

Pre-Construction Management by the Independent Cost Engineer

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ABSTRACT: The expedient culture within the construction industry often results in a tendency to rush the pre-construction stages of a project, and to diminish or eliminate the many benefits of a properly performed pre-construction process. Traditional delivery methods and pre-construction team structures have not encouraged the integration of design and construction activities, leaving a constant rift between owners, architects, and contractors. By incorporating a pre-construction manager (PCM), a bridge is formed to facilitate the proper integration and communication of team members.

KEY WORDS: Construction, pre-construction, design, project management, and workflow

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The choice of who is best suited to perform as pre-construction manager (PCM) will be discussed in this article, along with why traditional team members may not be suitable. The sophistication of the client is limited, and they are often left with reservations about the accuracy and importance of pre-construction services.

In today's market, most design professionals are reducing their fees and "extra" services, like constructability reviews, are eliminated from the scope of work. The consequence of this is rushing the design stage and missing the lowest cost opportunity to meet the project objectives.

The construction manager/general contractor (CM/GC) is the most qualified pre-construction team member to perform and manage the pre-construction process. Not many clients are aware that there are, however, several limitations of the CM/GC to the successful performance in the role of pre-construction manager.

The pre-construction manager (PCM) needs to understand the client's priorities and business objectives, while providing

unbiased advice. Such unbiased advice is critical to helping the client in gaining a competitive advantage. Soliciting an independent cost engineer to serve as pre-construction manager is one way to ensure the pre-construction deliverables are accurate and unbiased.

This article analyzes the traditional project delivery methods along with the primary pre-construction team members to decide why the independent cost engineer is most capable in this role. The article will also discuss the benefits to each team member and the industry as a whole.

The culture within the construction industry, and of many clients, is an environment of expediency. The inevitable result is a tendency to rush the pre-construction stages of project development and to diminish or eliminate the many benefits of a properly performed and managed pre-construction process [1].

The traditional delivery methods available to clients have not encouraged integration between design and construction, but rather have fostered a pre-construction "hierarchy" that contradicts any notion of a "team" atmosphere. The selected project delivery method has tremendous impact on the definition of the pre-construction process and whether any pre-construction services, beyond estimating, will be required at all [4]. Integration of design and construction is an expectation of the client. They do not considerate it optional or extra [1].

Pre-construction services are a set of planning techniques and methods developed to serve both the client and the design team. These serve as a source of reliable

information from which the best decisions can be made regarding a project's time, cost, and quality objectives.

The pre-construction phase of a project is as critical as the construction itself. During pre-construction, the team plans the work to be implemented during construction. Clients are also provided with an early analysis of the effects materials, equipment, systems, techniques and schedules will have on project time, cost, and quality.

There is no substitute for the proper implementation and management of pre-construction services. A responsibility often overlooked by the client, pre-construction management, is an important part of the pre-construction process and, in fact, is one of the keys to a project's success [1].

Today, too many projects are being "stripped down" or even cancelled because of budgetary conflicts. The inevitable result is a lack of innovation and a constant rift between owners, architects and contractors.

This article will analyze the traditional project delivery methods along with the primary pre-construction team members in an attempt to decide who is best qualified to properly manage the pre-construction process. We will also discuss the benefits to each team member and the industry as a whole.

Pre-Construction Management Definition

Pre-construction management, as defined by the author, is the implementation, facilitation, scheduling, supervision, quality control and analysis of pre-construction services performed on a project.

The pre-construction services being managed may include, but are not limited to the following.

- Scope definition;
- Feasibility studies;
- Constructability and design reviews;
- Quantity takeoff;
- Conceptual estimating;
- Preliminary budgeting;
- Value engineering;
- Scheduling;
- RFPs/bid forms; and,
- Bid reviews and comparisons.

Pre-construction management can easily be compared with project management. Just as a project manager oversees and is responsible for all of the individual trades performed during construction, a

	Program	Conceptual	Design Development	Bid Documents	Construction Documents	
	Pre-Construction Phase					Construction Phase
Design-Bid-Build						
CM @ Risk						
CM Agency						
Design-Build						

Figure 1— Pre-construction Involvement, Relative to Design Phase by Project Delivery Method [4]

pre-construction manager (PCM) oversees and is responsible for all of the individual tasks performed during the pre-construction process.

Seven knowledge areas of pre-construction management are the following [5]:

1. Pre-construction scope management – defines the scope of pre-construction services to be implemented, managed, and delivered to the client.
2. Pre-construction time management – organizes the order in which the pre-construction services are to be performed, and assigns start and finish dates along with objective delivery milestones.
3. Pre-construction cost management – an assessment and control of the time, material and equipment costs incurred in the performance of pre-construction services.
4. Pre-construction quality management – the process of ensuring the pre-construction services will satisfy the needs of the project and the client.
5. Pre-construction resource management – the process required to make the most effective use of the people, information and systems involved.
6. Pre-construction communications management – ensures the proper collection, dissemination and reporting of pre-construction information.
7. Pre-construction integration management – the facilitation of cooperative efforts between pre-construction team members.

Items 1-4 (scope, time, cost and quality) are the elements which determine the deliverable objectives of the project and items 5-7 (resource, communication, and integration) are the elements which provide the means of achieving the deliverable objectives [5].

Traditional Project Delivery Methods

Clients will typically select one of the following four traditional project delivery methods:

1. **Design-Bid-Build** - a project delivery method in which the agency or owner contracts with separate entities for the design and construction of a project. There are three main sequential phases to the design-bid-build delivery method
 - a. the design phase;
 - b. the bidding phase; and,
 - c. the construction phase
2. **Construction Manager @ Risk** - a delivery method which entails a commitment by the construction manager/general contractor to deliver the project within a guaranteed maximum price (GMP).
3. **Construction Management-Agency** - a fee-based service in which the construction manager (C.M) is responsible exclusively to the owner and acts in the owner's interests at every stage of the project.
4. **Design-Build** - a construction project delivery system where the design and construction aspects are delivered by a single entity known as the design-builder.

Figure 1 indicates the relative level of pre-construction involvement required of contractors and subcontractors for each traditional project delivery method. Each construction project is unique and owners approach the selection of their delivery method and construction partner differ-

ently. But the recent trend toward more integrated project delivery methods demands greater pre-construction activity than required with design-bid-build [4].

This increase in activity requires additional management for the process to be successful and to serve as a true value to the client. Pre-construction management is an essential part of all project delivery methods and the benefits gained by the client must outweigh the costs.

The Traditional Pre-Construction Team

While there is no fixed definition, a typical pre-construction team flow chart may closely resemble what is shown in figure 2.

In the figure 2 configuration, each pre-construction team member reports directly to the client, with little or no communication between team members. As a result, team members may interpret the wants and needs of the client differently. A client's program requirements may often conflict with their budgetary goals and this typically leads to friction between team members. The only outcome of such an environment is a constant "back and forth" between the team members with no real progress, solutions or innovation. The end result is a lack of progress, solutions and innovation, with increasing budget concerns and a diminished value to the client.

In order to properly manage the diverse and complex tasks undertaken during pre-construction, it must be decided which team member is best suited to act as the pre-construction manager (PCM).

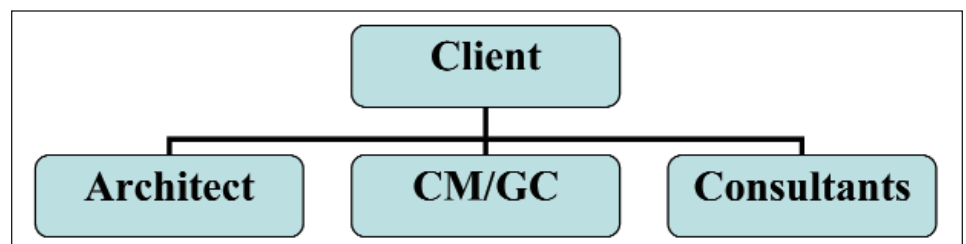


Figure 2— Typical Pre-Construction Team Flow Chart

The Client

Project risk attributable to poor scope definition and improper levels of pre-construction services are major obstacles to project success. Each project has its own risk factors and in today's uncertain economic climate, risk mitigation is of paramount importance to clients and their investors. In this increasingly competitive marketplace, clients must also be assured that their investment is safe in the hands of the "lowest responsible bidder."

In order to mitigate the most significant project risk factors, clients often employ architects and/or general contractors to perform pre-construction services. These pre-construction services include scope definition, feasibility studies, constructability/design reviews, quantity takeoff, conceptual estimating, preliminary budgeting, value engineering, scheduling, RFPs, bid forms, bid reviews and comparison reports.

Most experienced clients are well versed in the construction industry. They can speak the language and know which important questions to ask. They are investment professionals who see the big picture and make sure the numbers add up in their favor. What most clients are not experienced in is the analysis of the project from a constructability standpoint, where efficiencies and cost savings can be identified prior to field implementation.

With a focus on the big picture, clients typically do not get tied up in the small details of a project. When presented with feasibility studies and preliminary budgets, most clients are only concerned with one number... "the bottom line."

Typically, days of quantity takeoff, weeks of pricing exercises and countless hours of supplemental information result in a simple turn to the back page, to see the final outcome, with no immediate interest in how or why the number was derived. With no real ability to interpret and dissect the information in front of them, clients are often left with reservations and an uneasy feeling about the accuracy of such studies and budgets.

Being only able to take the pre-construction information at face value leaves a client without solutions and an inability to properly reassess project objectives. The consequences of performing in the role of PCM without the knowledge and experience required to analyze the information presented is a waste of both time and client resources.

As part of their risk management strategy, the client needs to have accurate, well presented information, that identifies possible problems, and more importantly, solutions. To ensure this happens, the client should retain an independent PCM to ensure their best interests are paramount and the dynamics within the pre-construction team are well managed. As an independent advisor, the PCM is charged with challenging the status quo when deliverables do not meet the intent of the client relating to cost, design, and duration. The ability of the PCM to quantify all project costs, compare them with historical data sets from similar projects, and provide alternate solutions, ensures that the client will get more value for their investment.

The Architect

An architect's primary objective and focus is on providing the client with the best, most efficient design possible that meets all of the client's functional requirements.

Architects must process all of the client's wants and needs into functional and effective design solutions. This is not always possible. While trying to manage the client's expectations, architects are often quite reluctant to add the additional restriction of cost control to what may already seem like an endless list of constraints. These constraints can be because of location, site limitations, square footage, resources and economic conditions, etc. However, cost is always of paramount importance to a client. After all, this is an investment and they need to gain the most value for the money.

As previously mentioned, clients expect the integration of design and construction. Architects must come to appreciate the process of construction when formulating their design and engage general contractors and other building professionals to perform constructability and buildability reviews.

"Constructability is an integrated approach where design takes account of the construction process and balances various project and environmental constraints. Buildability is the extent to which design of a building facilitates relative ease of construction, subject to the overall requirements for the completed building [1]." Both processes are intended to facilitate the overall project objectives of time, cost and quality and if performed successfully, the project objectives should be more capable of being achieved [1].

In today's competitive market, most architects are reducing their fees. As a result, "extra" services, like constructability and buildability reviews are eliminated from the architect's design scope. The unintended result of rushing the design stages of a project is missing the lowest cost opportunity to meet the project objectives (See figure 3). Changes introduced in the early design stage of a project are inexpensive and can have major impact on increasing the overall value of a building. Alternatively, late changes in the design stage or during construction are expensive or impossible. This usually leads to a disruption in the delivery process, resulting in cost overruns and schedule extensions [1]. Figure 3 illustrates the potential savings (or cost reduction) relative to the design stages of a project.

The two primary concepts in the development process are cost and value. It is therefore important that these two issues are of major importance in the design stages as well. A balance between these two components must be achieved for the pre-construction process to succeed [1].

Architects alone should not bear the responsibility of ensuring the client's needs are met in the program stage of the project. The client is better served at this point by engaging a well versed and independent PCM. This will ensure that the client and the team are served by the best information available at the early stages of project development.

The PCM should be tasked with balancing cost, time and quality for the benefit of the project, its users and, most importantly, the client. The role of the PCM is not simply to price the decisions of the design team, but to be intimately involved in the design discussion and decision making process [1].

Each design decision made must be viewed in relation to the project as a whole. Communication between pre-construction team members on the impact of decisions made for specific elements is essential and must be managed so that the best final design scenario can be implemented. This type of management requires a high level of activity, expertise, tact and ingenuity in order to arrive at a balanced approach that serves the client's best interests.

The CM/GC

The lack of standardization and uniformity within the construction industry makes it easy for new firms to enter and increase

competition. Unfortunately, this easy entry and additional competition often makes it difficult for established firms to promote innovation, which then hinders progress towards an increase in efficiency. This increase in competition also promotes competition on cost alone, and leaves little consideration for true value.

The construction manager/general contractor (CM/GC) is by far the most qualified pre-construction team member to perform and manage the pre-construction process. There are, however, several limitations to the successful management of the pre-construction process that not many clients are aware of.

Pricing Accuracy

Budget control is an important part of the pre-construction management process. The CM/GC must come to cost conclusions based upon historical data and their specific experiences. The accuracy of the historical data is directly related to the similarities between projects, the level of success the CM/GC had on past projects, and other factors such as the local market resources, project schedule, material costs and environmental changes. Because of these many issues, the cost basis must also be checked by a third party to confirm or to question the budgetary conclusions. This ensures the quality and accuracy of the service and enhances the information for various uses by the client.

Prior Experiences

The prior experiences of the general contractor relative to certain construction materials, methods, and systems may bear weight on various design decisions. Some materials, methods and systems may be overlooked or excluded in the design phase even though they present a competitive advantage to the client and the project as a whole.

Several resources for information must be accessed for best construction materials, methods, and systems including input from other competing CM/GCs and trade contractors. Independent insight to the advantages and disadvantages of materials, methods and systems must be obtained while considering local market resources, project schedule, material costs and environmental implications. A commitment must be made to making decisions with the client's best interests in mind.

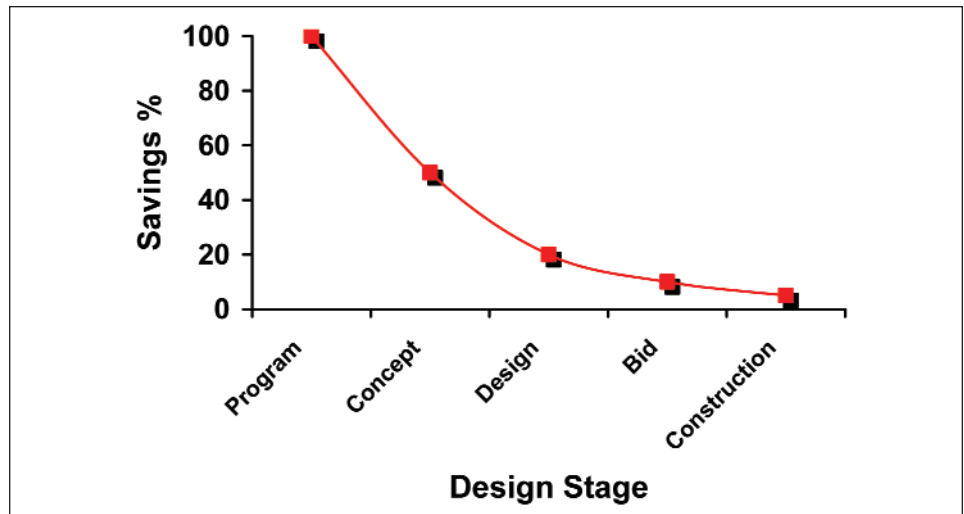


Figure 3— Potential Cost Savings, Relative to Design Stage [3]

Conflict of Interest

A potentially inevitable result of a competing general contractor performing pre-construction services for a client is a conflict of interest.

As an employee of the CM/GC, the first priority is often to support the best interests of the company. As a result, the company's interests may come before those of the client, and very rarely are those interests the same.

In a competitive bidding process, recommendations must be made to the client on which contractor is the lowest, most responsible bidder. This is where an independent third party is most valuable. The client is left to decide to whom to award the project. With little or no expertise in evaluating proposals, the client must seek unbiased counsel. This serves to level the playing field between competing CM/GC's and promotes healthy competition within the industry.

If pre-construction services are not properly performed, managed, and delivered, all of the team work and client resources are wasted. Similarly, if the client is not properly informed during the bid process, the competitive market shall not have served its purpose. The greatest consequence of a poorly managed pre-construction process is a client pursuing a project through construction only to discover the pre-construction deliverables were misleading or inaccurate.

The Independent Cost Engineer (ICE)

In today's economy, few in the industry are willing to put in place anything that might interfere with profit potential. Even fewer are willing to allocate budget dollars on something that may only offer a theoret-

ical return on investment.

Some would argue that a pre-construction manager (PCM) only adds another layer of front-end cost. But pre-construction management is not about adding cost. It's about ensuring that the front-end costs incurred offer the most value possible. It's an effort to ensure that the competing interests of the pre-construction team are well managed and the client's best interests are placed first.

The independent cost engineer (ICE) is the most qualified individual to perform in the role of PCM. The ICE is able to maintain a fair and balanced decision making process while representing the best interests of the client and the team. This also assures all team members that their pre-construction efforts are not wasted by the lack of effort of any other team members.

With the addition of the ICE/PCM, our new pre-construction team flow chart will closely resemble figure 4.

Four primary goals of the pre-construction manager are the following.

- Encourage more integration between architects, engineers, building professionals, and contractors.
- Foster greater communication within and between teams while providing adequate client consultation.
- Create the efficiencies required to meet the demand for more complex buildings from more exacting clients.
- Provide the client with a competitive advantage by promoting healthy and fair competition within the industry.

The four goals of integration, communication, efficiency, and competitive advantage are focused on delivering the best value

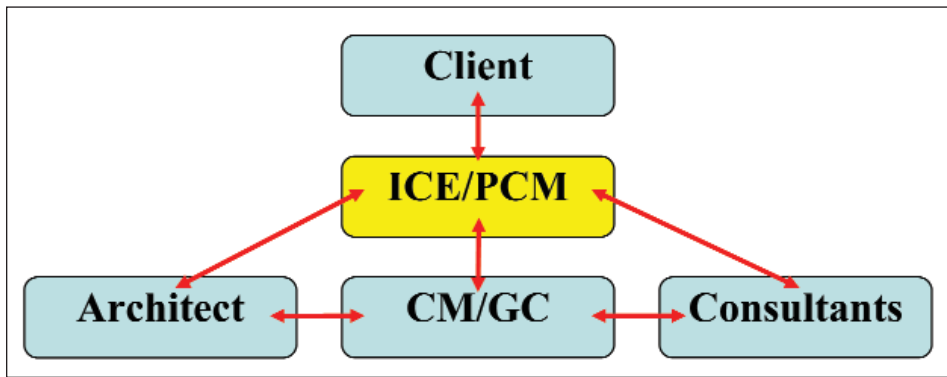


Figure 4— Pre-Construction Team Flow Chart with Addition of PCM

for the client. Only an independent cost engineer can fulfill these requirements because of an ability to remain neutral within the pre-construction team.

This independence allows the cost engineer to best serve the interests of the client, the project and the team. It also facilitates the pre-construction team in reaching their maximum potential by enabling a group of diverse disciplines to work together effectively as a unit to achieve the project's goals [5].

Better pre-construction services will translate into a better construction experience for the team members and most importantly, the client.

Four unique benefits attributed to properly managed and successful pre-construction services are the following.

- More accurate budgets and fewer project cancellations.
- Better, more efficient design and construction methods, resulting in better buildings and client/end user satisfaction.
- An increase in communication, integration and innovation within and between design and construction that will contribute to the overall growth of the industry.
- Fairer competition contributing to the overall well-being of the industry.

An unmanaged pre-construction process can lead to breakdowns in relations within the team and with the client. It can also eliminate the possibility for influencing the total project cost at the lowest expenditure [1].

The PCM needs to place precedence on understanding the client's priorities and business objectives while providing unbiased advice which assists the client in gaining a competitive advantage.

It is necessary for the PCM to get every-

one involved in the pre-construction process to fully understand its objectives and deliverables so that their activities and contribution can be improved. Participants must recognize that with all team members working with clear objectives, the team is able to speed up the time and improve the quality of the decision-making process. This will inevitably result in significantly lower pre-construction costs.

Pre-construction is an essential part of the total development process and it is important that the PCM enforce the best interests of the client during pre-construction activities. By adding extra value through more effective pre-construction activities, the client will gain a better product for less cost, resulting in greater pre-construction value and client satisfaction.

Traditional team members are not suited to act in the role of PCM because of inexperience, partiality or conflicts of interest. Proper pre-construction management is a key factor to a successful project and the independent cost consultant is a perfect candidate to ensure the delivery of the most reliable and unbiased information available.



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ISO Offers Standard on Risk Assessment

ISO/IEC 31010:2009, Risk management – Risk assessment techniques, has been developed jointly by ISO and its partner IEC (International Electrotechnical Commission)

The standard provides a basis for decision about the most appropriate approach to be used to treat particular risks and to select between options.

ISO/IEC 31010:2009 will assist organizations in implementing the risk management principles and guidelines provided by the recently published ISO 31000:2009, itself complemented by ISO Guide 73:2009 on risk management vocabulary. Risk assessment is not a stand-alone activity and should be fully integrated into the other components in the risk management process.

It is available from ISO national member institutes. It may also be obtained directly from the ISO Central Secretariat, price 252 Swiss francs, through the ISO Store, or by contacting the Marketing, Communication & Information department.