COMPARISON OF ALTERNATIVE CONTRACTING METHODS OVER 10 YEARS IN A LARGE STATE TRANSPORTATION AGENCY

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The construction industry is currently under pressure due to the increase in population and deterioration of infrastructure in the last twenty-five years. The Florida Department of Transportation’s (FDOT)’s response to this pressure has led to using Alternative Contracting Methods (ACMs) as replacements of the traditional contracting method, Design-Bid-Build (DBB), which has been serving the public for over a century. ACMs such as design-build (D-B), lump sum contracting, incentive/disincentive (I/D), cost-plus-time (A+B), and no excuse bonus (NEB) have proven to increase project quality, expedite schedule and decrease costs. The performance of ACMs by FDOT on highway construction projects was evaluated by two reports conducted in 2007 (Ellis et al. 2007) and 2016 (Minchin et al. 2016). Based on these two reports, the research analyzed the change in the performance and number of projects applied in ACMs between 2007 and 2016. This research compared the number of projects, costs, and time of the above-mentioned studies to assess the change and the reason behind it encountered in this comparison. The results of this research show that all ACMs evaluated in the 2016 report were performing better than they performed nine years prior, in 2007, in terms of time and cost. Potential obstacles to applying ACMs and lessons learned were identified in the research, as well as recommendations that would help FDOT to improve the application of ACMs in transportation projects.

Keywords: Design-build, Lump sum, Incentive/disincentive, Cost plus time, No excuse bonus, Highway construction.

1 INTRODUCTION

A well-known traditional delivery system referred to as design-bid-build (DBB) served the public throughout the vast majority of the 20th century. The use of DBB has supplied the public with efficient and safe transportation facilities built at the lowest price available. The separate contracts with the designers and contractor balance and encourage competition in the private sector. Nevertheless, this process can lead to adversarial relationships among the entities that are part of the project, restricting innovation, and resulting in high costs and time growth, eventually failing to provide the best value to the public and owners of projects. In recent years, these issues have become a more pressing concern for highway agencies as the deteriorating infrastructure and increasing population have created tremendous pressure to expedite critical projects. The response of the Florida Department of Transportation (FDOT) to this pressure led to several innovative contractual clauses and contract types in the late 1980s. These brought about the innovative
contractual clauses and contract types such as design-build (D-B), lump sum contracting, incentive/disincentive (I/D), cost-plus-time (A+B), and no excuse bonus (NEB).

The Florida legislation promoted the use of alternative contracting techniques to preserve project quality and reduce life-cycle costs in 1996. Project-specific contracting practices (A+B, Lane Rental, and Warranty clauses) were deemed acceptable operational techniques in Florida since their inception as early as 1990 (Minchin et al. 2016). In 2010, the Every Day Counts (EDC) initiative was implemented by FHWA to improve project delivery approaches and promote innovative practices in highway construction. The program made a significant impact on promoting the deployment of alternative contracting methods (ACMs) (FDOT 2015).

2 METHODOLOGY

Data for the 2007 report (Ellis et al. 2007) were obtained from several FDOT sources, including FDOT Infonet Financial Project Search, FDOT Webfocus and Bid Solicitation Notices. Data for the 2016 report were obtained from the Webfocus database. Information was gathered on all completed projects to compare construction time and cost fairly (FDOT 2015).

The projects were filtered to include only those with five contracting methods (D-B, lump sum contracting, I/D, A+B bidding, and NEB), as well as those classified as DBB only. For the sake of analysis, all projects were filtered to ensure that only construction-based projects were investigated. FDOT provided data on a few projects that were terminated and hence filtered out the outliers. The flowchart explains the filtering process (Figure 1).

The FDOT database provided a huge collection of data concerning cost and time. The data used in this study were related to three parameters: number of projects, cost, and time performance. Analysis was performed using the data for five ACMs.

Figure 1. Data filtering process for analysis.

3 RESULTS

3.1 Design-Build

Design-build was comparatively new to FDOT when the 2007 report was compiled and the deployment of D-B has been popularized ever since. The 2007 report noted that there were 66 D-B projects compared to the 233 in 2016, a 253% increase. The 2007 report noted that D-B had average time extensions of 30 days (7.08%) per project compared to the average time savings of six days (1.39%) per project as noted in the 2016 report. The time performance has improved over nine years.

The 2007 report noted that there was an average cost overrun of $558,552 (4.45%) per project. The 2016 report noted that there was an average cost overrun of $135,470 (1.69%) per project. The
cost overrun was reduced by $423,081 per project over the course of nine years, suggesting that it performed better on cost, as well.

3.2 Lump Sum

The number of projects rose using lump sum from 372 in 2007 to 603 in 2016, an increase of 62.10%. The 2007 report noted that time was extended by an average of eight days (6.89%) per project, whereas the 2016 report noted that there was a time saving of one day (2.60%) per project. Based on the time analysis, the performance of lump sum has improved. The 2007 report noted a cost overrun of $19,142 (1.54%) per project compared to cost savings of $19,285 (1.30%) per project in 2016. Lump sum performed better in 2016 compared to 2007 in accordance with the cost parameter.

3.3 Incentive/Disincentive

The number of projects using incentive/disincentive decreased over the nine years from 121 in 2007 to 73 in 2016. There was a reduction of 39.67% in 2016 compared to 2007, but the views regarding I/D did not change considerably during the nine years. The use of I/D as a stand-alone method decreased, but it was used in combination with other methods, mostly on DBB projects. The reports compared here focused on evaluating the performance of stand-alone contracting techniques and excluded combinations. The reason for this exclusion was that many different combinations were used by FDOT, and they continued to be in a state of flux, making them difficult to evaluate statistically.

The performance regarding time improved from a time saving of one day (0.32%) per project in 2007 to 35 days (10.42%) per project in 2016. The cost performance also improved from a cost overrun of $539,430 (12.46%) per project in 2007 to $151,947 (2.46%) per project in 2016. The cost overruns, reduced by $387,482 per project, imply that the performance of I/D has improved based on cost.

3.4 A+B

FDOT reduced the number of A+B projects over nine years. The 2007 report identified 85 A+B projects, whereas the 2016 report noted 21 A+B projects, a reduction of 75.29%. For A+B, the 2007 report noted that instead of saving time, the time was lengthened on projects by an average of 56 days (13.21%) per project. The 2016 report noted that A+B had an average time-cut of 44 days (9.12%) per project. The time analysis showed that over nine years A+B contracting had become a time-saving method.

The 2007 report noted that there were cost overruns of $956,942 (9.25%) per project, while the 2016 report noted that there were cost overruns of $679,947 (4.54%) per project. The cost overruns had been reduced by $276,995 per project over the nine years suggesting that A+B had ultimately enhanced its performance in terms of the cost parameter.

3.5 No Excuse Bonus

The number of NEB projects decreased considerably over the nine-year period. The 2007 report noted that the number of NEB projects was 128. The 2016 report showed that the number of NEB projects had shrunk to 12, resulting in a 90.63% decrease. Time performance had improved from an average savings of 11 days (3.02%) per project to 50 days (11.04%) per project. The 2016 report noted a time savings of 11.04%, while the new formula noted an 11.72% time-saving. The cost performance had also improved from an average cost overrun of $538,085 (7.99%) per project to an overrun of $120,764 (1.37%) per project.
4 CONCLUSIONS

SEP-14 has allowed state DOTs to use, and analyze the performance of, ACMs. This makes it necessary for the state DOTs to conduct performance evaluation studies such as the 2007 and 2016 reports. This study provided a comparison of the two reports, creating a link between them and providing a better sense of what and why the performance had changed. This study compared the change of number of projects, cost savings and time savings of the above-mentioned studies in regard to five ACMs and attempted to assess the reason behind the change encountered in this comparison.

4.1 Design-Build

The number of D-B projects increased considerably in 2016 compared to 2007, from 66 to 233. This considerable increase might be the reason behind the reduction of projects using A+B, NEB and I/D. This suggested that FDOT might not be particular about whether D-B or other ACMs should be used. FDOT increased the use of D-B, which may have rendered the better performance of A+B, NEB and I/D less important, even though the improved performance of each may have saved considerable taxpayer time and money if they had been utilized more. D-B reduced cost overruns and displayed a time-savings in 2016 compared to 2007. The more transparent procurement methods among designers, contractors and inspectors should receive credit for their better performance in 2016.

4.2 Lump Sum

The performance of LS improved over the nine years. During that period the cost overrun changed to cost savings and the time extension changed to time savings. The number of LS projects increased during the time of the study. Comparing the 2007 report and the 2016 report, FDOT used the LS contracting method for appropriate projects with well-defined risks. This appropriate use of LS might have been the reason behind the improvement in its performance. The increase in the number of projects suggested that the FDOT is getting accustomed to LS and refined its implementation over time, which undoubtedly contributed to the performance improvement as well.

4.3 Incentive/Disincentive

There was a reduction in the number of projects using I/D over the nine years from 121 in 2007 to 73 in 2016. Even though the use of I/D as a stand-alone method decreased, it was more frequently applied in combination with the DBB and A+B methods. Time and cost performance improved in 2016 compared to 2007. The better performance might be due to the experience applied over the nine years, considering I/D was relatively new to the industry back in 2007.

The 2007 report suggested that the use of I/D would be beneficial on projects exceeding $10 million. The 2016 report noted that I/D was extensively used on projects with current contract amounts ranging from $1 million to $10 million, while the use of I/D on projects exceeding $10 million was minimal. This suggested that either FDOT improved the use of I/D for projects between $1 and $10 million or that the number of projects decreased so considerably that the issue was ignored.

4.4 A+B

The overall cost and time performance of A+B improved despite the reduction in the number of projects over the nine years. The reason behind this improvement might be the better
implementation of the method over time as compared to 2007, a time when it was relatively new. The manner in which the FDOT recorded the data on A+B might be another reason for the improvement. When the time-bid was lower than the FDOT official estimate, the contract was considered a success as long as the contractor could bring to completion the contract within the original contract time.

4.5 No Excuse Bonus

Based on the time and cost analysis, the performance of NEB improved over the nine years. However, the number of NEB projects steeply decreased over that time period, as well. It seems that FDOT failed to address these issues during the nine years, suggesting that the improvement in the performance of NEB might just be due to the smaller sample size, or perhaps due to the appropriate use of NEB on bridge projects rather than paving projects. The high cost overrun as reported in 2007 might have been the reason behind the considerable reduction in the number of NEB projects over the past nine years. Experience with implementation of this method over time might have affected the performance of NEB. NEB appears to have been the most contentious method among the ACMs discussed in this study, and this also could have contributed to its falling out of favor with the department.

To sum up, the results of this study show that all ACMs evaluated here were performing better in terms of cost and time analysis than they were when the first of the two studies was conducted. FDOT evaluated the performance of alternative contracting techniques at intervals, an effective method for research purposes, and one that can provide data from enough projects for a thorough analysis of most of the ACMs. This study shows that if FDOT had focused on mitigating the issues that were encountered in the 2007 report, the performance of the methods other than D-B could have improved, which could have eventually led to a reduction in cost and time. Such savings would be beneficial for both FDOT and the traveling public.

5 LIMITATIONS

One of the limitations of this study is that it analyzed only the five ACMs which were common to the two reports. Therefore, in future studies, many various combinations being used in the field should be considered. In addition, the study focused merely on the transportation industry in the state of Florida, so it was difficult to conclude whether the result can be applied to other states in the United States and other countries, as well.

References