objective as possible. A diverse cross section of Michigan DOT staff comprised the evaluation team, including:

- Detroit Transportation Service center (TSC) Manager;
- Detroit TSC Development Engineer;
- Detroit TSC Delivery Engineer;
- Metro Region Engineer;
- Metro Region Planning Specialist;
- Director of the Small Business Development; and
- Contract Services Division Administrator.

For each evaluation criterion, the team started with a baseline score, and added points for good ideas and innovative thinking. Emphasis was placed on developing a consensus score for each evaluation criterion, taking into account input from the entire team. Consensus scores and comments were recorded, and each team member signed the score sheets.

To maintain and enhance transparency of the selection process, Michigan DOT held a mandatory Pre-bid Meeting/DBE Reverse Trade Fair to expose the local workforce and potential DBE contractors to potential prime contractors. Michigan DOT staff provided an overview of the project and answered contractor questions regarding the nature of the work and the logistics of the best-value selection. Furthermore, the technical proposal scores were publicly announced and the bids were downloadable.

Summary

The Michigan DOT indicated that this best-value project was successful. They highlighted that under the traditional low-bid procurement, it was not easy to address the concerns of the community in this project. While the low-bid contracting method provides the ability for contractors to propose value engineering alternatives after award to save money, there is little incentive for contractors to propose value engineering approaches that that add value to the affected community. Conversely, the best-value process put the owner agency between the contractor and the community, pushing the contractor to perform above contract requirements in response to community feedback. The Michigan DOT concluded that they learned much about the best-value process that will help them to use it where most appropriate in the future (*16*).

New York DOT: Patroon Island Bridge Project

The Patroon Island Bridge is a heavily used commuter route and provides an important connection between the Northway, Interstate 787 and the Thruway. The project involves rehabilitation of the Patroon Island Bridge and all the ramps comprising the I-90 interchange with I-787. The major work of this project includes replacing the bridge decks and bearings, repairing steel and painting the bridges, as well as replacing or repairing the substructures of the interchange and replacing the concrete bridge piers. The engineer's estimate was $174.1 million. The project was awarded using best-value selection with the cost of $145.8 million. The project began in 2013 and is expected to be completed in 2016 (*17*).

Best-value rationale

This bridge project is located in a high volume corridor including the Interstate 90 over the Hudson River between Albany and Rensselaer counties, as well as the ramps creating the I-90 / I-787 interchange. The speed of construction and mitigating the impacts of construction on the traveling public was the critical success factor. It was essential that the selected contract has a proven record in high volume corridors with complicated maintenance and protection of traffic staging. In December 2012, New York DOT announced that this D-B-B project was no longer low-bid and determined that best-value procurement would meet the best interests of the State. New York DOT stated that the use of best-value selection methods for traditional D-B-B construction contracts has the potential for significant benefits in terms of shorter duration to complete work, improving quality, and safety (*18*). The best-value procurement allows the New York DOT to consider and evaluate critical aspects of the project in addition to price.

Best-value legislation

New York State DOT submitted the work plan for SEP-14 review and approval to use of best-value alternative bidding practices for the capital construction program dated April 2012. New York State enacted Chapter 56 of the Laws of 2011, known as the infrastructure Investment Act that authorizes a variety of innovative contracting methods including best-value procurement (*18*).

Best-value evaluation criteria

The project is complex. Most work occurred at night to mitigate the traffic disruption because the bridge carries an average of 70,000 vehicles daily. The six-lane bridge maintains two lanes in one direction and one lane in the opposite direction during construction. Six technical evaluation criteria included: schedule; driver first; technical approach; key personnel; past performance; and presentation as seen in Table 3. Due to the impact on the traveling public, New York State DOT put a heavy weighting on the driver first and technical approach criteria. The objective of the driver first criterion was to encourage proposals that have the least impact on the traveling public. The objective of the technical approach criterion was to enhance innovation techniques, address potential issues and risks, and optimize the sequencing and phasing of the work. Table 3 summarizes the technical criteria and their final weight.

TABLE 3 Summary of Technical Evaluation Criteria - New York State DOT

Technical Evaluation Criteria	Final Weight (50% total)	Ranking Points (100 points total)
Schedule	5%	10
Driver First	20%	40
Technical Approach	10%	20
Key Personnel	5%	10
Past Performance	5%	10
Presentation	5%	10

It is noted that the minimum acceptable combined Score for the first five Technical criteria (prior to the Presentation) was 63 Points (70 percent of 90 potential points). Any firm scoring lower than this was removed from further consideration. New York State DOT provided instruction and specification how to score these criteria in the bid document information. The second component in the best-value evaluation criteria is cost or price. The final weight of cost was 50%. A total of 100 Cost Ranking Points was assigned to the contractor with the lowest bid. Remaining bids received Cost Ranking Points based on the percent that their bid exceeds the low-bid (*19*).

Best-value selection process

After evaluating technical and price proposals, the three proposers with the highest subtotal scores (technical score + cost score) plus any proposal within 10 ranking points of the proposal with the highest subtotal score was offered the opportunity to provide oral presentations (*19*). The objective of the oral presentation was to increase the understanding of the submittal on technical evaluation criteria. A selection committee included main and/or regional office staff that evaluate and score technical qualifications.

To enhance objectivity and fairness of the selection process, the selection committee was kept strictly separate from cost proposals and scoring. The selection committee met as a group and agreed on consensus scores for each technical evaluation factor for each proposer. The selection committee was asked to provide comments as appropriate. Additionally, New York Contract Management Bureau oversaw the selection committee meeting, compiled all technical evaluation criteria scores with cost scores and comments, and determined the proposer that represents the best-value to the New York State DOT (*17*).

Summary

The New York State DOT has typically used the D-B-B delivery method with a low-bid process to award a majority of capital construction contracts. The best-value selection process that has been employed recently and has proven to be beneficial to the department (*18*). New York State DOT has identified several advantages of using the best-value contract including: (1) reducing risk to the department; (2) providing a more flexible process; and (3) truly generating best-value to the department. However, the New York State DOT recognized two main limitations of implementing best-value. Comparing to the low-bid approach, the submission preparation of the best-value approach is time consuming and costly. The other limitation involves extra time required to be able to evaluate and select the best-value contractor.

Oregon DOT: I-84 Sandy River - Jordan Road Project

This project involved the replacement of two structurally deficient bridges on Interstate 84 in Multnomah County. The bridges are located at the gateway to the Columbia River Gorge National Scenic Area. The existing Sandy River bridges were replaced with four span steel box girder bridges. Each bridge consists of three 12-foot lanes and two 12-foot shoulders. The eastbound bridge includes a 16' wide multi-use path on the south side. The engineer's estimate of this project was $65.4 million. The project was awarded using best-value selection with the cost of $48.5 million. The project began in 2010 and completed in 2014 (*20*).

Best-value rationale

The Oregon DOT traditionally uses a low-bid process, but has concluded that using the low-bid approach for the D-B-B delivery method may entail an unacceptable risk for this project (*20*). As a result, Oregon DOT decided using best-value procurement as a means to accomplish the required work for this project.

The project is located in the commercial and recreational travel corridor. Because of the lack of alternative access routes, the I-84 traffic lanes must be maintained during construction. A temporary bridge was required to allow for demolition of the existing bridges and construction of the replacement bridges without impacting I-84 traffic. Additionally, the project had several complicated construction constraints and technical requirements that require a contractor with specialized expertise in designing and constructing a bridge with steel box girders and drilling eight foot diameter shafts with post-grouting which both are not commonly used in Oregon. Furthermore, the ability of the contractor to complete necessary in-water work within each of the constrained six-week in-water work windows for this project location is critical to meeting the project schedule.

Best-value legislation

The Oregon legislation (ORS 366.400) authorized Oregon DOT to enter into all contracts deemed necessary for the construction, operation, maintenance, improvement, or betterment of highways (*20*). The Exemption Number 2009-03 granted the Oregon DOT to use best-value procurement for the I-84: Sandy River-Jordan Rd Project (*21*). This procurement method encompasses the Oregon Legislature's focus on economic efficiency and stimulation and provides recognition of the value to the public of employing enhanced contracting methods to accomplish the required work in the most effective manner (*20*).

Best-value evaluation criteria

The relative weight of price and technical evaluation criteria for this project was 70% and 30% respectively (*22*). The Oregon DOT determined that the contractor must be able to develop and follow an accurate work plan that incorporates the large variety of work items in this project. To be successful, Oregon DOT also required excellent communication and coordination among key individual in addition to the contractor's qualifications, technical approach and diversity element (*22*).

The technical evaluation criteria included four categories: bidder's experience; key individuals; technical approach; and diversity. Table 4 summarizes the sub-criteria and their maximum of these four categories. The total of the maximum technical score is 100 points. As previously mentioned, this project is several complicated construction constraints and technical requirements. Table 4 also indicates that Oregon DOT assigned heavy weights to the technical approach category.

TABLE 4 Summary of Technical Evaluation Criteria - Oregon DOT

Evaluation Criteria	Sub-criteria	Maximum Points (Total 100 points)
Bidder's Experience	Steel Girder Bridges	6
	Difficult Foundations	6
	Short In-Water Work Windows	6
Key Individuals with similar project	Project manager and Superintendent	6
	Project manager's Experience	3
	Superintendent's Experience	2
	Environmental Manager's Experience	1
	Diversity Manager's Experience	1
	Years of Experience in Role	8
Technical Approach	Project Approach	21
	In-Water Work Approach	16
	Girder Erection Approach	8
Diversity	Workforce Diversity Development	3
	Utilizing Disadvantaged Business Enterprise	3
	Subcontracting, Consultant and Supplier Plan	10

To maintain objectivity and fairness of the selection process, Oregon DOT provided a detailed instruction on how to score each technical evaluation criterion in the bid booklet. The technical criteria were evaluated and scored based on content, conformance, clarity and completeness, quality of work plan approaches, and bidder qualifications. Oregon DOT also included non-voting members during the scoring process (*22*).

Best-value selection process

Oregon DOT used the best-value weighted criteria algorithm to select the contractor. The technical evaluation committee consisted of agency personnel and discipline experts. Each evaluation committee member separately evaluated and scored the technical for each bidder. After that, the evaluation committee discussed their evaluations and scores of the technical component for each bidder. Finally, the evaluation committee agreed upon and provided a single technical component score for each bidder (*22*). It is noted that Oregon DOT reserved all rights to require any clarification it needed to understand a bidder's technical component.

Summary

Oregon DOT reported that on typical construction projects, the traditional low-bid contracting process has demonstrated predictable success. However, for complex and complicated projects, best-value procurement provides greater opportunity for the contractor to add significant value to the project. Based on the success of using best-value selection method for the D-B program, Oregon DOT employed best-value procurement of this D-B-B project. Oregon DOT recognized several benefits, including: (1) providing a mechanism for agencies to obtain more value for their money; (2) reducing agency's risk, change orders, and cost overruns; and (3) creating economic benefits to the public by inclusion of many entities in subcontracting and supply opportunities (*23*).

CONCLUSIONS

The D-B-B best-value approach has been successfully implementing by several federal agencies such as the U.S. Army Corps of Engineers, the U.S. Department of the Navy, and the Federal Aviation Administration (*3*, *20*). State DOTs are increasingly using best-value procurement to deliver their highway projects. However, the majority of agencies who use best-value procurement use it only for their D-B project delivery programs. This paper presents three case study projects with the successful implementation of best-value procurement with the traditional D-B-B delivery method.

The findings from this research shows that the D-B-B best-value approach can provide benefits to state DOTs such as emphasizing non-price factors that align with project objectives, reducing risk, and cost savings. All three state DOTs believe that using this approach has the potential for significant benefits. There was no logistical problem in executing the best-value selection and the awarded contractor was able to meet and exceed all performance measures (*16*). Compared to the traditional D-B-B low-bid approach, the D-B-B best-value approach can increase chance for success and decrease overall risk to the department by selecting a contractor based on their capability to complete all critical aspects of the project rather than just price alone (*18*). Similarly, Oregon DOT indicated that using best-value with D-B-B projects may provide better overall value, reduce change orders, and shorten project duration (*23*).

There are several disadvantages of implementing the best-value process. New York State DOT mentioned that the process may take longer than a traditional low-bid process. The extra time is often required for evaluating and selecting the best-value contractor. In addition, the preparation and submission process can be more time consuming and costly than the low-bid process (*18*). State DOTs require additional time and efforts for the preparation of bid documents and evaluation plans. The Oregon DOT indicated that a minimum of eight months and additional $20,000 should be budgeted to account for extra staff work for large and complex projects (*24*). Oregon DOT also pointed out that best-value procurement is suitable for a project that has: unique technical requirements (e.g., a project requires expertise that may be difficult to meet if using low-bid procurement); and potential for cost savings (*24*).

This research has found that, while many advantages exist, the best-value approach cannot guarantee the success of a D-B-B project. Instead, owner agencies should work closely with FHWA and the industry to determine when best-value procurements align with project objectives. On appropriate projects, best-value procurement can improve project delivery success.

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REFERENCES

1. Palaneeswaran, E., Kumaraswamy, M., and Ng. T. Targeting Optimum Value in Public Sector Projects through ‘best-value’-Focused Contractor Selection.” *Engineering, Construction and Architectural Management*, Vol.10, No.6, 2003, pp. 418–31
2. Gransberg, D.D., and Senadheera, S. Design-Build Contract Award Methods for Transportation Projects. *Journal of Transportation Engineering*, Vol.125, No.6, 1999, pp. 565–567.
3. Scott, S., Molenaar, K.R., Gransberg, D.D., and Smith. N. *NCHRP Report 561: Best-value Procurement Methods for Highway Construction Projects*, Transportation Research Board of the National Academies, Washington, D.C., 2006, 213 pp.
4. Molenaar, K.R. and Tran, D. *NCHRP Synthesis of Highway Practice 471: Practices for Developing Transparent Best-value Selection Procedures*, Transportation Research Board of the National Academies, Washington, D.C., 2015, 67 pp.
5. Elyamany, A., and Abdelrahman, M. Contractor Performance Evaluation for the Best-value of Superpave Projects. *Journal of Construction Engineering and Management*, Vol. 136, No. 5, 2010, pp. 606–614.
6. Gransberg, D.D., “A Framework for Performance Based Contractor Prequalification,” *Transportation Research Record, Journal of the Transportation Research Board No.2151*, National Academies, 2010, pp.46-54.
7. Gransberg, D.D. and Ellicott, M.A. Best-value contracting criteria. *Cost Engineering Transactions*, Vol.39, No.6, 1997, pp. 31-34.
8. Yu, W. D., and Wang, K. W. Best-value or lowest bid? A quantitative perspective. *Journal of Construction Engineering and Management*, Vol.*138, No.* 1, 2011, pp. 128-134.
9. Akintoye, A., Hardcastle, C., Beck, M., Chinyio, E., and Asenova, D. Achieving best-value in private finance initiative project procurement. Construction Management and Economic. Vol.21, No.5, 2003, pp. 461–470.
10. Molenaar, K. R., and Johnson, D. E. Engineering the procurement phase to achieve best-value. *Leadership and Management in Engineering*, Vol.3, No. 3, 2003, pp. 137–41.
11. Minnesota Department of Transportation (MnDOT), *Best-value Procurement manual*, MnDOT, St. Paul, 2013, 57 pp. [online]. Available: http://www.dot.state.mn.us/const/tools/docs/BestValueGuide-FinalMarch2013.pdf [accessed July 25, 2015].
12. Federal Acquisition Regulation (FAR). Part 15—Contracting by Negotiation. CCH Incorporated, Chicago, Illinois, 2004, pp. 293-341
13. U.S. Postal Service Handbook. Design and Construction Purchasing Practices: U.S. Department of Justice Federal Bureau of Prisons, Program Statement: Design & Construction Procedures, February 15, 2000
14. Oppenheim, A. N. *Questionnaire Design, Interviewing and Attitude Measurement.* Continuum, London, 2000.
15. Yin, R. K. *Case Study Research: Design and Methods.* Sage Publications, Beverly Hills, Calif., 2009.
16. Innovative Contracting Practices, SEP-14, M-39 (Southfield Freeway) Final Report. Michigan Department of Transportation, July, 2012.
17. New York State Department of Transportation. Construction to Begin This Spring on High-Volume Interstate Span. Web Document. https://www.dot.ny.gov/news/press-releases/2013/2013-04-02

18. Work Plan for SEP-14, Alternate Contracting - Utilizing Best-value Selection for Capital Construction Contracts. New York State Department of Transportation, April, 2012
19. New York State Department of Transportation. Patroon Island Bridge Project. Web Document. https://www.dot.ny.gov/main/business-center/projects-studies/prequalification
20. Oregon Department of Transportation, SEP 14, A+C+D Best-value Contracting. I-84: Sandy River - Jordan Rd Project - Bundle 210, August, 2012.
21. Exemption Number 2009-03, Oregon Department of Transportation, November, 2009.
22. Oregon Department of Transportation, Bid Booklet for Highway Construction. I-84: Sandy River - Jordan Rd Project - Bundle 210, February, 2010.
23. Oregon Department of Transportation, SEP 14 Final report, A+C+D Best-value Contracting. I-84: Sandy River - Jordan Rd Project - Bundle 210, June, 2014.
24. Oregon Department of Transportation, ODOT Project Delivery Guide, Appendix C: Project Delivery Procurement, 2010.