

## VALUE MANAGEMENT ASSISTANCE IN DESIGN - BUILD

**Dr. Stephen J. Kirk, AIA, CVS, FSAVE**



Dr. Stephen J. Kirk, AIA CVS, FSAVE is Vice President and Corporate Director of Facility Economics for SmithGroup Program Management, Inc., Detroit, Michigan where he is responsible for overall value and cost management. Since 1977, Dr. Kirk has been involved in many design-build projects for both owners and design-build entities. He has led over 400 VE studies of offices, hospitals, labs, manufacturing facilities, military projects, environmental facilities and transportation projects. Dr. Kirk is the author of seven books related to VE and routinely gives seminars both nationally and internationally. He is a registered architect, a Senior Fulbright Scholar and received his Doctorate from the University of Michigan. Dr. Kirk is a Fellow of SAVE International and currently serves as its Executive Vice President.

### **ABSTRACT**

Value Management has continued to meet owner, designer and contractor challenges by enhancing project value since its inception in the 1940's at General Electric by Larry Miles. Since then, value specialists have continued to develop new tools to meet these challenges. This paper highlights tools that are very valuable in the design-build (D-B) project delivery process. These new tools permit the owner and the design-builder to maximize project value while minimizing costs. Topics addressed include: function analysis systems technique (FAST) diagramming, modeling (quality, space, cost, life cycle cost, time, risk), weighted evaluation, value workshops, design and constructability analysis, and post occupancy evaluation.

### **INTRODUCTION**

The traditional design, bid and construction project delivery process is being challenged by government and private industry owners alike. The design-build process is nothing new for many countries such as Australia, who have been using it as a method of project procurement for many years. In the United States however, the use and interest in D-B has greatly accelerated in the last 5 years. This is one of

the most significant trends in the U.S. design and construction industry today.

Design-Build, also known as "design/construct" or "single responsibility," is a method of project delivery in which one entity contracts for both architectural/engineering design and construction. This is similar to the "master builder" approach used by Michelangelo in the fifteenth century. In the traditional design-bid-construction approach, the owner commissions an architect or engineer to prepare drawings and specifications, and then selects a construction contractor, either by negotiation, or as is usually the case, competitive bidding. Historically, this approach has not always adequately served the needs of many owners. Cost overruns, schedule delays, post-contract litigation, compromised quality and the adversarial atmosphere that often surrounds this process has lead to a search for a better approach.

For many government and private industry owners, Design-Build appears to be the answer to their concerns.

But, the D-B process also creates concerns for an owner and the D-B entity such as:

- Has adequate project criteria and expectations been defined?

- Are design-build proposals responsive and cost competitive?
- Will decisions during design and construction provide optimum value?

Value Management (VM), as a proven problem solving methodology offers significant benefits for both the owner and the design-build entity when properly applied during the D-B process. Several VM techniques are presented which help overcome some of the concerns about implementing design-build delivery in the design and construction industry.

### **WHY DESIGN-BUILD?**

As documented by the Design-Build Institute of America, located in Washington, DC, many owner benefits can be gained through use of a D-B process which is well-designed and well managed. These include:

- Higher quality and proper project performance
- Singular responsibility for design and construction
- Cost savings identified from the team of designers and builders
- Time savings by overlapping design and construction
- Reduced administrative burden by avoiding need for coordination and arbitration of separate design and construction contracts
- Early knowledge of construction costs which are guaranteed
- Risk management by its assignment to D-B entity

These benefits have resulted in D-B being used extensively, if not predominantly, throughout the world. In the United States, the private sector is using D-B with increasing frequency and application during the past 30 years. It is being used in a wide variety of commercial and institutional applications including hospitals, educational facilities, office buildings, retail centers and hotels.

### **WHY VALUE MANAGEMENT WITH D-B?**

Value management stages of application and techniques have continued to expand over the past twenty years. Today, VM is highly effective in the early planning stages of a project as well as during various stages of design and construction. Since the

design-build process spans from project planning & definition through design and construction, VM offers a variety of unique techniques that improve upon the project's performance. These value enhancements include:

- Construction cost savings of 5-15%, or more
- Life cycle cost optimization
- Function-based project criteria definition
- Balanced quality, program and cost expectations
- Project risks identified along with mitigation strategies
- Improved schedule coordination and project delivery
- Enhanced business process/operational effectiveness

Effective application of VM with D-B, results in owner project expectations which are defined, managed and achieved, if not exceeded. For the D-B entity, this means being selected by owners to provide D-B services and, upon project completion, repeat business opportunities. Specific VM techniques, along with example applications, are presented as they relate to the D-B process, which follows:

The design-build typical process can be described as consisting of three broad phases:

- Request for Qualifications/Request for Proposal (RFQ/RFP) preparation by the owner
- Response to RFQ/RFP by the D-B entity
- Design and construction by the D-B entity with input from the owner

### **RFQ/RFP PREPARATION AND VM**

The RFQ/RFP preparation stage involves defining owner expectations regarding such things as project size and operational performance, quality of building systems, architectural image, environmental sustainability, flexibility, safety, schedule of completion and cost budget. These criteria are defined in performance terms only, in order to give D-B firms an opportunity to creatively explore alternatives. In many cases however, certain elements of the project can only be described in prescriptive terms, such as the type of mechanical system required. Other data about the project is also presented such as: site information, code and regulatory standards, economic and financial

considerations and other restrictions. Some owners also prepare a detailed space program of requirements. Still others may develop conceptual layout designs to begin to understand the consequences of their project requirements as well as to communicate to prospective D-B entities their preferred solution. VM can provide owner assistance with the above.

The VM approach focuses on desired functions of the owner. This is the heart of VM and consists of verb-noun function descriptions. A technique called FAST diagramming (Function Analysis Systems Technique) permits project definition in terms of desired functions. It also helps communicate the higher level business purpose(s) of the project. Asking "how" questions helps determine the specific solution to the problem. Asking "why" questions leads to the overall purpose of the project. The FAST diagram, when completed, provides a big picture of the project functions for all concerned.

Another VM technique called "Quality Modeling" assists the owner in carefully defining the quality elements of the project. These elements consist of the following:

- Operations
  - Operational effectiveness
  - Flexibility / expandability
  - User comfort
- Image
  - Site planning / image
  - Architecture / image
  - Community values
- Technology
  - Engineering performance
  - Security / safety
  - Environmental
- Resources
  - Operations & maintenance costs
  - Schedule
  - Capital cost

The quality modeling process assists in the defining, measuring and managing of owner quality expectations. An interactive workshop setting, with owner and user participation, allows project

expectations to be brought out, explored and documented. The relative importance between these quality elements is then explored, prioritized and documented with the owner. The quality model consists of narrative descriptions of each quality element and a graphic diagram which shows the relative priorities.

Space Modeling is a third VM technique which is used to assist in documenting space functional requirements. Space technical criteria, relationships and other information are also a part of space modeling. Benchmarking of similar space functions helps to validate overall needs.

Cost Modeling is a formal VM technique which ties quality and space requirements to a realistic cost budget. The cost model is organized into project functional systems. UNIFORMAT is an elemental cost accounting system used by VM specialists to organize costs. Historical project costs, also organized by UNIFORMAT, permit benchmarking comparative information.

Some owners also establish life cycle cost budgets for their projects. For those that do, the VM technique of life cycle cost modeling assists in setting realistic budgets. Normally, cost elements include:

- Capital costs
- Staffing costs
- Energy costs
- Maintenance costs
- Replacement costs
- Associated costs

All costs are converted to an equivalent present worth basis using the owner established economic criteria for discount rate and life cycle.

A time model is also prepared to relate critical scheduling activities with the overall anticipated project completion date. This VM technique permits discovery of potential problems and leads to improvements to the project schedule.

Once the above models are prepared, a value workshop is held to review all criteria for adequacy and completeness. In most cases, the quality and space expectations exceed the cost budgets. The value workshop study team includes participants from the owner, user, designer, constructor and

facility manager. They explore a variety of options to get the project in balance. The workshop itself is structured following SAVE International Value Methodology. This methodology consists of the following phases: information, function, creativity, evaluation, development, and presentation.

In addition to the above design criteria, including VM techniques, the owner also identifies the minimum qualifications acceptable for prospective Design-Build firms. This might include:

- Experience on similar projects
- Performance in meeting owner budgets, schedules
- Overall capability and resources
- Financial strength
- Previous owner references
- Management approach and leadership

The above information is assembled into an RFQ document. The project is advertised and qualification proposals are received (in response to RFQ). The owner then shortlists (selects) preferably three and usually no more than five of the most qualified D-B entities, for further consideration.

The shortlisted firms are then given a formal request for proposal (RFP). This document seeks a design and cost proposal in response to the design criteria developed earlier. Once these proposals are received, each D-B entity is evaluated on the basis of quality of design, price and other factors. Before making a final award, the short listed firms may be called in to make presentations.

### **RESPONSE TO RFQ/RFP AND VM**

D-B entities interested in responding to owner requests for qualifications prepare appropriate information for consideration. Management strategies are developed by the D-B entities which explore how best to design and construct the facility, should they be selected. The VM technique of function analysis helps identify strategies.

Upon notice of being short listed by the owner, the D-B entity then begins the process of responding to the RFP. Superior creativity and innovation in the preparation of a response is needed in order to satisfy both the quality of design sought as well as to achieve a cost that is competitive. VM can provide terrific assistance in developing a design which is

both high quality and lower in cost than the competition.

To gain competitive advantage, the D-B entity uses VM techniques and outside experts. A Value Workshop is held to explore options in satisfying owner criteria. This workshop follows the procedures of SAVE International's "value methodology." The workshop begins with a review of the RFP and VM material including the FAST diagram; quality, space, cost, life cycle cost and time models. The team then explores alternatives which will meet the required functions but at a cost that will be low enough to win the award.

The VM technique of Risk modeling assists in identifying the potential risks involved with the project. These risks range from geotechnical concerns to construction labor and material availability. The VM team creatively explores mitigation strategies for each of the high risk areas.

Upon receipt of proposals from the D-B entities, the owner begins the process of selecting the one that provides the greatest value to the owner. A variety of selection processes are available to public and private sector owners. Each has been used successfully and each has merits. Following is a listing of the most common approaches:

- Weighted Criteria
- Adjusted Low Bid
- Equivalent Design/Low Bid
- Fixed Budget/Best Design
- Meets Criteria/Low Bid
- Emergency (public safety or welfare threatened)

Whatever selection approach is used by the owner, it should be mentioned in the RFP document so as not to cause any possible disputes later. Explicitly describing the approach including any "weighting" of criteria will also help the D-B entity produce a better response. The VM technique of weighted evaluation assists the D-B entity in assessing their own strengths and weaknesses. This analysis helps the firm to identify weaknesses so that they may be strengthened by adding additional consultants, etc.

Several model D-B contract documents exist for owner use. These D-B contract documents can be obtained at the following organizations:

- American Institute of Architects

## SAVE INTERNATIONAL CONFERENCE PROCEEDINGS 1998

- Associated General Contractors of America
- Engineers Joint Contract Documents Committee, American Consulting Engineers Council
- Design-Build Institute of America

### DESIGN / CONSTRUCTION AND VM

Upon selection and award of the contract with the owner, the D-B entity begins the process of finalizing the design and construction documents. Because there are still a number of decisions yet to be resolved, the owner and the D-B entity must maintain good relations. In many cases a VM “partnering” exercise begins the working relationship. VM can assist both D-B and the owner in continuing to seek best value solutions during the final design stage. Issues about design documentation, constructability, schedule, quality and life cycle cost effectiveness continue to be explored, during value workshops in which the owner and the D-B entity participate. As a further incentive for the team, a sharing of savings between the owner and the D-B entity is suggested. After the project is built, a post-occupancy evaluation is conducted to obtain lessons learned about the relative success of the project.

Significant time savings can result using the D-B method because procurement and construction work can begin before all the construction documents are fully completed. This fast-track construction in time savings translates into lower costs and earlier utilization of the completed facility.

### SUMMARY & CONCLUSION

Figure 1 illustrates the three phases of the design-build process and key responsibilities. VM assistance in this process is also itemized. This VM integration in the D-B process results in the products listed at the bottom of the figure.

As the design-build form of delivery continues to expand in use, VM offers significant benefits for both the owner and the D-B entity. VM offers help in:

- Assuring adequate project criteria and expectations have been defined.
- Assisting D-B entities in preparing competitive proposals which are responsive to owner needs.
- Optimizing project value during final design and

construction.

Owners and D-B entities are encouraged to consider use of value management for their next project in order to improve quality and reduce costs.

### REFERENCES

- American Consulting Engineers Council, 1015 15th Street, N.W. Washington, D.C. 20005
- American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006
- The Associated General Contractors of America, 1957 E. Street, N.W., Washington, D.C. 20006
- Design-Build Institute of America, 1010 Massachusetts Avenue, NW., Suite 350, Washington, DC 20001
- Kirk, Stephen, “Quality Modeling: Defining Project Expectations,” 1994 SAVE Proceedings
- Kirk, Stephen & Alphonse Dell’Isola, Life Cycle Costing for Design Professionals, 2nd Edition, McGraw-Hill, New York, 1995
- SAVE International, Value Methodology Standard, May 1997

**Figure 1**

**Value Management Integration in the Design - Build Process**

