NAC Executive Insights

Accelerating Project Delivery through Early Contractor Involvement

Key Points

- Early contractor involvement (ECI) provides a contractor the opportunity to make substantive input to a project's final design.
- Historic cost databases are typically out-of-date and do not reflect current market conditions.
- Optimism bias in the early stages of a project can be misleading in decision making.
- Real-time pricing is a benefit due to early contractor involvement in the planning process.
- Project development that uses a construction-centric focus maximizes cost and time certainty.
- As schedule and cost certainty increases, everyone wins.

Purpose

The purpose of this Executive Insight is to explain the benefits of accelerating project delivery through early contractor involvement (ECI), regardless of project delivery method. The Insight will discuss the idea that for projects in which delivery is being accelerated, a paradigm shift to a construction-centric process is required. The goal of that shift is to maximize certainty.

Introduction

The traditional design-bid-build (DBB) the low-bid approach to project delivery, uses a linear approach that requires the design to be fully developed before seeking a contractor to complete construction. One unintended result of this often used process is that the owner and the design consultant become totally focused on the details of the design. They proceed to make decisions by technically comparing design alternatives. Those alternatives are supported by cost and schedule estimates based unfortunately on historic data. Although ubiquitous in the design and owner sectors, historic databases are by definition out of date and do not reflect current markets.

The industry then turns to engineering economics in an attempt to bring historic data to the present using cost indices and accounts for future changes using some form of discount or inflation rate. The upshot is that owners and design consultants, by using historic data, are stuck with inherently inaccurate

methods for making the financial decisions associated with optimizing the design of a construction project with its budget and delivery schedule.

The results of this traditional approach to project delivery are well-documented by both experience and research. For example, in a seminal study of over $90 billion worth of U.S. transportation infrastructure projects, researchers found the impact of a behavioral phenomenon called “optimism bias” (also termed “appraisal optimism”) evident in the estimates developed in the early stages of most projects. The same study found that underestimating during early stages of project development consistently reached almost 30 percent in almost all of the 300 projects.

In a nutshell, optimism bias is rooted in the opinions of experienced engineers using the “best possible case” for their cost estimates. Further exacerbating the situation is a tendency of nontechnical promoters of projects to latch onto the low number when given a credible range that also includes the “worst possible case.” The *Oxford Handbook of Project Management,* calls this phenomenon “anchoring” and states:

> “Even when people know that the anchor is too high or too low, their adjustments away from it are almost always insufficient.”

A project is then often developed, all the while with the false assumption that an expected lower cost will hold. After cost and schedule risks become a reality during the design and construction process, the actual cost is higher than expected.

ECI Defined

At the most fundamental level, early contractor involvement means that regardless of the contractual project delivery method, the contractor who will be at risk for the project’s construction is given an opportunity to make substantive input to the project’s final design. The timing and amount of that input is a function of the project delivery method.

ECI is *not the same as* hiring a construction manager to act as the owner’s agent. Additionally, the use of the term ECI is broader than the definition of ECI in Australia and New Zealand (ECI-A,) where it is a recognized project delivery method. ECI-A, in fact, involves two contracts: one for planning and another for design and construction. Figure 1 shows the spectrum across which contractor involvement is found in each of the major project delivery methods.

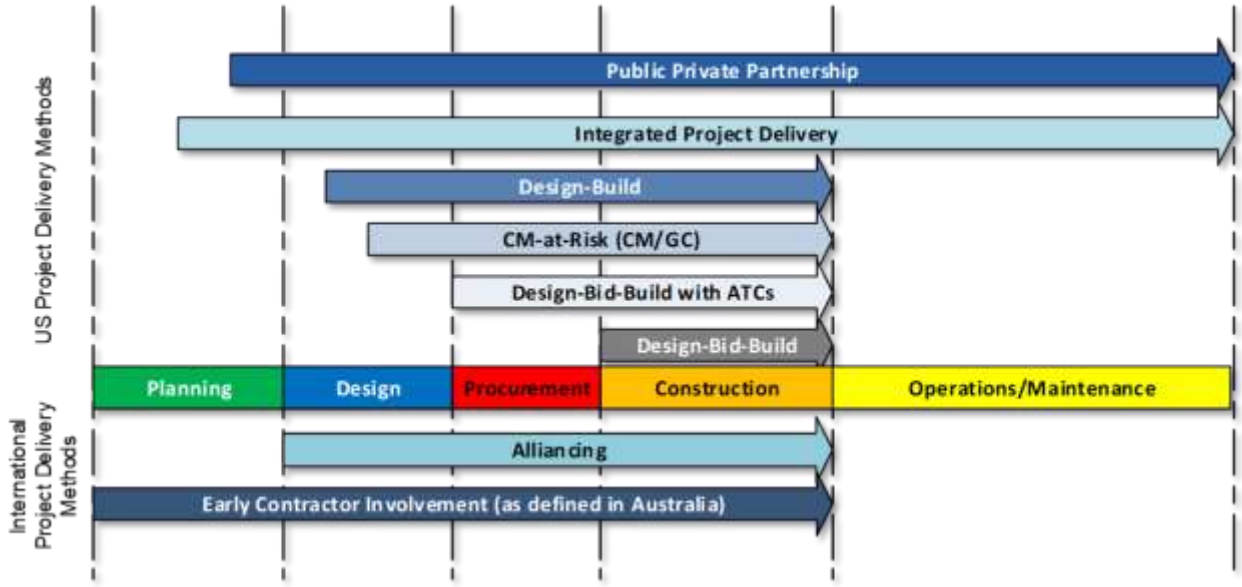

Figure 1. Spectrum of Project Delivery Method Coverage of Project Development and Delivery Process

In Figure 1, P3, IPD, and ECI-A bring the contractor on board during the planning phase, which provides an opportunity for the contractor to have influence on the environmental permitting process as well as other early design decisions that will ultimately define the final scope of work. DB, CMR, and alliancing typically start contractor involvement at some point in the design process.

Adding alternative technical concepts (ATC) to the DBB procurement phase permits a "last bite at the apple" opportunity for construction contractors to propose confidential changes to the baseline design during bidding and actually build their approved ATCs if awarded the contract. While this approach is not widespread, it has been used effectively in departments of transportation in Alabama, Michigan, and Missouri, and is approved to be used nationwide by the U.S. Federal Highway Administration. ECI has been successfully employed across the entire project delivery life cycle: from selecting the construction contractor at project initiation in Australia to the last-minute opportunity to gain enhanced constructability by encouraging confidential ATCs during DBB procurement.

Using Early Contractor Involvement (ECI) and Real-Time Pricing

Using early contractor involvement (ECI) as an alternative, a construction contractor calls a material supplier for a quote on the cost of a specific amount of material on the day it is needed on the jobsite. This is "real-time" pricing and that price is incorporated into the contractor's bid. The same contractor can use real-time pricing for labor and equipment and will get quotes from all the required subcontractors. The only major unknown now is the value of the risk associated with a given project.

Real-time pricing is only one benefit of bringing a contractor into the project planning and design process. When combined with constructability knowledge (the in-depth knowledge of means and methods and construction work sequencing), cost and schedule certainty are increased as those factors

are now known for the project's final scope of work that will be reflected in the design. The project development and delivery process with ECI now shifts from a design-centric approach focusing on cost and time savings to a construction-centric approach, where cost and time certainty are maximized.

Moving away from design-bid-build, alternative project delivery methods such as construction manager-at-risk (CMR), construction manager/general contractor (CMGC), design-build (DB), integrated project delivery (IPD), public private partnerships (P3), and international methods known as alliance contracting are all structured to increase integration and collaboration between the owner, designer, and construction contractor through early contractor involvement in the design process.

Value Added through ECI

A recent study to quantify the benefits of ECI finds that the ability to accelerate the schedule, flexibility during design and construction, and contractor design input were the most frequently cited benefits of ECI regardless of project delivery method.

Table 1, limited to the three most common project delivery methods, reviews the research findings of almost 7,000 U.S. projects of all types. When time and cost growth are used as the measure of certainty, the use of ECI in both DB and CMR increases both measures.

Table 1: Summary of Research Findings of Time and Cost Growth

	Time Growth			Cost Growth		
Author	**DBB**	**DB**	**CMR**	**DBB**	**DB**	**CMR**
Sullivan et al. (2017)	18.40%	10.70%	10.20%	5.10%	2.80%	5.80%
El Asmar, et al. (2013)	22.90%	6.40%	3.20%	3.70%	6.30%	4.20%
GSA (2015)	24%	13%	5%	35%	14%	5%
Gransberg et al. (2003)	19.00%	-1.40%	-	18.80%	2.20%	-
Konchar and Sanvido (1998)	4.40%	0.50%	0.30%	4.80%	2.40%	3.40%
FHWA (2018)	18.00%	-3.00%	2.00%	4.20%	4.00%	0.90%
West et al. (2012)	4.80%	-4.20%	-6.20%	2.90%	-1.20%	-6.80%
FHWA (2006)	4.80%	-4.20%	-	4.30%	6.00%	-
Bogus et al. (2009)	5.00%	4.30%	-	-	-	-
Average	**13.48%**	**2.46%**	**2.42%**	**9.85%**	**4.56%**	**2.08%**

Contingency

Contingency, from the owner's perspective, is a measure of efficient use of available capital. As the required contingency amount drops, the owner is tying up less available funding on the given project and potentially can use more of the budget to fund additional construction. As schedule and cost certainty increases, everybody wins. Owners are able to fund more construction projects on which designers and contractors will work to grow their companies. In the public sector, the taxpayer gets more value for money as more infrastructure is rapidly rehabilitated, rebuilt, and newly constructed.

This is achieved because ECI provides construction-centric and accelerated project delivery with real-time pricing. The entity that will construct the project (regardless of the delivery method used) assists in optimizing the scope and schedule with its means and methods.

Importantly, time and cost *growth* are relative project performance metrics that do not directly indicate time and cost *savings*. Rather, they measure the change from the awarded schedule and contract amount. The two metrics are indications of how well the project delivery plan was executed and how much the project's scope of work changed after contract award. This is another way to indicate how much contingency the owner must allocate to cover the unknowns at the time of contract award.

Summary

The research cited above and other credible studies conclusively show that ECI not only provides a recognized ability to accelerate project delivery, but increases the certainty that the accelerated project will achieve its schedule and budget objectives. Beyond these results, several common-sense conclusions apply to the value of ECI:

- The old idea of involving the construction contractor in the design process has literally centuries of successful practice. Until the late 19th Century, capital construction projects were delivered by a master-builder who planned, designed, and constructed the facility for the owner. The separation of design and construction that later became DBB project delivery was a reaction to government corruption and mismanagement. The Brooklyn Bridge is a notable example of a complex project successfully delivered by master-builders, the Roebling family.
- While saving time and money on a construction project is certainly desirable, finishing that project on schedule and on budget equally desirable. Cost savings are short-term benefits, whereas spending the available budget on building the highest quality project results in long-term lifecycle benefits.
- Designing a given project around a specific contractor's preferred means and methods as happens in ECI makes that project more likely to be constructed effectively and efficiently, which in turn reaps benefits in terms of safety, quality, and schedule certainty.
- ECI enhances both collaboration between the personnel that make up the project delivery team and integration of the business systems used by the companies involved in the project.
- When the project delivery environment becomes less adversarial, the resources wasted on making sure each entity in the project can defend itself in litigation, not to mention the time and cost of litigation itself, can instead be invested in accelerating the delivery of the final constructed project.

ECI changes the project delivery paradigm from being design-centric to construction-centric. Early construction input to design provides a flexible foundation to optimize a project's required scope of work with its budget and schedule constraints.

About the Author

Douglas Gransberg was elected to the National Academy of Construction in 2020. His contributions to project delivery have resulted in a more productive industry in both the public and private sectors. He is the president of Gransberg & Associates, Inc.