AC 2008-243: UNDERSTANDING CONSTRUCTION PROJECT RELATIONSHIPS

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Abstract

Throughout history major construction projects have been designed and built using many different project delivery approaches. Thus, it is important that students studying to be in construction related professions understand various project delivery options and how they may impact the design and construction of their projects. I will attempt to provide an introduction to each of the three most commonly used project delivery approaches. This information could also serve as a simple guide to help construction professionals assist owners as they decide on the approach best suited for their particular project. One objective is to make the point that there is no perfect delivery approach; each has advantages and disadvantages.

Understanding the Project Delivery Approach Choices

When construction professionals are beginning a project, the choice of a construction project delivery approach is critical. This decision is often based on a number of factors, including past experience, skill, and time availability of the owners' project staff. Additionally, the owners must also decide on their priorities. The four main criteria for the success of any project are cost, quality, time, and safety. There are many viable project delivery methods available today. The following three approaches are the most popular construction project delivery methods:

Design/Bid/Build (also called the Traditional Delivery Method)
Construction Manager @ Risk (CM@R)
Design/Build (D/B)

Design/Bid/Build Approach

This is the traditional project delivery method, and is sequential in nature. The owner selects an architect and/or engineer to design the project. After the owner approves the design, it is put out for bids to general construction contractors. In most cases the lowest responsible bidder is selected and enters into a contract with the owner. The architect and/or engineer often continues to administer the construction phase of the project for the owner.

This approach gives the owner the most control. The owner is generally involved throughout the design phase, making decisions on the trade-offs between scope and quality, and traditionally delegating the monitoring of construction quality to the architect and/or engineer. By allowing all responsible and qualified contractors to compete on an equal low-bid basis, this approach eliminates allegations of owner favoritism, real or perceived, in the contractor selection process. However, because there is no opportunity for input from the contractor during the design phase, their expertise is unavailable on what may provide the best value in trade-offs between scope and quality. The construction contract is usually done on a lump sum basis, and savings are not returned to the owner. Design/bid/build projects normally do not allow for fast track design and construction, and as a result, can take more time than those delivered by other approaches.

On the one hand, there can be less owner risk because it is the traditional project delivery approach and the project participants understand each other's role and responsibility. On the other hand, design/bid/build relationships are generally forced marriages that change with each project. Because all team members are not involved throughout the entire project delivery process, contractor bids may come in higher than budget and long-lead time items may not have been properly considered in the design. And because the owner has controlled the design through completion and transferred virtually all risk to the contractor during construction, when mistakes or unexpected circumstances arise adversarial relationships can develop between architect, contractor, and owner as they argue about who to blame.

The design/bid/build approach is generally best suited for projects when:

- The owner desires the protection of a well-understood design and construction process;
- The owner desires the lowest price on a competitive bid basis for a known quantity and quality of project;
- The owner has the time to invest in a linear, sequential, design/bid/build process;
- The owner needs or prefers total control of the design process.

Construction Manager @ Risk (CM@R) Approach

This project delivery approach is similar in many ways to the traditional design/bid/build approach in that the construction manager (CM) acts as a general contractor at risk during construction. That is, the CM holds the risk of subletting the construction work to trade contractors and guaranteeing completion of the project for a fixed price negotiated at some point either during or upon completion of the design. However, unlike design/bid/build, the CM also provides advice to the owner and architect/engineer during the design on budget, schedule, and constructability, and construction usually starts before the design work is complete.

Because this is not the traditional method, some owners do not fully understand how to successfully implement it and as a result, rely on the CM when they should question them. For example, owners sometime forget that because the CM is serving as an at-risk contractor once the GMP is established, the CM's interests may differ from the owner's during construction.

Like with the design/bid/build process, projects built using the CM@R approach are prone to controversy between the architect/engineer and the CM over change orders, disputes, and claims when the unexpected occurs after the GMP is in place. This tends to happen more often on design/bid/build because the contractor is not involved when design decisions are made, unlike the CM approach where the contractor is involved with design decisions and would be more familiar with the project.

CM@R approach is generally best suited for projects when:

- When the owner desires to start construction before the design is complete yielding a shorter overall project duration;
- When the owner desires the benefits of an architects/engineers and contractor perspective in making decisions on trade-offs during the design phases;
- When the owner desires the CM's expertise in pre-qualifying trade contractors to achieve better performance and workmanship from the trade contractors;

- The architect/engineer and CM working together during the design and construction phases of the project can result in a better product for the owner.

Design/Build Approach

With the D/B approach, the owner contracts with one entity (the designer/builder) to take responsibility for the delivery of their project from the beginnings of the design phase until occupancy. The selection is usually made by soliciting qualifications and price proposals from designer/builders, who are usually teams of contractors and architects/engineers, before or during the conceptual design phase of the project. The D/B team is usually led by a contractor resulting in the owner issuing one contract to the contractor, who in turn contracts with an architect/engineer for the design services.

D/B can have several advantages for the owner. First, the designer/builder is the single responsible party to the owner and generally this will result in the project being designed and constructed in a shorter period of time. Because they are together by choice and functioning as one team, the designer and builder may work together better. Errors and omissions in the construction documents are the D/B team's responsibility and are not passed on to the owner.

The major trade-off for an owner considering the D/B method is the owner's loss of control during the design phase and the lack of an architect/engineer's representation of the owner's interests. As a result, the outcome can be disappointing or result in a facility that is not totally consistent with the owner's needs or expectations. When this happens due to the lack of clarity by the owner during the D/B proposal and contracting process, the owner may have to pay more to get what they want by issuing change orders to the D/B team.

The D/B approach is generally best suited for projects when:

- The owner is willing to forego control of design and does not seek a highly complex design program/solution;
- The owner can provide a complete definitive set of performance specifications and program for design to the designer/builder to serve as the basis for the designer/builder's proposal and the owner's contract with the designer/builder;
- The owner has realistic expectations for the end-product and a thorough understanding of the risk of giving up control of the design;
- The owner desires a fast delivery method and is willing to compensate the D/B firm for its assumption of risk for design and construction.

Understanding Project Delivery Approach Relationships

The relationships that form during the project delivery process can be very complex. These relationships are influenced by many things but most important are the number of players involved, the contractual obligations of the players, the order in which the players come on board, the time the players spend together and shared or conflicting motives of the players.

Design/bid/build relationships can best be identified by the following characteristics:

- Three prime players - owner, designer, builder

- Two separate contracts - owner to designer, owner to builder
- Final contractor selection based on lowest responsible bid or total contract price

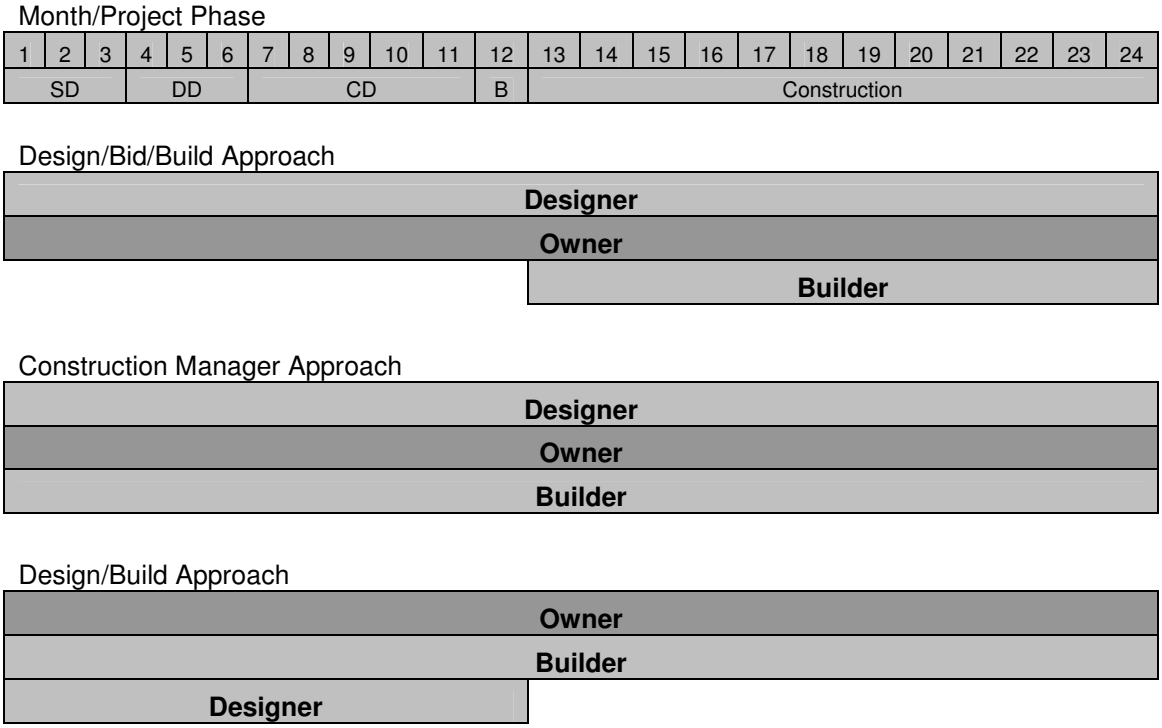
CM@R relationships can best be identified by the following characteristics:

- Three prime players – owner, designer, CM
- Two separate contracts – owner to designer, owner to CM
- Final providers selected based on aspects other than total cost

D/B relationships can best be identified by the following characteristics:

- Two prime players – owner, designer/builder
- One contract – owner to designer/builder
- Provider selected based on total project cost

The matrix below attempts to graphically illustrate the project delivery approaches by comparing the number of players involved, the contractual obligations of the players, the order in which the players come on board, and the time the players spend working together. The matrix assumes a 24 month construction project (with one year dedicated to design and documentation and one year to construction) and involving three key players (an owner, a designer, and a builder).



It is through an understanding of this matrix that a student can see that the project delivery approach can create different project dynamics and more importantly different player relationships. With the D/B/B approach the designer works directly with the owner for the entire design phase before the builder comes on board, thereby allowing the designer to foster a much better bond with the owner than the builder. With the CM@R approach the designer and the builder work directly with the owner for the entire project, thereby creating a forum for the

designer and builder to compete for the owner's trust and confidence throughout the duration the project. With the D/B approach the designer works with the owner through the builder for the design phase of the project only while the builder works directly with the owner for the entire project, thereby allowing the builder to foster a much better bond with the owner and insulate the designer from the owner.

Student Learning Exercise

In an effort to help students fully understand these project delivery methods the following role playing classroom exercise has been developed. Students are divided into three groups, one representing the owners, one representing the designers, and one representing the builders. Teams are then organized with one owner, two designers and two builders. Team A is to produce a project using the D/B/B approach, Team B the CM@R approach, and Team C the D/B approach. The project is the building of a cardboard ¼" scale model of a 2,000 square foot house.

Team A

- The one owner must interview and select one of the two designers to produce a sketch for their house model. The selection is based on the speed and quality of the sketch. The selected designer must design a house that meets the owner's approval. After the design is approved the designer must produce a sketch depicting the selected design. Once the owner approves of the sketch, the owner then gives the designer's sketch to the two builders who independently decide how fast they can build the model. The owner, with assistance from the designer, must select whoever says they can build it faster. Armed with cardboard, an exacto blade, white glue and the designer's sketch the builder must build the model. Success is measured by the time and quality of the final model.

Team B

- The one owner must interview and select one of the two designers to produce a sketch for their house model and one of the two builders to build the yet to be developed designers sketch. The selection is based on the speed and quality of the sketch and the speed and quality of the model. The selected designer must design a house that meets the owner's, with assistance from the builder, approval. After the design is approved the designer must produce a sketch depicting the selected design. Once the owner approves of the sketch, the owner then gives the designer's sketch to the builders who decide how fast they can build the model. Armed with cardboard, an exacto blade, white glue and the sketch the builder must build the model. Success is measured by the time and quality of the final model.

Team C

- The one owner must interview and select one of the two designers/builder teams to produce their house model. The selection is based on the speed and quality of the model. The selected designer/builder team must design a house that meets the owner's specifications, as described in a written paragraph, and within the time period promised. The designer must design a model that they think meets the owner's specifications and

armed with cardboard, an exacto blade, white glue and the sketch the builder must build the model. Success is measured by the time and quality of the final model.

Speed or time is only one aspect of a successful project. However, speed or time is used here to help students understand the different project delivery methods. Students see the impact these delivery approaches have on the design, the control over the design, and the speed (and cost) at which the design can be delivered. In many respects the key to any project delivery method really lies in the relationships that develop and how these relationships affect the final product and all those involved in the making of that product.

Conclusion

During the past couple of decades, several alternative project delivery methods have evolved for the management of design and construction projects. How is one to know what delivery approach is best for which project? Each method has certain advantages and disadvantages depending on the owner's circumstances and goals. For this reason, the answer to this question cannot be easily given or quickly decided. But beware; with many of the construction delivery approaches, once the choice is made, you are committed. The key to making the correct choice is in understanding the different approaches, the objectives of the owner, and the specifics of the proposed project.

There is no single path, but rather many paths that can be taken to manage design and construction factors while meeting each project's unique needs. Students studying in the construction related professions need to be prepared to work with all of the possible project delivery methods.

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