UPSIDE DOWN VE
Study Analysis Sessions
An Early Value Added Application

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ABSTRACT

This paper discusses the concept and use of a modified value engineering (VE) session completed early in the life of a project at the United States Department of Energy's (DOE) Hanford Site. Specifically, it describes how some VE methodologies have been used at the early stages of design to select and develop design approaches and rough order of magnitude estimates.

Introduction

Study Analysis Sessions (SAS) are facilitated interdisciplinary and intercontractor team approaches using some VE techniques. These sessions are to develop a project cost estimate, identify project scope and identify a project functional design requirement in an expeditious manner.

A SAS team is selected from site personnel to establish the scope of work to produce the associated estimate. The SAS process improves the estimates accuracy by: 1) separating the wish list from the actual needs, 2) minimizing design options, 3) identifying the related uncertainties and the associated contingencies. The overall project benefits by reducing the design development costs through the SAS concentrated multidiscipline discussion of alternatives. These discussions minimize the time normally needed to identify the actual scope, thus improving the productivity and value per dollar spent.

The optimal time to conduct a session is before or at the beginning of functional design development. It was used at other stages of design up to the 30% design completion for specific problem resolution or scope changes, not to replace VE. Occasionally a SAS will replace the initial or conceptual phase of project design. Session teams consist of 6 to 12 people who have expertise related to the topic or project of study.

Process overview

The SAS process usually requires two to four days depending on the project complexity. Typically the session team reviews the project background information and performs a site job walk to clarify the scope of the project. During the session, the following information is documented: 1) memories, 2) information needed, 3) in-scope items, 4) out-of-scope items, 5) estimate basis, 6) applicable codes & regulations, 7) requirements, 8) unknowns or uncertainties, 9) assumptions, and 10) major or unique components, (refer to section following figure 2 for definitions). After the walkdown and discussion about any additional information gathered, Functional Analysis System Technique (FAST) diagraming is done by the team to verify that all significant functions have been included in the design. Design approaches are then developed to the detail necessary for the team estimator to generate the associated cost estimate elements. Once project functions have been identified and addressed in the design an estimate of the functional design requirement document outline is developed. Before session completion an action item list is developed assigning post-session action responsibilities, with completion dates, to the team members. Possible post session actions include: estimate completion, schedule and guide specification development, sketches necessary to support the estimate, and report documentation as required per project and session objectives.

This process may also be used for project kick-off meetings at the beginning of conceptual design to initiate design compliance with the project team. These sessions build a team by providing an open environment conducive to cooperation between all team members since at the initial stage of design, they are inquisitive, not locked into a concept, and value each other's input.

The SAS benefits the engineering team, project managers, and the customers (operating contractor {OC}, DOE and tax payer) by:

- Enabling the team to identify and resolve problems earlier,
- Reducing the time needed to generate the functional requirement document, while
- Increasing its comprehensibility,
- Identifying the scope that will fit the budget early in the project,
- Developing an estimate with realistic contingency and documented backup,
- Promoting team building between all team members and end users,
- Establishing OC and engineer/constructor (E/C) ownership of the project candidate cost estimate,
- Reducing duration and related costs of standard design development, reducing the planning stage duration for the initial stages of design, and
- Enabling the customer to finance more projects within their budget by reducing each project's overall costs.

Pre-Study Preparation

Initiation of a session involves the VE practitioner meeting with engineering representative and customer representative to provide input to the scope statement sheet (SSS)[1] and agenda.

The engineering representative:

1) provides the scope, objectives and deliverable input to the VE practitioner; 2) assists the customer representative in establishing a budget for initial team participation at the onset of a session; and 3) assures completion of all session action items.

The customer representative supplies all necessary reference drawings, engineering studies, and documents needed to enable team project understanding. They are responsible for communicating the customer's goals and expectations to SSS development. Additional tasks include assuring all actions assigned to the customer are completed. Full time participation for both the engineering and customer representatives is necessary.

A scope statement sheet is developed as a focus and project clarification vehicle. There are four essential part of the SSS: scope, objectives, deliverable, and team members.

EXAMPLE PROJECT SCOPE STATEMENT SHEET

Project Title: ____________ Project No. __
Location of SAS Session: ____________ Dates: ____ Time - 7:30 to 4:00

TEAM MEMBERS

NAME	PHONE	DISCIPLINE	COMPANY
		Engineering PM	
		Customer PM	
		Fire Protection	
		Architect	
		Electrical	
		Structural	
		Estimator	
		Civil	
		Facility Rep.	

FLOATERS

FACILITATOR

NAME	PHONE	DISCIPLINE	COMPANY
		Value Engineering	

SCOPE

OBJECTIVES

DELIVERABLES

Figure 1

The following describes the contents for each of the SSS sections:

1. Scope is described to clarify the boundaries or limitations of the area of study.

2. Objectives of the session include concise statements agreed upon by the team during the study, to complete the project specific information as applicable for each information sheet (e.g. scope, assumptions, etc.)

3. Session deliverables are a list of expected results. They are the culmination of the scope clarifications and objectives which determine the project design direction, such as:

- Documentation of project scope including: sketches or calculations as necessary to support the estimate, with list of project requirements, unknowns and uncertainties, assumptions, major or unique components, applicable portions of codes, standards, regulations, orders, etc.
- Draft functional requirements in an outline format
- Action items are assigned to team members with deliverable dates. Typical items include: cost estimate, schedule, actions necessary to close open items from information needed list, and team summaries in format for design report text, estimate and schedule.

4. The team selection is based on the scope, objectives and deliverables of the session. Team members are selected based on the discipline required, their knowledge of the site, facilities, technical expertise and familiarity of pertinent code requirements for site.

A cost estimator is an essential member of the team since the primary reason for the session is to obtain an estimate. The estimator provides the requirements to the team for establishing the estimate and provides estimating data during the session to guide decisions. Their full-time participation is very important to the success of the session.

Interdisciplinary participants representing architecture, various disciplines of engineering, facility operations, maintenance and the customer are essential to establish the project technical requirements. They supply technical expertise, draft text and sketches as required for the estimate, function and report documents. Full time availability is necessary.

Floaters are individuals who are not full time team members but are essential to the success of the session. They provide technical, operations or project assignment expertise and information.

The session facilitator is a VE practitioner or has training in value management. Their role is to offer unbiased facilitation, conduct the session, maintaining project focus and process flow. Following the session the VE practitioner completes a report summarizing the process followed and results.

Session Process

To set the stage for the SAS the agenda, guidelines and expectations (Figure 2), SSS (Figure 1), and use of the information sheets are reviewed with team at beginning of day one. Working with teams of highly logical and technical individuals the agenda is a resource to help them understand the process logic and track their progress.

EXAMPLE GUIDELINES AND EXPECTATIONS

- Not a VE; Not a Functional Analysis
- Uses some VE techniques
  - Functions
  - FAST
- Site Walkdown discussion about specifics
- Purpose for Flip Charts
  - Record Data
  - Reference during session
  - Basis for session report
  - Focus attention
- Active listening
  - Let person finish before questioning
  - Question for clarity not objection
- Be succinct - make your point
- Facts versus Perception
  - A discussion on the differences and the related decision impacts
  - "We all see the world not as it is, but as we are"
    -Stephen R. Covey
- Expect frustration!
  - FAST diagramming can be frustrating, but it forces team to focus and communicate
- Consideration
  - Inappropriate language is not acceptable

Figure 2

To enhance open communication between the team members, and to help them understand what to expect during the session along with the acceptable behaviors for the session, the guidelines and expectations are reviewed at the beginning of day 1.

Part of understanding the session process is understanding the purpose of the information sheets. The following list identifies the typical information sheets used during a session. Each flip chart header catalogues the related information pertinent to the project as it is recognized during the session.

- Memories/ideas - A list of ideas, suggestions, and occasionally areas of concern not necessarily pertinent to the discussion. This sheet stores information that may be wanted for future reference. It may also be used to move the discussion along when a team member lodges on a point they are trying to make.

- Information needed - A list of information items needed by the team to bring to closure an area of concern for the session. The required information formation is to be obtained during the session or if unanswerable during session will turn into an action item.

- In scope - A list of discussion items to be included in the project, it is used to maintain focus and for clarifying items to be included in the function document.

- Out of scope - An information sheet used to document areas of discussion that are not a part of the project.

- Estimate basis - Documentation of specific items, often unique estimating information, to be included in the estimate, relating to materials or methods of construction.

- Codes, regulations and standards - A list identifying specific applicable codes that design will need to consider or meet. If possible and appropriate, the specific applicable sections are documented.

- Project requirements - A listing of specific project requirements or constraints that will influence or direct the design.

- Unknowns and uncertainties - A list containing issues and areas of concern that have not been brought to closure during the session and are needed to evolve into an assumption to establish a direction for the design basis.

- Assumptions - A listing of assumptions may be needed to close unresolved issues for design to continue.

- Questions for job walk - A listing of specific items to be looked at during the job walk needing clarification to determine the best design approaches.

- Major or unique components - This list is not always used but can be helpful when a specific item will impact the project design, scope or estimate.

This process is similar to the VE job plan. The Information Phase of a SAS reviews the project background to develop a common understanding of the project for the session team which allows open questioning for further clarification.

Part of the information phase includes a job walk. The job walk is completed for the team to clarify questions and develop a better understanding of what the design involves. Following the job walk all information obtained is documented on flip charts for future reference. Additional questions identified during the job walk are added to the appropriate information sheet.

A FAST diagram is completed to identify the project functions, their relationships, and additional related functions not previously identified. A very important benefit of the FAST is that it builds a team and team understanding.

Using appropriate facilitation techniques, alternatives are identified and reviewed from the job walk documentation and memories lists. Alternatives can then be selected and evaluated using decision making techniques (pros & cons, paired comparison matrix, etc.). Often a single preferred alternative can be identified.

During the development phase or as post session action items the estimate is developed for each alternative along with the following supporting information as appropriate per project:

- A brief engineering statement of work (SOW) that includes input from each design discipline required by the project.

- A plot plan, sketch or collection of existing drawings from which the estimator can determine where the project work elements (proposed and existing) are located and the relative dimension.
- A piping and instrumentation sketch diagram which shows the various project equipment and their relationship.
- Data sheets on key pieces of equipment including sizing and sufficient detail to allow pricing of the equipment.
- An electrical plot plan and one-line diagram sketch.
- Graphic identification of all project areas in special work locations.
- Dimensioned layout sketches of all new structures to be built as part of project.
- Hand draft outline specifications or brief data sheets to include pipe codes (by reference), generic building types, and any special or unique construction or design feature.
- Tentative estimated start and finish dates for initial design, final design and construction schedule.
- Project estimate identifies study developed assumptions, uncertainties and risk, other pertinent information and out of scope clarifications.
- Action items are assigned to team members along with due dates from the items remaining on the information needed list.

Normally, a management presentation is not made since the team is continuing to develop their deliverables.

Completion of the session report is essential to attach to the estimate, for team reference during the continuing design development effort and as a permanent part of the project records.

Conclusion

In excess of 60 study analysis sessions have been conducted at the Hanford DOE site over the past four years. Cost savings cannot be quantified since there was not a design basis for an estimate before the session that the SAS resulting estimate could be compared against. But the SAS benefits include: 1) design cost and schedule optimization, due to 2) scope clarification, 3) functional requirement identification, 4) design option minimization, and 5) establishment of a comprehensive project design basis.

The demand continues to grow as the word spreads among project people regarding its benefits. It has been recognized by many individuals who have experienced the SASs that the impact from these sessions surpass those of the VE studies. SASs seem to respond to the customer's needs much better by getting a project started in the right direction at it's conception, rather than by trying to regain lost ground once it's been lost. With the increasing attention our nation has on obtaining the biggest bang for the buck, the push for more sessions is expected to drive the demand even higher.

Reference

[1]G.E. Parker, "Applying Understanding of Individual Behavior and Team Dynamics Within the Value Engineering Process", **SAVE Proceedings 1989,** p. 224-229.