

A Comparison of P3's, DB and DBB Project Delivery Methods in North American Highway Construction

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INTRODUCTION

Cost and schedule overruns during construction of highway projects are common for projects over US\$100 million. This phenomenon has been observed in international projects, in the United Kingdom (Mott 2002), in Canada (Iacobacci, 2010) as well as the United States (US GAO, 1997). Scholars have compared the cost and schedule overruns of private public partnership (P3) projects against publicly funded projects in mature P3 markets in Europe (Flyvbjerg 2003), but similar comparisons are lacking for the North American market. This research begins filling that gap by comparing the cost- and schedule-overrun results of previous research studies reporting on large-scale design-bid-build (DBB) or design-build (DB) highway projects with comparable P3's.

A COMPARISON OF PROJECT DELIVERY METHODS

Twelve 12 projects from the United States and Canada were analyzed, which met the selection criteria and had been completed through the construction phase. The research results indicate the P3 sample cost overruns averaged 0.81% and schedule overruns averaged -0.30%, compared with 1.49% cost overruns and 11.04% schedule overruns for design-build projects and 12.71% cost overruns and 4.34% schedule overruns for publicly financed large-scale design-bid-build highway projects.

The researchers determined the criteria for selection of P3 projects by the trend of the P3 market over the past 20 years. The research study project list was obtained from "Public Works Financing, September 2010" edition. From that list, only highway transportation projects meeting the following criteria were studied: (1) Projects constructed in North America, (2) Projects constructed between 1990 and 2010, (3) Projects with construction costs between US\$90 Million and US\$1,100 Million, (4) Highway and bridge projects without a large signature tunnel, (5) Projects procured under a design build finance operate maintain (DBFOM) procurement model. The researchers gathered data and confirmed the selected projects were DBFOM through a thorough literature review and survey with personnel involved with the projects.

The study determines the project performance regarding cost and schedule adherence for transportation projects. Two key metrics are used: cost change and schedule change. Cost change is the difference between the actual project contract cost of the capital expenditure specified in the P3 contract at financial close and the estimated project cost. The estimated project cost is the cumulative value of all payments made by the sponsor(s) to the developer(s) to compensate for the construction of the project.

$$\text{percent cost change} = \frac{(\text{actual project cost} - \text{estimated project cost}) \times 100}{\text{estimated project cost}}$$

Schedule change is the estimated construction duration allotted in the contract for the construction of the project, and the final construction duration is the actual time of construction to the point of availability of use of the project.

$$\text{percent schedule change} = \frac{(\text{final construction duration} - \text{estimated construction duration}) \times 100}{\text{estimated construction duration}}$$

ANALYSIS

Using the parameters of cost and schedule performance, the researchers studied the P3 projects under consideration. These P3 projects are from an exhaustive list (Public Works Financing, 2010) of large-scale highway construction projects in North America that were contracted under a DBFOM project delivery model. This study provides insight into the advantages and limitations of the P3 procurement method in North America at the present time (projects completed between the 1990 and 2010). The results obtained from this research

study are compared to previous research (Shrestha 2007) that analyzed the performance of DBB projects and DB projects on the same parameters of cost and schedule growth. As shown in Figure 1, P3 projects provide both cost and schedule control for large scale highway projects.

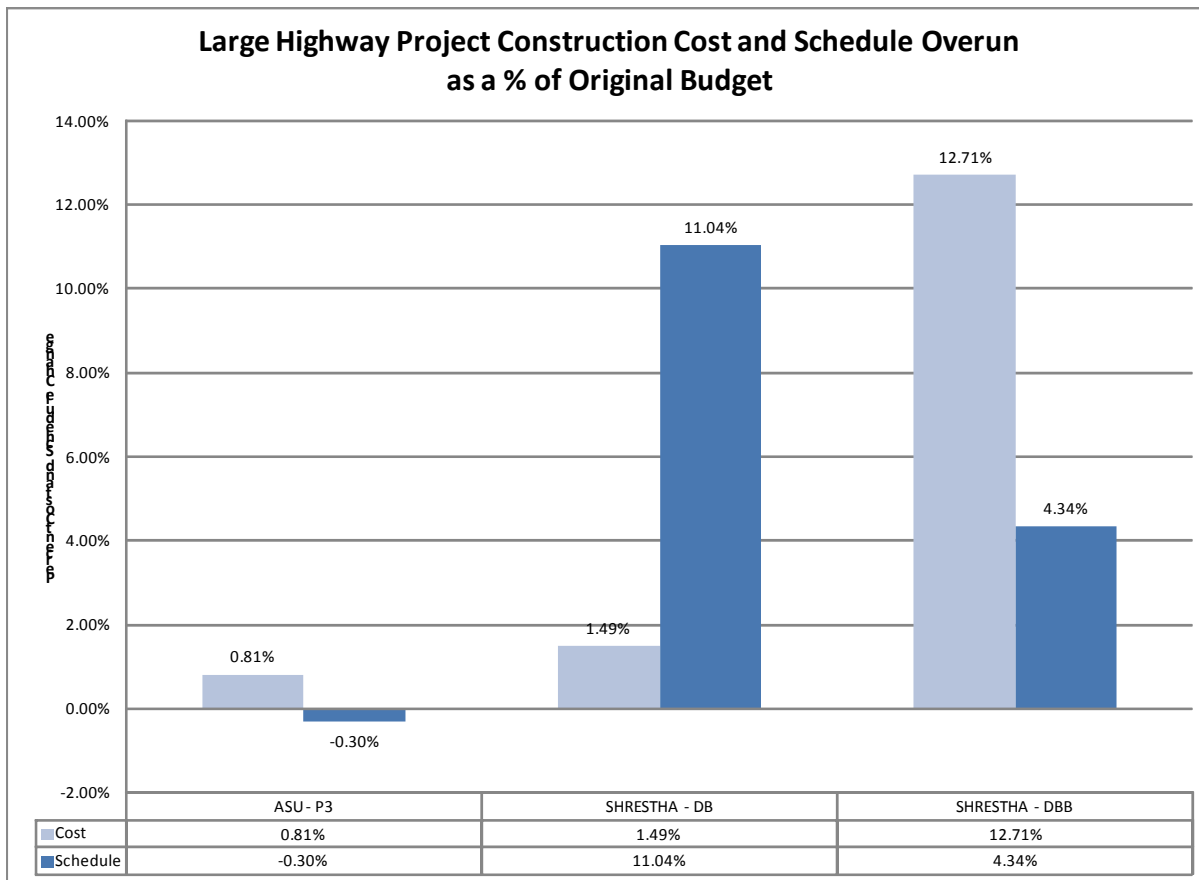


FIGURE 1. Large Highway Project Construction Cost and Schedule Overrun as a % of Original Budget for Projects over \$90 million

CONCLUSIONS

With a relatively small universe of completed construction phase efforts to examine, it is premature to draw explicit conclusions, yet the results reported in this study point to tighter control of highway construction costs and delivery schedules when projects are delivered via the P3 method. Findings from this study provide empirical evidence for various theoretical advantages and limitations of P3 projects, as well as serve as a reference tool to compare the appropriateness of different project delivery methods.

REFERENCES

- Flyvbjerg, B., M. K. Skamris et al. (2003) How Common and How Large Are Cost Overruns in Transport Infrastructure Projects? *Transport Reviews*, Vol. 23, No. 1, pp. 71–88.
- Iacobacci, M. (2010) *Dispelling the Myths: A Pan-Canadian Assessment of Public-Private Partnerships for Infrastructure Investments*. The Conference Board of Canada.
- Mott MacDonald. (2002) *Review of Large Public Procurement in the UK*. Prepared for HM Treasury.
- Public Works Financing, (2003) September, Volume 252.
- Shrestha, P. P. (2007) Performance Benchmarking of Large Highway Projects. *PhD thesis, University of Texas at Austin, Austin, Texas*.
- United States General Accounting Office. (1997) *Transportation Infrastructure: Managing the Costs of Large-Dollar Highway Projects*. Publication GAO/RCED-97-47.