A CASE STUDY, INNOVATIONS IN CONSTRUCTION BY THE UNITED STATES ARMY CORPS OF ENGINEERS

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ABSTRACT. The United States Army Corps of Engineers (USACE) is the world's largest public engineering, design and construction management agency. Technical, schedule and workload challenges have driven procurement innovations, including a FAR compliant adaption of Construction Manager at Risk (CM@R) known as Integrated Design Bid Build (IDBB). The USACE evaluated their efforts to implement CM@R and IDBB and determined that both approaches were project delivery method subsets of an enterprise level project delivery solution identified as Early Contractor Involvement (ECI). By creating innovative procurement solutions to fast-track large and complex construction projects USACE has exceeded mission, competition, and schedule goals in an increasingly complex federal procurement system. This case study is a summary of selected projects, and addresses the challenges faced by those interests promoting innovation in construction in a highly regulated Federal procurement system. The study also provides a focused discussion on lessons learned by the stakeholders who developed and implemented ECI and provides recommendations on the challenges facing the successful introduction of innovation in large, high profile procurement agencies.

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INTRODUCTION

The United States Army Corps of Engineers (USACE) is the world's largest public engineering, design and construction management agency. Technical, schedule and workload challenges have driven procurement innovations, including a FAR compliant adaption of Construction Manager at Risk (CM@R) known as Integrated Design Bid Build (IDBB). The USACE evaluated their efforts to implement CM@R and IDBB and determined that both approaches were project delivery method subsets of an enterprise level project delivery solution identified as Early Contractor Involvement (ECI). By creating innovative procurement solutions to fast-track large and complex construction projects USACE has exceeded mission, competition, and schedule goals in an increasingly complex federal procurement system. This case study addresses the challenges faced by those interests promoting innovation in construction in a highly regulated Federal procurement system. The study also provides a focused discussion on lessons learned by the stakeholders who developed and implemented ECI and provides recommendations on the challenges facing the successful introduction of innovation in large, high profile procurement agencies.

USACE is a federal agency, part of the Department of Defense, and in turn, of the Department of the Army. The USACE is the construction agent for the Department of Defense including the U.S. Army and Air Force, with a 200 plus year history of constructing and maintaining military facilities, dams, canals and flood protection in the U.S. The agency also develops and manages a wide variety of public works projects, including environmental and ecosystem restoration. Additionally, USACE, under memorandums of agreement with other Federal agencies, serves as a construction agent for these agencies. The USACE headquarters is located in Washington, DC. USACE operates across the United States and also provides engineer support to US Department of Defense and other national missions across the world. The USACE is organized into nine geographical divisions, each of which contains a number of districts which conduct operational contracting. Other supporting organizations within the USACE provide

for its critical operating functions, including research, logistics, finance and information technology. USACE employs approximately 36,000 civilians and 800 active duty military personnel, with an annual operating budget of approximately $5B. In Fiscal Year (FY) 2011 USACE issued nearly 100,000 contract actions for $24B. Contracts awarded by USACE employ approximately 300,000 people in the private sector each year.

Important users of the USACE services are, directly, the Army and other US Government departments/agencies (e.g., Air Force, Environmental Protection Agency, and Veteran's Affairs). Commercial entities and private citizens benefit both directly (e.g., by direct use of an improved waterway by shipping firms) and indirectly (e.g., externalities or spill over effects) from the services provided by the USACE.

The bulk of services provided by the USACE are in the areas of civil works construction, military and interagency construction and environmental restoration. As part of any construction project a design effort is required. To this end, USACE utilizes both internal professional staff and commercial architecture and engineering companies for design requirements. Commercial architecture and engineering firms perform approximately 65% of USACE design work and employ an estimated 5000 people in that process.

Today, USACE continues its historic role that began in the early years of the nation. It remains a leading US engineer agency and industry partner in both military and civil works including response to natural disasters and military contingency operations overseas. With its long experience in large civil works projects, military construction and support to deployed US forces, the USACE has unmatched expertise in large scale construction programs. As a result the agency has an adaptive mindset unmatched by most Federal agencies.

DISCUSSION

The success of USACE is largely a function of two agency strengths that are sometimes at conflict with each other. The first strength is a long record of success in planning, designing, contracting for and providing administration and oversight of thousands of projects totaling billions of dollars. USACE utilizes standard business processes that have a long, proven record of success.

The second strength is the ability to be flexible, to apply innovation and mission focus when required to successfully execute unplanned, complex, and often high profile projects that do not avail themselves to traditional business solutions. In this article, we will begin with a brief overview of traditional Federal construction delivery methods, Design Bid Build (DBB) and Design Build (DB). We then examine how USACE has adapted a commercial contracting innovation, Construction Manager at Risk (CM@R), in an effort to combine the strengths of the CM@R model with a FAR compliant acquisition strategy.

To properly understand the subject it is important to make clear the difference between a project delivery method and a contract type. A project delivery method is a system used by an agency or owner for organizing and financing the design and construction of a structure or facility. Delivery methods focus on the assignment of legal and financial responsibility for a project to an organization or an individual providing design and construction services. (American Institute of Architects, Primer on Project Delivery, 2012). Contract type is the contract format that defines the allocation of risk with respect to performance, schedule and cost/profit. The three major contract types defined in FAR Part 16 are fixed price, incentive and cost reimbursable. The three contract types provide a continuum of risk allocation with the contractor assuming the greater risk in a fixed price arrangement and the Government assuming the greater risk in a cost plus fee arrangement.

Traditionally, the Federal Government and the USACE followed a two step process known as Design Bid Build (DBB) where an Architect-

Engineer was separately contracted to design a project and this design was the foundation for the development of a competitive solicitation for the construction. Design and construction responsibilities were separated. USACE construction has historically been a DBB model that emphasized a linear approach to construction with emphasis on owner controlled, one hundred percent (100%) design prior to development of the Invitation for Bid (IFB) solicitation. Award of the contract was made to the firm whose bid was determined to be responsive, responsible and low. Prior to the 1970s virtually all USACE construction contracts were solicited using DBB. Bid openings were public events and, while bids were evaluated for responsiveness and responsibility following bid opening, the low bidder, and presumptive winner, was revealed once all bids were opened.

A review of public non-Federal construction of that period reveals that DBB dominated that landscape as well. Construction management in the public non-Federal sector was the responsibility of the Owner and its project manager (often also the project designer) who managed the risks inherent to traditional design-bid-build projects for the government. This necessarily required the agencies to build large project management and engineering staffs, or acquire those services by separate contract, most often the designer. In the 1960s a new and attractive alternative emerged in the commercial sector which provided for professional CM firms managing the entire design-construction process and freed the agencies to focus on their core missions (Cunningham, 2005).

The DBB model worked well, and continues to do so, where there is sufficient acquisition time or where the complexity of the project, or design unknowns, compel the Owner to want full control over the final design. The process requires the Owner to be able to adequately describe the project scope and criteria in advance of the design process. Other factors include having sufficient acquisition lead time or where the complexity of the design and design unknowns compel the owner to want full control over the design before a solicitation is developed and released. And, while the low bid approach raises questions about whether low price necessarily equates to best value,

the straightforward simplicity of the approach has many advocates in both the government and construction community. Still, the separation of responsibilities associated with DBB led to failures when designs did not consider constructability and the owner was faced, in turn, with claims for construction defects (Cbinic and Nash, 1998).

With DB, the owner contracts with an entity to both design and construct the project. Proponents of DB emphasize that the model has proven to be faster and cheaper than traditional DBB, an argument which is supported by a number of studies.[1] DB is a project delivery method in which both the design and construction services are contracted for by award of a single contract. The contractor is responsible for both project design and construction which provides the client, or owner, a single point of responsibility. Experience in the private sector reveals significant time savings can be achieved when the design component is combined with actual construction.

Faced with increasingly complex requirements, aggressive construction schedules and demands to bring projects on line faster the Federal government gradually relaxed acquisition policy to allow for negotiated construction procurements.[2] DB utilization by USACE increased incrementally in the 1970s and 1980s, often as a result of customer preference where the completed project initiated a revenue stream. DB proponents argued that the model saves time and money for the owner while providing the opportunity to achieve innovation in the delivered facility. They also note that DB allows owners to avoid being inserted directly between the architect-engineer and the contractor. Under DBB the owner takes on significant risks as a result of that position. DB places the responsibility for most design errors and omissions on the DB, relieving the owner of major legal liabilities, though not management responsibilities. (It should be noted that in Federal contracting the DB contract is a construction contract executed under FAR Parts 15 and 36 and is not subject to a Brooks Act selection process. [3]) The burden of these costs and associated risks are transferred to the DB team.

By the time Congress passed the 2005 Base Realignment and Closing (BRAC) legislation the Army had developed a military construction transformation model that favored DB as the contract delivery model of choice. One of the key tenets of USACE's transformation program was to change the way it performed military construction (MILCON). The stated objectives of the MILCON transformation were:

- Provide quality, adaptable, and sustainable facilities in less time and at a lower cost
- Use performance-based requirements and industry best practices
- Emphasize planning to a greater degree
- Expand the use of pre-engineered solutions
- A continuous building program of more predictable funding without waiting for phased project funding

With the tenets of Military Transformation in place, use of an IFB/DBB delivery model to execute a military construction project (MILCON) became an exception that required justification and USACE HQ approval. It was a policy that invited scrutiny. Critics of the DB approach claim that DB limits the client's involvement in the design and permits contractors to make design decisions outside their area of expertise. They also suggest that a designer, rather than a construction professional, is a better advocate for the client or project owner and/or that by representing different perspectives and remaining in their separate spheres, designers and builders ultimately create a synergy that results in better buildings.

CM&RISK

USACE project planners, many made aware of the benefits of CM@R by USACE contractors experienced in this method, felt that it was time to try new and better delivery models in play that combined the speed of DB without the loss of owner control of the design. The delivery model that appeared to address both schedule acceleration and agency oversight was CM@R, a widely used private sector process. Much like the movement away from IFB construction contracting to a negotiated procurement model, CM@R was driven by the private sector. Unlike DB, the introduction of CM@R in the public sector has not been led by the US Federal Government or Department of Defense, but by the states. In the federal Government, the GSA has been a large user of CM contracts since the 70s. The Federal Acquisition Regulations were revised in 1996 to explicitly allow for Two-Phase Design-Build Selection Procedures. While to date many states have passed legislation that provides guidance for CM@R there have been no statutory changes to the FAR or the Defence Federal Acquisition Regulation Supplement (DFARS) that address CM@R.

State governments, faced with complex construction projects and many of the same challenges that forced the commercial sector to adopt CM@R (frequent cost and schedule overruns, litigation), embraced CM@R starting in the 1990s. Currently, 25 states use CM@R in some form (American Institute of Architects, "Construction Manager at Risk State Compendium," 2005). Many of the states that have passed legislation that is favorable to CM@R at the state level have made it commonplace in conducting business. Between 2001 and 2005 states spent an average of $50B on projects using CM@R as the construction delivery method. Figure 1 (below) illustrates the point that, collectively, DB and CM@R have achieved essentially the same share of the commercial non-residential market.

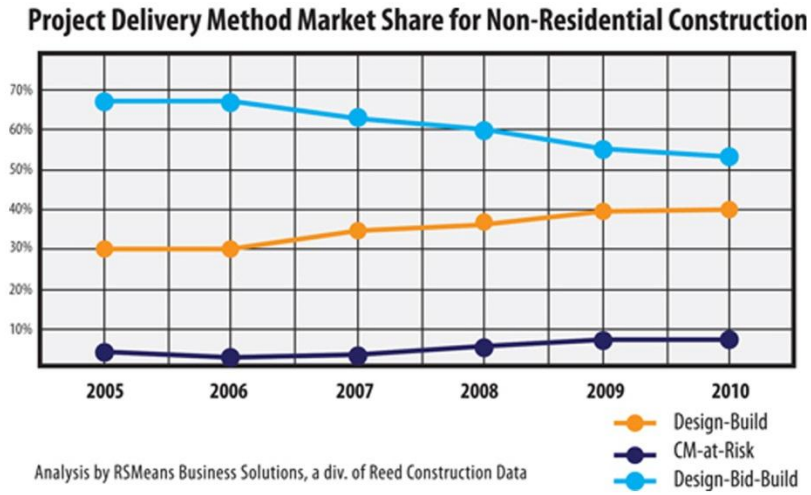

Figure 1.

*Proponents of CM@R emphasize that the model is more effective than DB in that it increases the speed of the project and fosters a collaborative relationship between the owner, the construction manager and the architects/engineer. Advocates also note the potential for enhanced synergies throughout the process and, because upfront costs and fees are revealed, transparency is enhanced. The USACE experience cannot confirm those claims.

With CM@R the Construction Manager is generally selected on the basis of qualifications, past experience and other factors that form a basis for a best-value selection. Hired after minimal design is completed, construction management firms have long been enlisted to provide owners technical guidance on complex construction projects. With CM@R a construction manager is hired early in the design process with a contractual intent to have the construction manager assume the role of constructor. In the design phase the construction manager evaluates scheduling, pricing and design features (e.g., alternate materials, alternate systems, and equipment to assist the owner in achieving a design that will result in a more constructible project). The construction manager is, therefore, a

leader in the execution of the project from the early planning stages. The incentive to work closely with the customer and designer is strong, for the more successful they are in advancing the constructability of the design (material choices, technologies, etc.) the greater the likelihood of success when they become the constructor. CM@R works best when all parties work together as a team to identify efficiencies throughout the construction process.

When the design has matured to a sufficient level (e.g., 60-90%), negotiations are conducted between the construction manager and owner to agree upon the Guaranteed Maximum Price (GMP), scope and schedule. The construction manager then assumes the role of general contractor for the construction phase. If the GMP is exceeded, the construction manager, turned general contractor, will face a financial loss. In addition, the construction manager has the risk of late completion. In some cases it's not possible to agree to a GMP, at which point the CM can be released and the owner can explore completing the design and using it for the purpose of soliciting competitive bids or offers elsewhere. There will always be a tendency for CMs to cover risk by increasing contingencies; but owners, aware of this incentive, will negotiate aggressively to reduce contingencies in the finalized GMP. CM must balance protection of their interests against a need to effectively manage overall costs that are subject to their control (Strang, 2002).

CM@R was first employed in the USACE by the Kansas City District) in 2004. While CM@R worked well for CENWK in the half dozen projects it initially executed utilizing the model, the process came under increasing scrutiny by the USACE legal community for its compliance with the FAR. Questions were raised concerning the funding of pre-construction activities, the proper application of the FAR incentives clause used by the district, compliance with the requirement to provide public notice when modifying FAR clauses and various collateral issues. These issues were not ultimately resolved until a March 2007, USACE Chief Counsel opinion on "CM@R" that laid out considerations that must be addressed for the application to be legally sufficient (USACE, PIL 2008-13). Additional discussion of

fiscal law issues will be presented in the Lessons Learned section of this paper.

While the FAR does not address CM@R it does address a contract type that allows the Government to enter into a contract when one cannot negotiate a realistic firm target cost before award. Facing a situation where there was not sufficient cost or pricing information to permit negotiation of a fixed price contract prior to award, Kansas City District sought a FAR based incentive contract solution. The FAR provides that a fixed price incentive (successive targets) contract may be employed where there is sufficient information to permit negotiation of initial targets and there is reasonable assurance that additional reliable information will be available at a point in the contract performance so as to permit either negotiation of a firm fixed price or firm price targets. The mandatory contract clause to be included in the resulting contract is far 52.216-17, Incentive Price Revision—Successive Targets. Utilizing that incentive contract formula Kansas City District proceeded with the award of a series of CM@R projects.

INTEGRATED DESIGN BID BUILD

Faced with a myriad of BRAC 2005 MILCON projects, some estimated to exceed one billion dollars and all with rigid completion dates established by statute, the USACE North Atlantic Division acquisition teams sought a strategy that compressed the traditional procurement action lead time (PALT) and construction schedules. Believing that a DB acquisition strategy might not afford the necessary flexibility to accommodate the lack of current project pricing information and the need to initiate project related “fast tracking” they looked at options to include CM@R. Their research led them to adopt a CM@R variant which they identified as IDBB.

IDBB was an attempt to capture the strengths of CM@R while avoiding the policy compliance issues that had arisen with the Kansas City District application of the model. While developing IDBB the Corps of Engineers North Atlantic Division planners made a series of assumptions about the projects identified for application of IDDB

and assumptions related to aspects of the service delivery model that they considered critical. Ultimately, two projects were approved as pilot projects for IDBB in North Atlantic Division and soon thereafter a third in Texas), one a 1.2M square foot hospital complex with central energy plant, helipad, and 2600 vehicle parking garage and one a 2.4 M square foot office building which included sensitive compartmented information facilities (SCIFs), a data center, a 10 megawatt power plant and a remote delivery facility. Both projects were characterized as high dollar, highly complex and highly visible politically. It was imperative that the delivery method provide for "preconstruction services" delivered by a general contractor concurrent with the design effort, that the contract include the Government's ability to exercise an option for construction, that the contract(s) include terms and conditions to allocate risk among the parties and that, similar to successful USACE CM@R projects, the construction contract include the FAR clause prescribed at 16.403, Fixed Price Incentives (Successive Targets). In order to meet the BRAC completion dates for these projects, "fast-tracking" construction would be necessary. (Fast-tracking is an industry term which means that the project construction must begin before the design is completed, and both design and construction proceed simultaneously for a period of time.)

The IDBB model provided that the agency engage the services of a general contractor to provide "preconstruction services" concurrent with the design effort. Preconstruction services were defined to be construction related services that are not subject to the Brooks Act. It was determined that the earlier the general contractor had access to the design process the better able he would be to influence the process in ways that would result in cost savings over the term of the contract. The research on early engagement shows that maximum benefit is achieved when the constructor is introduced in the early planning and design stages (Mendelsohn, 1977). There was, however, no specific guidance that defined an optimal point for the construction contractor to initiate work with the designer of record. It was determined that the construction contractor and designer should be "integrated" at concept design which was identified notionally as 15%. Functionally, concept design defined the scope in sufficient

detail to permit the development of drawings and specifications that would allow offerors to interpret the data in the same way. Discussion with industry and the lessons learned in the private sector revealed that by 35% design many major design decisions are set in place and not amenable to rapid change without cost and redesign impacts.

In some respects the products of early collaboration efforts were anticipated to be similar to those of a value management concept commonly identified as the value engineering (VE) program wherein a construction contractor may propose value engineering changes that, if determined to result in true and quantifiable cost savings, result in those savings being shared with the contractor based on a ratio specified in the contract's Value Engineering clause. VE analysis evaluates the design to see if life cycle cost can be reduced without a loss of functionality and can be characterized as a design audit from a constructor perspective (Song and AbouRizk, 2009).

Unlike the VE program, however, the benefits of collaboration under IDBB accrue only indirectly to the contractor as cost savings should contribute to his ability to bring the contract in under the target cost he proposes and thus, potentially, increase profit. The timing of the early involvement is key to both reducing cost and maximizing innovation. (See figure 2 below.)

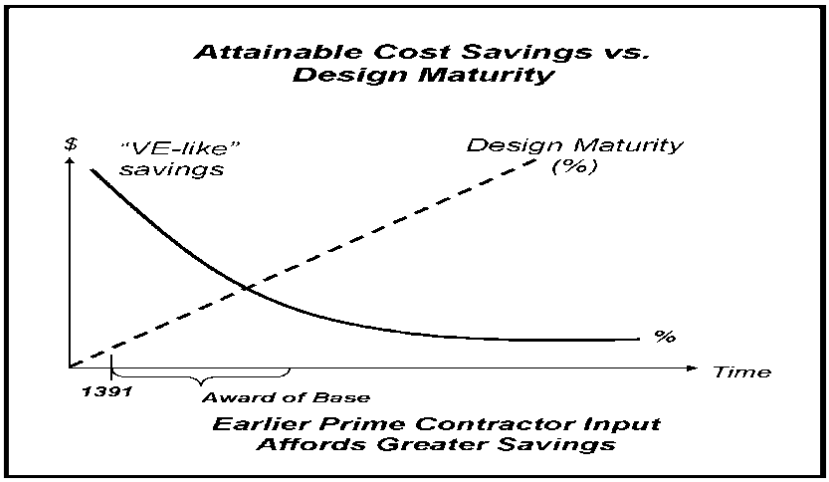

Figure 2. USACE Learning Center Manual, Early Contractor Involvement (ECI), p. 1-10. (1391 is short for Department of Defense Form 1391, Military Construction Project Data. The form is a programming tool used to request and justify a construction need. It defines the site, scope and cost estimate of a project.)

The work the construction contractor executed during this early collaborative phase was specified as preconstruction services and allowed the contractor to fast track a series of work initiatives that were not dependent on design. Fast tracking of preconstruction services, to include early non-design dependent construction, proved to be vitally important in establishing a successful foundation for exercise of the construction option. When fast tracking a project the IDBB project delivery team (PDT) learned that being able to efficiently process changes was critical to minimizing cost impact and maintaining schedule. Utilizing an accelerated notice to proceed (NTP) process allowed for ongoing designer and constructor input and facilitated the execution of early work items with minimal loss of time while maximizing schedule efficiencies.

Fast tracking IDBB provided an opportunity to pre-position subcontractors and initiate critical field activities but it also resulted in schedule driven design and contributed to compromised QA/QC support. The ability to fast track the construction process was key to meeting the aggressive BRAC project schedules but it also imposed on the design process the need to break the design into ever smaller chunks so that the constructor could move out on front end work with the understanding that modifications were likely to follow.

EARLY CONTRACTOR INVOLVEMENT

Reviewing the various CM&Risk and IDBB acquisition plans that were being submitted by USACE districts to the HQ the acquisition community of practice at the HQ grasped the need to provide unified policy guidance on the district initiatives. It was determined that IDBB and the CM@R variants in play were actually subsets of a service delivery model identified as ECI. Once that determination was made, the HQ implemented both policy and training initiatives to address the proper execution of ECI and establish training requirements for activities desiring to add ECI to their acquisition toolkit. The idea to establish ECI as an umbrella service delivery concept and provide prescriptive guidelines afforded the USACE field activities improved insight into which projects would likely benefit from application of the model. To that end a series of guidelines and directives were issued via Engineering and Construction Bulletins, Office of Counsel memorandums and Procurement Instruction Letters (PILs) from the National Contracting Organization (NCO). The iterative release of policy and guidance sought to keep up with the issues as they arose with the award and administration of each new ECI project.

The choice of the name ECI is significant. It acknowledges a design method that seeks to achieve a more collaborative relationship between the owner, designer and the construction manager. ECI, as practiced by USACE, is a design-bid build contract that, through the use of contract options, achieves many of the same objectives of CM@R; collaborative effort during design and construction between designer, builder, owner and user to increase the likelihood of project

success, the ability to make collective decisions regarding risk early on by the team, construction execution and material cost information provided to the Government and the designer while scope and quality are being refined and early information sharing to facilitate understanding among the parties. ECI is most appropriate in cases where a commercial construction project would use CM@R; a complex "one of a kind" project with no standard design, an aggressive no-fail project schedule, a customer that wants to shape design and a challenging site or other unique aspect of a project that would benefit from collaboration between the designer, builder, owner and end user.

ECI is characterized by a contractual separation between the constructor and the designer. As USACE is a design agency, the designer of record may be either internal to the agency or an A-E firm (most often the latter). Where the agency decides to seek external design utilizing the ECI process they would solicit the construction contractor through "full and open competition" as defined by FAR Part 6. To ensure that there is sufficient information in the solicitation to elicit priced technical proposals on a general scope of work and provide for fair competition designs will typically reflect, at a minimum, 15% concept stage drawings. USACE policy issued in May 2011 provided that concept designs must include sufficiently detailed plans and specifications so that potential offerors would interpret the data in the same manner for bid development purposes.

As previously mentioned, implementation of ECI was not without challenges. Legal concerns emanating from both federal contract law and fiscal law required addressing. The concerns covered a broad range of issues associated with, among other things, contract funding, the proper use of incentive clauses, identification of the scope of preconstruction services and approved accounting systems. The consolidated guidance from USACE Office of Counsel was issued in March of 2007 and provided activities anticipating use of ECI "like" contracts a roadmap for preparation of acquisition plans and contract administration requirements (USACE, CECZ-A Memorandum, 2007).

The nature of the construction services at the initial stage of the contract requires that preconstruction services must be funded with design funds and that these funds cannot be used in turn for any of the follow on construction effort. (DoD project authorization and appropriations statutes for construction generally separate design and construction funds.) Having a base period, with no guarantee of coming to terms with the construction manager for the construction effort, requires that the ECI contract be structured as a base contract with construction options. There is no guarantee that a successful negotiation will result in the construction contractor providing preconstruction services becoming the successful prime contractor. Clearly, from an industry perspective, the model presents significant front end cost risks.

One of the challenges for a federal Contracting Officer is that many FAR provisions and clauses when included in a contract require in turn additional clauses and requirements. An example of how this has impacted ECI is the 52.216-17, Incentive Price Revision—Successive Targets (FPIS) clause. When included in a DOD contract, the Defense Supplement to the Federal Acquisition Regulations (DFARS) at 234.201 requires implementation of an Earned Value Management System (EVMS) that meets the requirements of American National Standards Institute/Electronic Industries Alliance Standard 748, Earned Value Management Systems (ANSI/EIA-748). When fast tracking is anticipated full EVMS is required. While EVMS is routine for large DOD systems contracts, it is not the norm within the US construction industry. Commercial companies, who have routinely completed CM@R contracts in the commercial marketplace and for states, now, with ECI, face a new requirement that sometimes requires significant modification of their accounting systems and/or contract administration processes.

Additionally, as an FPIS contract is a negotiated procurement the contractor must have a cost accounting system that is compliant with the cost accounting standards (CAS, full or modified) prescribed by FAR Part 30. Because the final price of the contract will be determined during contract performance the Government must have the ability to verify the costs the contractor has incurred to enter into

negotiations. Thus CAS and the requirements of Cost or Pricing Data, FAR Part 31, must be implemented at the time of award to provide a foundation for future (post award) negotiations.

ECI represents both an innovative and substantially more complex approach to the acquisition of construction. In view of that, and the early lessons learned, USACE has adopted a series of reviews throughout the acquisition process to ensure regulatory compliance, leverage the agency's top tier contracting subject matter experts and ensure that best practices are learned and shared throughout the organization. The review and evaluation processes associated with ECI are set forth and discussed in Procurement Instruction Letter 2011-16, Updated Supplemental Guidance on the Use of the Early Contractor Involvement Delivery System. To enforce that doctrine, prior to commencing an ECI project, all members of the core program team (e.g., contracting, engineering, program management) must complete USACE's week long ECI training class/workshop. In addition, a standalone acquisition plan is required prior to initiating any contracting actions, including issuance of the solicitation. The plan must be updated/approved prior to entering the construction phase of the contract. Finally, a number of internal reports/peer reviews are required to provide leadership the opportunity to monitor the progress/success of the contract and to capture and record lessons learned.

LESSONS LEARNED

Understandably, when implementing a unique approach to contracting for major construction projects further complicated by aggressive schedules there will be many processes identified for evaluation and improvement. The general themes identified across ECI projects involved the need to keep stakeholders aligned and informed, develop and execute training on the model prior to project initiation, ensure that individuals properly trained and knowledgeable are available to staff the project PDT and maintain a high level of management commitment to creating conditions focused on success. The fast tracking of non-design dependent construction proved to be

a significant enabler in meeting schedule on large, highly complex projects. While the process required extensive coordination and the development of new business processes the ability to effect early starts on project components was a significant factor in the teams maintaining the aggressive schedules imposed by BRAC.

While it was generally conceded that ECI proved an advantage in maintaining project schedule there is little evidence that the model resulted in large cost reductions. Several ECI projects had substantial cost overruns though it would be difficult to say the additional costs would not have accrued under a different project delivery model. An analysis of cost growth across all ECI projects would provide valuable insight as to how the model might be modified to achieve greater economies for future work.

One of the critical lessons learned from ECI projects was the challenge of staffing the project delivery team and ensuring that a capable workforce that understood the unique acquisition requirements was in place prior to issuance of the contract. The processes required to effectively manage an ECI contract differ in important ways from a more traditional firm fixed price construction contract awarded at full design. The requirement to locate and recruit construction representatives and supervisors with experience in Earned Value Management Systems (EVMS) and administration of incentivized contracts proved difficult, as did not fully accounting for the time required to execute new hires in an economy where many projects were competing for highly qualified workers. In fact, resourcing an ECI contract initiative with workers that possessed the necessary skill sets, were available at the right time and in sufficient numbers, proved a challenge from project inception through contract closeout.

The lack of training and experience with the ECI contract format proved formidable for both the Government and contractor. Getting all stakeholders on the same page and getting the “culture” right was a challenge and it was generally observed that the training and skill required to effectively administer an ECI contract was largely achieved through on the job training. This USACE corrected by

developing a weeklong ECI training class for all members of the acquisition team (contracting, program management, construction, legal) before initiating a new ECI contract. Indeed, getting the culture right has been identified as the major barrier to implementing ECI (Song, and Abourizk, 2009).

Part of getting the culture right with a new approach is ensuring that the end user is fully apprised of the progress of the effort and made aware of schedule challenges. Some ECI projects developed transition teams which included end user representatives. The collaborative teams proved beneficial in improving the relationship between USACE and the end user and led to a recommendation that transition teams established early in the process would have facilitated a smoother initial outfitting and takeover (IO&T) process. Establishing a clear understanding of how to properly identify preconstruction services proved a challenge as, initially, many preconstruction services appeared to be A-E in nature. Moreover, even where the services were predominately of a construtction nature they represented a very limited portion of the total contract (e.g., 5%). Thus the construction option, when exercised, represented as much as 95% of the total contract value, a position Counsel and others found risky.

It was also important to understand that, in accordance with FAR 36.101(c)(2) the clauses in the base contract and option must match the work that predominates in each; and the Contract Line Item Number (CLIN) structure must ensure that work under discrete categories is properly funded and work/fund types are not commingled. While there was incentive during the preconstruction period to continue efforts to clarify or enhance the requirements of the construction option the parties learned that the exercise of the option was a good time to stop considering bright ideas for that phase of the project (Moore, 2008).

There were aspects of ECI that proved more challenging than initially thought. The transition from a cost-mode to FFP contract is a process that requires significant prior planning and commitment of all stakeholders. The quantification of remaining risk (even at 100%

design) and agreement on acceptable contingencies in the contractor's proposal proved to be taxing on the largest and most complex ECI projects. While there was a substantial amount of guidance on FPIS milestones (e.g., production point) and how to proceed with negotiations to convert to a FFP contract not all ECI projects were successful in making the conversion prior to contract completion. The FPIS contract provides that the final contract cost may be negotiated at contract completion and the final profit is established by formula as it would under a fixed-price incentive (firm target) contract.

Moving beyond USACE, a study comparing the success of other Federal Agencies in adopting ECI type contracts would be of great benefit. For instance, The U.S. General Services Administration is using a version of CM@R for several high profile projects, including the U.S. Capitol Visitors Center and the World War II Memorial. To adopt a uniform Federal standard for ECI will likely require advocacy from more than one agency. As demonstrated by the history of Design-Build contracting prior to its incorporation into FAR Part 32, innovation challenges regulatory limits, and success can result in regulatory changes. The success of USACE in using ECI will hopefully, over time, contribute to expanded coverage in the Federal Acquisition Regulations.

ACKNOWLEDGMENTS

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NOTES

1. Researches on *Selecting Project Delivery System* by Victor Sanvido and Mark Konchar of Pennsylvania State University found that design–build projects are delivered 33.5% faster than projects that are designed and built under separate contracts (design-bid-build). Sanvido and Konchar also showed that design–build projects are constructed 12% faster and have a unit cost that is 6.1% lower than design-bid-build projects (Konchar and Sanvido, 1998).

2. The USACE data for FY-2011 shows that requests for proposals (RFQ) and request for quotations (RFQ), when combined, represent 94% of all actions. The ratio of request for quotations (RFQ) to information for bids (IFB) is approximately 5:1.3. The Brooks Act, 40 USC 1101, was passed by Congress in 1972, and established qualification-based selection process for A-E contracting. Firms submit on an annual basis qualifications statements, with firms selected based on demonstrated technical competence and professional qualifications directly related to the professional services required. Only then are negotiations of reasonable prices conducted, starting with the most highly qualified firm.

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