

An Analysis of Design/Build vs. Design-Bid-Build

Capital improvement projects can be completed under numerous contractual formats between the owner and design and construction service providers. Two commonly applied delivery methods in public and private projects are design-bid-build (DBB) and design/build (DB). This summary examines the differences between the two and the benefits of one over the other.

“For the past two decades, public owners have been demanding that the design and construction industries enhance quality, decrease cost and compress the delivery period for public projects. As a result, both the owners and the industry have experimented with various forms of project delivery methods.”ⁱ

The Construction Industry Institute (CII) defines two widely known and accepted delivery methods as follows:

Design/build: Under this method, an owner typically hires a single entity, the design/builder, to perform both design and construction under a single contract. Portions or all of the design and construction may be performed by the entity or subcontracted to other companies. DB is characterized by high levels of collaboration between the design and construction disciplines, input from multiple trades into the design, and a single entity bearing project risk. Typically, the general contractor is responsible contractually for this delivery method.

Design-bid-build: This is the most traditional process in the U.S. construction industry, where the owner contracts separately with a designer and a contractor. The design firm is hired to deliver 100 percent complete design documents. The owner or agent then solicits fixed price bids from contractors to perform the work. Designers and contractors bear no contractual obligation to one another and the owner bears all risk associated with the completeness of the design documents.

In determining which project delivery method and contractual arrangement to employ, owners should carefully analyze their:

- Capacity and technical capability to closely manage the process
- Individual project drivers
- Sensitivity to cost and schedule escalations
- Degree of comfort with bearing project risk

Collaborative delivery methods where construction has input into design are growing in popularity. Under these collaborative arrangements, design and construction are contractually obligated to work together in the best interest of the project.

Owners who have little or decreasing capacity (funding) to closely manage the construction process or have discomfort with bearing project risk tend to find the more collaborative DB delivery method more effective.

In looking for the best possible project outcome, it is important to examine past project results achieved using the various delivery methods. According to the CII, the American Society of Civil Engineers (ASCE), and independent research conducted at the University of Nevada, Las Vegas, Texas A&M University, the University of North Carolina, the University of Texas and other institutions, owner-submitted projects delivered using DB significantly outperformed others in terms of:

- Cost performance
- Schedule control
- Number of change orders
- Quality of end product, with reduced rework

DB Outperforms DBB Based On Multiple Factors

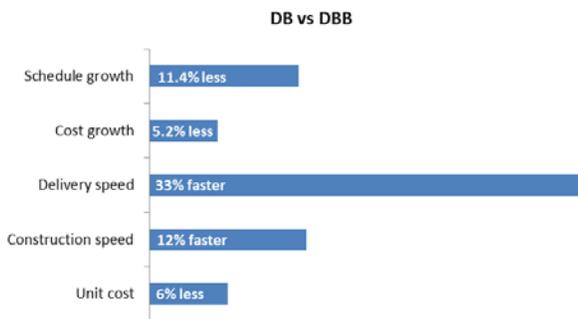
Cost and Schedule: A CII study of projects submitted by both owners and contractors stated, “Owner-submitted DB projects outperformed DBB projects in cost, schedule, changes, rework and practice use.”ⁱⁱ Practice use factors include constructability, team building, zero accident technique, design/information technology use and change performance. An additional, more recent study conducted for the 20th Annual Conference of the International Group for Lean Construction found that “...collaborative project delivery systems produce a more reliable cost outcome for public owners.”ⁱⁱⁱ

In terms of schedule, another CII study indicated that “An experienced DB team has the greatest opportunity of succeeding in achieving goals in schedule maintenance, construction speed and intensity.”^{iv}

The aforementioned International Group for LEAN Construction study also found that when employing the more collaborative DB method, projects had significantly lower schedule growth than DBB projects. Further analysis of change order growth showed that DB projects also have significantly lower total change order cost growth.

A study at the University of Texas at Austin on the performance of DB and DBB projects on U.S. Naval facilities examined the time and cost growth of 38 DB and 39 DBB projects. “The results showed that DB projects took less time, had less cost growth, and were less expensive to build in comparison to DBB projects.”^v

A study by Penn State found that compared to DBB, DB projects had a six percent reduction in change orders, delivered 33 percent faster overall, and cost six percent less.^{vi}



Reduced Risk: By involving the DB entity throughout design, the design and construction disciplines are contractually obligated to work together to complete a design that meets owner needs within constructability and budget parameters. The DB entity bears the risk for the design completeness thereby reducing the need for change orders that can derail budgets and schedules alike.

The previously mentioned CII study found “When schedule is critical to project success and budget is still unknown, the DB delivery method should be considered. DB relieves the owner from warranting design documents and mediating interpretations of those documents.”^{iv}

Higher Quality: At the end of a project, whether the budget and schedule were maintained means nothing if the facility does not meet the needs of the end user. A relatively short time of inoperability can quickly negate any savings earned during design and construction. The highest quality project outcomes analyzed by the CII were completed by DB teams with experience working together. Overall, DB teams delivered highest quality in terms of lower difficulty in start-up, fewer call backs and meeting project needs.^{iv}

Evolving project drivers: With regard to political drivers, it is critical that owners examine whether the project is being undertaken due to quickly evolving needs/demands or whether there is a long standing need for increased, less-specialized space. Project examples include those in fast changing industries such as microelectronics, pharmaceutical and food processing. Additional project examples on university campuses might include scientific laboratory facilities and medical or surgical instruction facilities.

The CII’s 2002 project delivery systems research study indicates “Owners who see an advantage to continue to fine-tune the scope, up to and even after the capital project has started, have a distinct advantage in using a design-build contractor in lieu of other methods of execution.”^{iv}

Conclusion: As stated previously, no one project delivery method is best for all projects. Both of the delivery methods examined may have merit for certain types of projects and some public entities may be required by law to use DBB.

Owners who possess a strong desire to control the design and construction process and/or have the funds in place to hire sufficient personnel or a firm to closely watch the process may be more suited to the DBB process, especially if they are willing to bear the risk that the design will be complete and include sufficient constructability analysis and contingencies to absorb potential costly change orders. The results from a DBB approach generally are better for very simple and predictable projects.

On the other hand, the overwhelming results of research efforts by numerous organizations indicate that DB projects outperform their DBB counterparts in terms of cost and schedule performance, quality outcomes, reduced owner risk, change orders and the ability to respond to evolving facility needs.

ⁱ Shane, J. & Gransberg, D. (2012). *Construction Manager/General Contractor Issue Identification*. (Report 2012-25). St. Paul: Minnesota: Minnesota Department of Transportation Research Services.

ⁱⁱ Construction Industry Institute. (2002). *Measuring the Impacts of the Delivery System on Project Performance-Design-Build and Design-Bid-Build*. (NIST Publication No. BMM 2002-10). Austin, Texas: CII Bureau of Engineering Research The University of Texas at Austin.

ⁱⁱⁱ Kulkarni, A., Rybkowski, Z.K. and Smith, J. (2012). *Cost Comparison of Collaborative and IDP-like Project Delivery Methods Versus Competitive Non-Collaborative Project Delivery Methods*. International Group for Lean Construction.

^{iv} Construction Industry Institute. (1997). *Project Delivery Systems: CM at Risk, Design-Build, Design-Bid-Build*. (CII Publication No. 133-1). Austin, Texas: CII Bureau of Engineering Research The University of Texas at Austin.

^v Hale, D.R. (2005). *An Empirical Comparison of Design/Build and Design/Bid/Build Project Delivery Methods*. Austin, Texas: The University of Texas at Austin.

^{vi} Konchar, M. & Sanvido, V. (1998). Comparison of U.S Project Delivery Systems. *Journal of Construction Engineering and Management*, Vol. 124, No. 6, November/December, 1998, 435-444.