



Montréal, Québec
May 29 to June 1, 2013 / 29 mai au 1 juin 2013

OVERCOMING THE DILEMMA OF EARLY PRICING: A STUDY AND ANALYSIS OF TARGET PRICING USING IPD APPROACH

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Abstract: From the earliest of times buyers of construction services have struggled with the best way to establish a fair price for construction work. Starting in the latter half of the 19th century owners increasingly sought fixed single prices, competitively bid, for their construction. This led to the growth of general contracting and the practice remained in force for over 100 years, until the owners once again intervened, tired of change orders, the opaqueness of the process and the constant disputes. They sought out new methods of pricing tied to new methods of project delivery. From the 1970's on experimentations led to various forms of construction management, to design-build and now more recently to radical methods of Integrated Project Delivery (IPD).

All of these methods shared a common feature – the earlier involvement of contracting expertise with the purpose of having the builders as partners and advisors during the design phase. This was all very well but it created a pricing dilemma for the owners: how were they to be sure of obtaining a fair market price for their projects when the traditional providers of prices and those with the greatest knowledge of pricing, the general contractors, were now involved at a stage where designs were incomplete and any pricing given would be subject to numerous assumptions, hedged with conditions and often priced without competition.

The aim of this research is to provide a brief overview of historical evolution of pricing and contracting methods, to investigate the challenges associated with early pricing in alternative delivery approaches, and to study and analyze if/how IPD addresses the challenge of obtaining and sustaining an early fair price for owners. To accomplish the goals, this research has conducted a literature review on early pricing practices, interviews with various institutional owners, general contractors, program managers, and lean institutes who have had experience with early pricing in alternative delivery methods and IPD approach.

1. INTRODUCTION

1.1. Traditional Delivery Approach and Competitively Bid Fixed Price Contracting

From the earliest of times buyers of construction services have struggled with the best way to establish a fair price for construction work. Sir Christopher Wren summed up the options in a letter to the Bishop of Oxford:

“There are three ways of working: by the Day, by Measure, by Great; if by the Day it tells me when they are lazy. If by Measure it gives me light on every particular, and tells me what I am to provide. If by the Great I can make a sure bargain neither to be overreached nor to hurt the undertaker: for in things they are not every day used to, they do often injure themselves, and when they begin to find it, they shuffle and slight the work to save themselves. I think the best

way in this business is to work by measure: according to the prices in the Estimate or lower if you can, and measure the work at 3 or 4 measurements as it rises” (Wren 1681).

While these three options continue in practice today, starting in the latter half of the 19th century owners in the United States increasingly sought fixed single prices, competitively bid before construction work began. Previously the final cost of the work was not known until the project was completed and, for the new owners of this period (industrialists, financiers, speculative developers and large scale public sector entities), a prior price commitment up-front was essential for orderly appropriation and financing guarantees. This led to the growth of general contracting and the requirement for architects and engineers to complete designs to permit the work to be bid.

The practice of Design-Bid-Build remained in force for over 100 years, until the owners once again intervened, tired of change orders, the opaqueness of the process and the constant disputes. They sought out new approaches to pricing tied to new methods of project delivery.

1.2. Historical Evolution Towards Design Construction Integration: Alternative Delivery Methods

From the 1970's on, experimentations have led to various forms of construction management, to design-build and now more recently to radical methods of collaborative integrated delivery. In summary these methods involve the following procedures in one form or another:

- A general contractor/construction manager is selected at an early project stage after a qualifications-based competition which may include quotations for profit and general conditions. The CM/ GC is retained first as an agent/consultant and paid a fee (quoted in the selection process) for providing pre-construction advice to the owner and design team and for preparing cost estimates. At some point, usually as late in the design process as possible, the contractor commits to a guaranteed maximum price (GMP), which frequently includes a contingency reserve for the unknowns at this stage. A provision maybe included for the sharing of any under- and/or over-runs (Kenig 2011).
- Design-Build was seen as a means of coordinating design and construction in a single contract while retaining an element of price competition based on a statement of owner requirements and has become popular in the public sector (Jackson 2010).
- A variation to Design-Build, called Bridging, attempts to solve the pricing problems arising from inadequate early bidding documentation. The process involves the owner appointing an architect or engineer who develops in conjunction with the owner, an advanced conceptual design and bidding package, which is used to select a design-build team, which quotes a target price. Design proceeds and prior to a construction start, a firm fixed price is submitted. If this is not acceptable then the owner reserves the right to terminate and bid the work out on the market, using the design-builders documents (Heery 2012).

All of these methods shared a common feature – the earlier involvement of contracting expertise with the purpose of having the builders as partners and advisors during the design phase.

1.2.1. Challenges Associated with Pricing in Alternative Delivery Methods

Each of the integrated approaches mentioned above has its supporters and each can work well especially with an experienced and committed owner. However many owners remain unconvinced that they are obtaining a fair price from the industry for their construction work. This is evidenced by a number of owners who have returned in these highly competitive post-recession days to the traditional Design-Bid-Build approach for recent projects. Their concerns with respect to early pricing as voiced to the authors during our surveys are included in Table 1.

Table 1: Challenges associated with early pricing in alternative delivery methods

The first cost quoted is rarely the final cost. “The guaranteed maximum price becomes a guaranteed minimum price”.
Even though their attorneys write vigorous contracts transferring risk, the result of a risk failure invariably finds its way back to the owner.
Most designers seem oblivious to and inexperienced with cost issues leaving the owner unprotected when dealing with contractors.
Placing monetary incentives in contracts are self-defeating as the conditions applied to them are frequently gamed.

1.3. Integrated Project Delivery (IPD): The Latest and the Most Integrated Approach

It might be considered inevitable that the progression in modes of project delivery from CM-at-Risk to Design-Build over the last forty years would be followed by another step whereby the owner effectively joins the design-build team to create a fully integrated ‘corporation’ for the fulfillment of the project.

The industry is now in the experimental phase of working out how this may be best achieved. This is a radical move that turns on its head the traditions of centuries, so it is not surprising that several barriers need to be surmounted if it is to be widely adopted. One of these barriers of course is the issue of this paper – how to establish a fair price and an incentive framework that brings all parties to a common purpose.

2. OBJECTIVES AND SCOPE

This research aims to investigate how owners deal with the issue of early pricing in integrated practices. The question that triggers this investigation is how owners can ensure obtaining a fair market price for their projects when the traditional providers of prices and those with the greatest knowledge of pricing, the builders, are now involved at a stage where designs are incomplete and any pricing given will be subject to numerous assumptions, hedged with conditions and often priced without competition. The scope of this research has involved a literature review and interviews with practitioners and experts in the construction industry. The authors contacted executive level managers of various well-known owner, construction, and program management organizations, and the Lean Construction Institute and invited them to participate in this study by engaging in an open-ended question and answer based discussion with the authors. More than a dozen face-to-face and phone interviews were conducted with these organizations to get their insight and experience on the issue of early pricing in integrated design and construction practices. Furthermore, this study is built upon the expertise of the two authors on pricing and IPD. One author has over forty years of experience as a quantity surveyor and cost estimator and the other author is specialized in the evolving field of Integrated Project Delivery (IPD) approach for more than 5 years and has interviewed many IPD participants and developed several IPD case studies.

3. DISCUSSION OF THE RESULT

3.1. Recommendations For Early Pricing In Alternative Delivery Methods

This section includes information collected from the interviews described above. The interviewees were asked to share their insight and experience with developing and sustaining early pricing. They were asked to provide recommendations on how owners can ensure obtaining and maintaining a fair construction price in an alternative delivery method like DB or CM@Risk.

- Early pricing is needed for financing approval

Owners need to have an early price established prior to seeking project approval (Owner 1, 2012)& (GC1, 2012).

- Selection procedures

Early in the design phase, contracting teams can be selected based on their qualifications, experience, General Condition quotation and their fee. (GC2, 2012).

- A pre-construction audit is beneficial in reaching a mutual understanding of allowable charges to be included in the pricing

Pre-construction audit will help both owners and contractors reach a mutual understanding of allowable charges to be included in the project price. Owners should include in their RFP a list of allowable charges, the categories, and their breakdown (Owner 1, 2012)& (GC1, 2012).

- The contract must clearly outline responsible parties for each cost

Historically, most of the disputes on cost allocation have been the result of ambiguity in the contract in outlining what charges are the owner's responsibility and which ones must be included in contractor's price. Minimizing the contract's grey zones help the owners with obtaining and sustaining a fair price.

- Establishing general condition costs as a fixed lump sum or target amount in the GMP

Some owners recognize that General Conditions are one of the greatest variables of project cost. Most of the time, cost overruns are due to schedule delays and do not result from an inaccurate estimate of the GMP. Schedule delay leads to an extra costs for supervision (salary of management staff). As a result some owners try to transfer these risks to the contractor by establishing General Condition cost as a lump sum (GC1, 2012).

- A client workshop would be beneficial in bringing parties to a common understanding

In some cases, the executive directors of owner's organization who are in charge of funding approval for the project may not have enough knowledge about the nature of construction projects and how cost is a result of many variables. A client workshop on construction process, pricing procedure, and the factors affecting cost could be highly beneficial in bringing parties to a common understanding of the terms, conditions, and the process (Owner 1, 2012).

- Shared construction contingency could be self-defeating in obtaining an early fair price

In some cases when a shared saving/overrun provision is included, the early price given by a contractor was artificially inflated and included a higher contingency to increase their potential profit. (Owner 1, 2012)& (GC1, 2012).

- Cost plus contract and open accounting is only suitable for competent, involved owners

Some owners do not have enough resources or experience to adopt IPD. They simply prefer a guaranteed fixed price contract (GC1, 2012).

3.2. IPD's Mechanisms to Obtain and Sustain an Early Fair Price

The industry's experience with early pricing in alternative delivery methods has not been very successful. In some cases, the owners have believed that the GMP given by the contractor was higher than the true estimated cost of the project especially when the price is set in early phase of the design. Some contractors include high contingencies as well as high profit to secure and increase their profit, especially when the contract involves a shared saving provision. Additionally, in many cases the final price exceeds the initial price. Consequently, the guaranteed maximum price now has acquired the reputation of mutating into a guaranteed minimum price.

Integrated Project Delivery (IPD) has introduced various mechanisms to overcome the challenges of early pricing associated with alternative delivery methods (e.g. DB and CM@Risk). The following discusses those mechanisms in IPD which are effective in obtaining and sustaining an early fair price.

Table 2: IPD's mechanism in obtaining and sustaining an early fair price

IPD's Mechanism to Ensure Getting a Fair Price	IPD's Mechanism to Sustaining the Early Fair Price
An aggressive target pricing (TP) and estimated maximum (EMP) price contract	Early involvement of key participants and jointly developed project criteria
Active involvement of the owner in decision makings	Target value design (TVD) and real time estimating
Qualification-based selection of the contractors	Qualification-based selection of the contractors
Open Accounting	Cost auditing

3.2.1. An Aggressive Target Pricing (TP) and Estimated Maximum (EMP) Price Contract

An aggressive target price, typically lower than the benchmarked market price, is established by the team. Such an aggressive cost leaves out unreasonably high charges for contingencies and profit. Target Pricing (TP), by definition, is a price management technique to establish and control a product/project price at a certain competitive rate. In construction, the target price is frequently set below the client's budget and a benchmarked market price to encourage innovation and value added solutions.

The target price includes all direct and indirect costs for designing and construction including the direct cost of design and engineering services, construction cost, general conditions, profit mark-ups for all contractors and consultants and a contingency reserve as a cushion against all perceived risks.

Designing to a target price, so-called "Target Value Design (TVD)" is a strategy used in lean practices and IPD projects to systematically sustain the initial target price. Unlike traditional design and cost estimating efforts whereby cost estimation is performed at the completion of each design phase, in TVD practice, design to cost is a critical criteria, and cost estimating efforts are performed concurrently as design develops.

Target Value Design requires a detailed cost model down to the subsystem level. The model is based upon historical data gathered by the owner, designers, and constructors and can be remarkably accurate. The model is flexible and allows potential trade-offs between subsystem targets as long as the overall cost figure remains unchanged.

Target Cost can be best achieved in a new contract type titled Estimated Maximum Price (EMP). In the EMP model, "the owner, designers, and major contractors, share the risk of cost overruns and use financial incentives to align the interest of each team member with the interests of the project" (Darrington & Lichtig, 2010). Thus, unlike a GMP, in which the risk of cost overrun is completely shifted from the owner to the Construction Manager/General Contractor; in EMP everyone's profit is at risk and thus everyone has a commitment to a common purpose. EMP can only be implemented in an Integrated Project Delivery (IPD) approach where the contract allows sharing of risks and rewards.

The EMP contract defines how savings and overruns below or over the target cost will be divided within the integrated team. In an EMP contract, if the team completes the project below the target cost they will share the project saving at a pre-defined ratio which is defined in the contract. However, if the project cost exceeds the target cost, the cost overrun is shared by the project team up to the extent of their at-risk fee and the shared IPD contingency. The shared financial risk and reward model introduced in EMP aligns the project team and eliminates the finger-pointing and blaming culture as often seen in the GMP and lumpsum contract.

When an aggressive target price is in place, the presence of an EMP contract with a shared financial risks or rewards model aligns the team's interest in sustaining the project cost.

The interviewees were asked to share their insight and experience with respect to Target Pricing. Below is a summary of the results:

- The target price is established based on benchmarked market price
Owners must identify comparable existing projects and use their cost information as benchmarks for establishing their target cost early in the business planning phase (GC2, 2012) & (Owner 1, 2012) & (Lean Construction Institute) & (Owner 3, 2012).

- Finding Comparable Projects to Use for Benchmarking Is Not Easy
Rarely can one find an apple to apple comparison. Currently, Stanford University keeps a cost database of university projects that can be used for the purpose of benchmarking. As long as other universities contribute to this database by inputting the cost information of their completed projects, they will have access to this information for their benchmarking purposes (Owner 1, 2012).

- An Aggressive Target Price Triggers Innovation
An imbalance between the project program and the imposed target price triggers innovation and value added solutions. It is advised that the target price is set below the comparable benchmarked market price (Owner 1, 2012) & (Lean Construction Institute) & (GC2, 2012).

- Development of Detailed and Flexible Cost Model Is Needed When Designing to the target Cost
Following the establishment of the target price based on the benchmarked market price and owner's budget, the construction manager/general contractor develops a detailed cost model according to the agreed target price. The cost model includes the target price for various systems and subsystems. The target price breakdown structure can be flexible and allow for reallocation of costs across the boundaries with owner's approval (GC1, 2012)& (Lean Construction Institute, 2012) & (Director – Construction, Retail Company – Fortune 500, 2012).

- Owners need a cost consultant and/or cost auditor on board during pre-con and construction phase
An owner needs an in-house or a third party estimator to help them with establishing the target price at the beginning of the project, and provide cost auditing services, including reviewing the charges and ensuring their accuracy and compliance with allowable cost according to the contract. Construction auditors are typically CPAs; there are some firms who specialize in construction audits. The best construction auditors are the ones with estimating experience at the construction companies in the past. The presence of cost auditor is especially critical, when the contract is cost-plus. Professional cost consulting is well established; many of the firms have been set up by British quantity surveyors. (Owner 1, 2012) & (GC1, 2012) & (PM, 2012).

3.2.2. Early Involvement of Key Participants and Jointly Developed Project Criteria

Compared to the Design-Bid-Build approach, integrated methods, like IPD & CM@Risk involve fewer disputes over what was included in scope and the bidding price. Scope is collaboratively defined, and thus there is a lower risk involved with incomplete scope and potential surprises on cost or unforeseen conditions (Owner 1, 2012). The early involvement of key participants and collaboration in developing project criteria in IPD increases the team's understanding of the project scope and the owner's needs. As a result, IPD projects by nature involve fewer surprises, RFIs, and change orders, which ultimately decreases the potential for cost overrun.

3.2.3. Target Value Design (TVD) and Real Time Estimating

Designing to the target cost (Target Value Design) and concurrent cost checking helps keep a design within the target price. Unlike the traditional delivery method, in which cost estimating is performed following the completion of each design phase, in IPD cost is one of the criteria for design. Cost estimating and design is performed concurrently and in a real-time fashion with the help of BIM technologies. As a result, it is unlikely that design evolves without meeting the cost criteria. The real-time estimating helps sustain the target price and eliminates future surprises and re-works often experienced in the traditional delivery method.

3.2.4. Active Involvement of the Owner in Decision Making

As a member of the core IPD team, the owner is actively involved in the decision making process and the selection of different design alternatives or reallocation of the budget within the boundaries of target cost sub-structures. Increased owner's involvement in the IPD process and decision making leads to increased owner satisfaction of the final product and an assurance of getting the best value for their investment.

The Owner can also be involved in other integrated approaches. While in CM@Risk or DB context, the owner's involvement depends on the owner's competency, in the IPD arrangement, the owner is contractually obligated to be involved (GC1, 2012).

3.2.5. Open Accounting

Open accounting is another strategy to ensure that price is not artificially inflated with increased profit, general conditions, or contingencies; especially, if the owner is resourceful, competent and experienced in understanding the cost and accounting systems, and the market price. In the end, when a project is operated on open accounting basis, the owner would know whether or not the price given was fair.

3.2.6. Qualification-based Selection of the Contractors

In IPD, project participants are selected based on qualifications and their responses to RFPs. Reputation is the key to survive in the market, have repeating clients and future business. The owner's satisfaction with contractor's performance, the project quality, and the fairness of the contract price are highly critical for contractors to ensure long term business success. It is unlikely that a contractor will chose to lose a long term business relationships due to a short term financial gain (Owner 1, 2012).

4. CONCLUSION

4.1. Does IPD Address the Challenges Associated with Early Pricing Experienced in Alternative Delivery Methods?

Table 3 illustrates how IPD's strategies have addressed the challenges associated with early pricing in alternative delivery methods. While the IPD method utilizes various effective strategies in establishing and sustaining an early fair price, its success depends on the owner's level of sophistication in selecting an aggressive target price and conducting cost auditing. Most of the time, the owner does not have the in-house expertise to conduct benchmarking and feasibility studies to establish an aggressive fair target price. Furthermore, some owners may not have the time or resources to perform cost audits. Independent cost consultants and cost auditors, who also have access to historical cost databases of comparable projects would be highly beneficial to owners. The AEC industry needs to develop more publicly shared cost databases of existing projects.

Table 3: Challenges of early pricing in alternative delivery methods, IPD's solutions and future recommendations

Challenges of Early Pricing in Alternative Delivery Methods	IPD's Strategies to Address the Challenges Associated with Early Pricing in Alternative Delivery Approaches	Future: What can be done next?
The first cost quoted is rarely the final cost.	<ul style="list-style-type: none"> • Target Value Design Process • Establishing an aggressive Target Price • Implementing Estimated Maximum Price (EMP) contract with shared financial risk or reward model. 	
Despite risk shifting provisions, the result of a risk failure invariably finds its way back to the owner.	<ul style="list-style-type: none"> • Risk of cost overrun is shared by the team through shared IPD contingency & at-risk fees 	
Most designers seem oblivious to and inexperienced with cost issues leaving the owner unprotected.	<ul style="list-style-type: none"> • Early involvement of key contracting parties 	<ul style="list-style-type: none"> • Addition of cost consultant to team would be beneficial.
Placing monetary incentives in contracts are self-defeating as the conditions applied to them are frequently gamed.	<ul style="list-style-type: none"> • Target price is set below benchmarking price • Fiscal transparency and open accounting 	<ul style="list-style-type: none"> • Cost consultant acts to ensure target price is not inflated
There seem to be few sources of pricing data to support early pricing efforts for owners that relate to actual experienced costs .v. theoretical costs	<ul style="list-style-type: none"> • Experienced cost data bases are slowly forming to respond to this problem Serial builders already have this data but often times they are not available for public use. 	<ul style="list-style-type: none"> • The industry needs a public database including as-built cost information of different project types and sizes with the detailed cost breakdown to systems and subsystems.

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