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Why Use SAVE International Value Engineering Methodology?

Competitive Edge

In today's economic environment, increased competition for project work and the budgetary resources to fund it has meant that private industry, public agencies, and the consultants who support them face a profound challenge. They must **deliver projects that perform better than ever—and cost less.** Imagine gaining the edge to get projects funded and to win the contracts that will see them to fruition. Further, imagine engendering the loyalty of your funding sources, clients, and stakeholders alike. Being a VE team member can give you exposure to potential clients and project team members, too! Here's how:

Definitions of VE

It seems the term "value engineering" (VE) is tossed about in industries ranging from manufactured homes to aerospace and used by engineers, contractors, and value management professionals in different ways. It's hard to know what people mean by it. Let's start with definitions from recognized authorities.

SAVE International

"...the systematic application of recognized tools and techniques by a multidisciplinary team to identify and categorize the functions of a project with the objective to create, select, and develop alternative approaches that will deliver cost-effective and performance-enhanced project functions."[1]

Washington State Department of Transportation

"…a systematic process using a team from a variety of disciplines to improve the value of a project through the analysis of its functions. The VE process incorporates, to the extent possible, the values of design; construction; maintenance; contractor; state, local and federal approval agencies; other stakeholders; and the public."[2]

Public Law 104-106

"…an analysis of the functions of a program, project, system, product, item of equipment, building, facility, service, or supply of an executive agency, performed by **qualified** agency or contractor personnel, directed at improving performance, reliability, quality, safety, and life cycle costs." [3]

Federal Acquisition Regulations Part 52.248

"…an organized effort to analyze the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with required performance, reliability, quality, and safety."[4]

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[1] Value Methodology Definition, SAVE International Module II Training, SAVE International Conference, June 2010.
[2] http://www.wsdot.wa.gov/Design/ValueEngineering.
[3] Public Law 104-106, National Defense Authorization Act For Fiscal Year 1996, Page 110 STAT. 186, Title XLIII Additional Reform Provisions, Subtitle A – Additional Acquisition Reform Provisions, Section 4306 Value Engineering for Federal Agencies.

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Differences Between SAVE Methodology and Other Value Engineering Methods

Misconceptions

"Oh, no! My project was value engineered!" Value engineering is often misconstrued as cost cutting or scope reduction because people think they are performing value engineering, when they are **not** using the proven project-improvement-focused SAVE International VE methodology. **VE myths** state, "VE is cost cutting—it delays projects, criticizes designs, focuses on initial costs, and diminishes quality."

Table 1. Characteristics of SAVE International VE Methodology and Non-SAVE Value Engineering

Characteristics	SAVE International VE Methodology	Non-SAVE Value Engineering
Scope	▪ The scope of a VE study encompasses life cycle cost considerations, minimizes risk, identifies scheduling/phasing opportunities, and often explores sustainability ▪ VE studies look at the whole project (across all disciplines) in a concentrated effort—offering a big-picture perspective of value ▪ Owners receive comprehensive project benefits ▪ The requirements of the project scope are preserved. VE may modify the *way* scope is achieved	▪ VE efforts focus on first costs ▪ VE is more often applied to specific project components or disciplines—examining them individually for cost savings opportunities ▪ Owners receive a limited set of project benefits ▪ Cost cutting is often the goal ▪ Often, scope items are "value engineered" out of the project
Value Achievement	▪ VE studies focus on identifying and analyzing the functions project components perform and their value relative to performance objectives ▪ Identifies opportunities to enhance or not impact performance while saving time and/or money ▪ Alternatives generated have a high implementation success rate, due to comprehensive study scope	▪ VE efforts focus on meeting project expectations at the lowest overall cost ▪ Alternatives generated have a lower probability of acceptance and implementation
Timeframe	▪ VE teams perform studies during finite times during a project—usually at project milestones, but most commonly when design is 30% complete	▪ Engineers conduct VE throughout their project work, usually when it is noted that the project is over budget (thus cost reduction) ▪ Contractors (design-bid-build) use value engineering cost/change proposals during construction

[4]Federal Acquisition Regulations, 52.248-2 Value Engineering—Architect-Engineer, (b) Definitions, March 1990. https://www.acquisition.gov/far/html/52_248_253.html

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Characteristics	SAVE International VE Methodology	Non-SAVE Value Engineering
Facilitators	▪ Uses an objective, third-party facilitator with formal training who has completed SAVE's rigorous certification process, recognized as an international standard ▪ Facilitators provide consistently well-documented studies with data that can be directly compared across multiple studies—and support informed decisions	▪ Uses internal personnel to lead the VE effort, often resulting in bias because their individual performance is tied to project outcomes ▪ Internal personnel rarely have formalized VE facilitation training ▪ VE results may not be consistently or well-documented for later comparison
Team Members	▪ Uses objective, third-party multidisciplinary experts who are often times familiar with the SAVE methodology and have no stake in the project outcome ▪ Affords the opportunity to have top-tier industry experts contribute to the project, as their hourly rates are applied over a short study period ▪ VE team members look at the project with a fresh perspective and consider information that may have been overlooked in the original design ▪ VE team members are asked to eliminate personal and institutional barriers	▪ Uses the internal project team to generate VE alternatives ▪ It is usually not financially feasible to have industry experts involved throughout the life of the project ▪ Project team members are close to the project and intimately familiar with its constraints—so much so that creativity can be stifled ▪ Project team members are often focused only on their individual discipline ▪ Project team members are constrained by scope and contract documents
Who is Involved	▪ VE studies involve project owners, the project team, construction team, funding and regulatory agencies, users, and other stakeholders ▪ Ensures institutional knowledge of project team and contractor team is understood by VE team	▪ Recognizes owner, agency, user, and stakeholder criteria, but typically does not involve these groups in the VE process
Techniques	▪ Uses standardized, widely accepted analysis techniques ▪ Uses a systematic, defined process, following a standard six-step job plan during the study. ▪ Moves the study from inception to completion, preventing project delays	▪ Uses a variety of techniques ▪ Uses a variety of approaches and processes ▪ May have an undefined effort or continuing duration
Creativity	▪ Creative analysis is facilitated using formalized brainstorming techniques to leverage the synergy of a multidisciplinary VE team building on one another's ideas	▪ Individuals generate alternatives, often without the opportunity for the whole project team to brainstorm together
Project Size Suitability	▪ Ideal for medium-to-large, complex projects with interrelated issues	▪ Can be applied to smaller projects, where components can be examined individually and the stakes are not high

SAVE VE Methodology is an organized approach for a second look using a consistent set of concepts to optimize the difference between the cost of doing the construction and the cost of satisfying the user of the facility. Value Engineering is not a matter of reducing the scope of a project, compromising the

performance of an element, or simply substituting cheaper materials that will not function with the required reliability.[5] SAVE VE focuses on identifying and analyzing the function of project components, processes, or activities. It is user-oriented approach that asks: What does it do? What does it do this to? What does it cost? What else will do the job? What does that cost?

Who is Using SAVE Methodology?

SAVE VE Methodology relies on the use of established analysis concepts and techniques used in private industry by firms such as The Boeing Company, Lockheed Martin, and other manufacturers. It is mandated by federal agencies including the Federal Highway Administration (FHWA), Federal Aviation Administration (FAA), Federal Transit Authority (FTA), Environmental Protection Agency (EPA), General Services Administration (GSA), U.S. Department of State Bureau of Overseas Building Operations; and by the Department of Defense (DOD), including the U.S. Army Corps of Engineers (USACE) and the U.S. Navy. It is also used by state and city agencies, such as the Washington State Department of Transportation; Caltrans; and the City of New York, Office of the Mayor, Office of Management and Budget.

These agencies use the SAVE International VE Methodology to add value to their organizations and because results can be quantified and qualified—the same reasons this can benefit any contracting delivery method, project, or process. SAVE "Value methodology easily produces savings of 30 percent of the estimated cost for manufacturing a product, constructing a project, or providing a service. The return on investment that public and private organizations derive from implementing VE programs averages 10:1."[6] Several agencies and the benefits they reap in their formal VE programs are detailed below:

Washington State Department of Transportation

Between October 1, 2008 and September 30, 2009 WSDOT finalized 15 studies on projects that had a combined original construction estimate of over $1.545 billion. Of these studies, nine were required by the FHWA and two by WSDOT policy. These projects ranged in size from $438 million (SR 520, Eastside Transit and HOV Improvements) to $16 million (SR 285, West End of George Sellar Bridge).

- 15 VE Studies in One Year Saved $159 Million
- Average Project Savings = 9.22%
- Average Return on VE Study Investment (Initial Costs) = 370:1
- Implementation Rate = 68%

The continued success of our VE program can be attributed to the timing of studies (scoping or early in design), careful selection of team members, improved study reports and the use of performance measures along with continuing to work proactively to improve our value engineering program.[7]

[5] U.S. Department of Transportation Federal Aviation Administration Circular, Use of Value Engineering for Engineering and Design of Airport Grant Projects, AC No. 150/5300-15A, Initiated by AAS-100, by Michael O'Donnel, Director of Airport Safety and Standards, September 30, 2008.
[6] http://www.value-eng.org/benefits.php
[7] http://www.wsdot.wa.gov/Design/ValueEngineering/AnnualFHWAReport.htm.

U.S. Department of State Overseas Buildings Operations

Results from OBO VE Program 2005-2008:

- VE Program Cost = $5.5 Million for 83 Studies
- Total Savings = $386.2 Million
- Average Return on VE Study Investment (Initial Costs) = 67:1
- Number of VE Ideas Accepted for Implementation = 786[8]

Caltrans

Caltrans refers to value engineering as value analysis (VA).

- Cumulative Study Savings Since 1990 = $2.419 Billion
- Number of Studies Since 1990 = 591
- 2009 Reported Results: 48 VA Studies Saved $171 Million
- 2009 Average Project Savings = 5%
- 2009 Average Return on VA Study Investment (Initial Costs) = 79:1
- 2009 Implementation Rate = 68%
- VA Study Timing: Average Construction Cost Savings at Various Stages of Projects, 2002-2009
  - Project Study Report (PSR) Scoping Phase = $12,116,600
  - Environmental Phase = $10,936,251
  - Plans, Specifications, and Estimates (PS&E) Phase = $3,515,886
  - Late in the PS&E Phase = $1,264,300 [9]

City of New York, Office of the Mayor, Office of Management and Budget

VE program initiated in 1982. Types of projects include jails, hospitals, bridges, schools, IT projects, firehouses, ferry terminals, garages, landfills, parks, police precincts, water treatment, vessels and boats, laboratories, clinics, museums, courts, RFPs, dams, data centers, and waste management. VE Results Summary, 2001-2007:

- 101 Projects Reviewed
- Cost Reductions Achieved = $1,186,639,000
- Average Project Savings = 5%
- Average Return on VE Study Investment (Initial Costs) = 71:1[10]

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[8] "Developing and Maintaining a VE Program in a Government Organization" by Kathy Bethany, Director of Cost Management, U.S. Department of State Overseas Buildings Operations, 2009.
[9] "Introduction to Value Analysis—Caltrans Delivers Value" Presented to Local Agencies, May 2010. Information Presented With Permission of Troy Tusup, Caltrans Value Analysis Program Manager, Division of Design, Office of Special Projects, July 8, 2010.
[10] "Value Engineering Optimized Capital Projects for New York City" by Jill Woller, Director, Technical Services, City of New York, Office of the Mayor, Office of Management and Budget, Presented at the SAVE International Conference, June 2010. Information Presented With Permission of Jill Woller, July 9, 2010.

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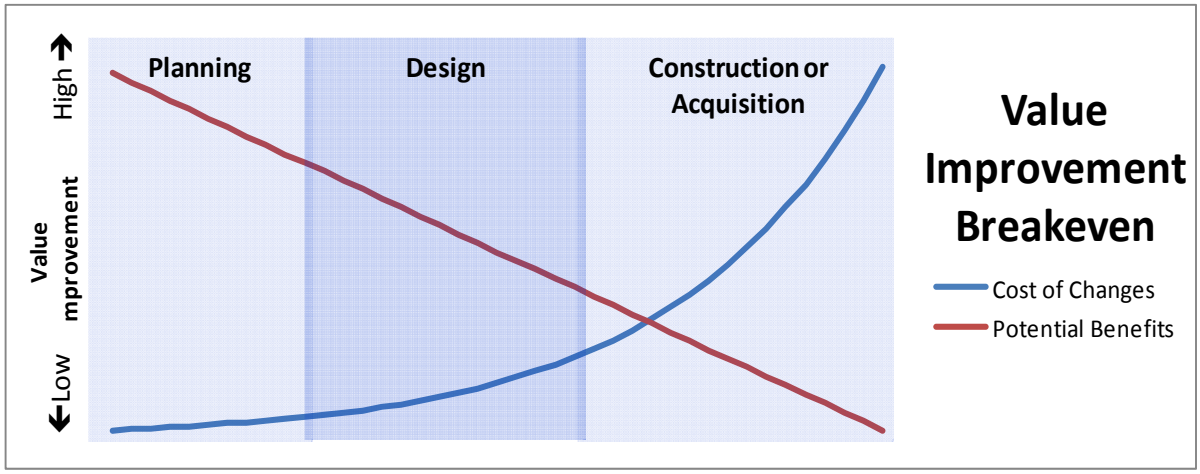
VE Study Timing

VE is most effective when done early in the design phase, because the ideas are still conceptual and the sponsor and the designer can be flexible with decisions without incurring delays in the project schedule or major cost impacts due to design changes. At this stage, the VE team can help identify high-cost elements before final budgets are decided. Once major decisions are made, the opportunity for influencing final costs is greatly reduced.

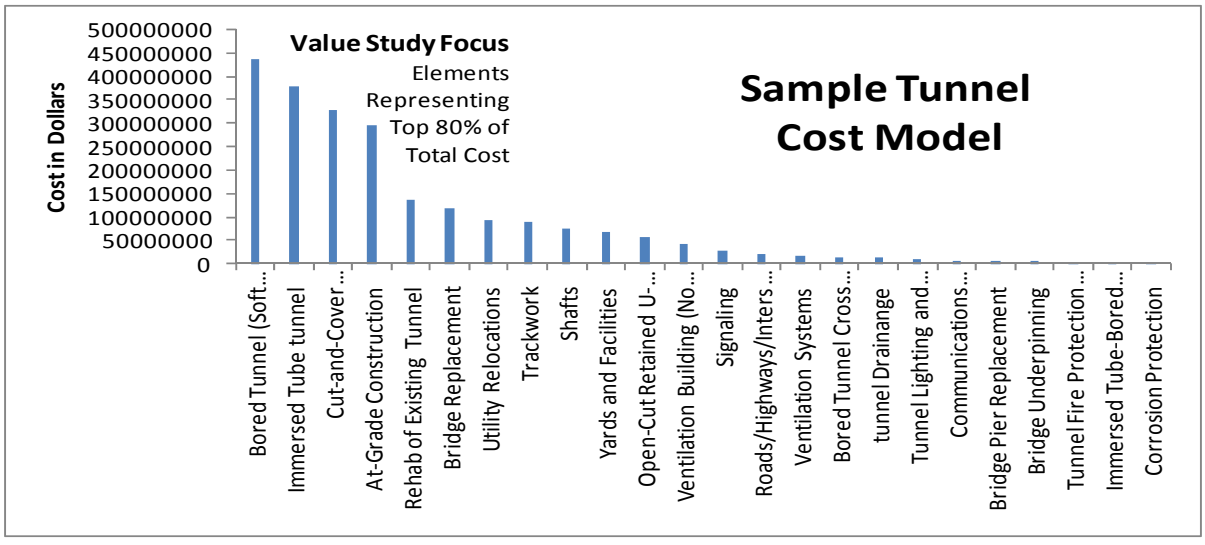
Figure 1. Value Improvement Breakeven Point During Project Life Cycle



Focus on High-Cost Project Elements

SAVE VE methodology focuses on getting the best value from the highest-cost project elements—based on Pareto's Law that 20% of the elements represent 80% of the costs. Below is an example of a cost model for a tunnel project showing the highest costs in 28% of its elements. By focusing on these items during a study, it helps to ensure the best possible outcomes for value improvement in the final design.

Figure 2. Cost Model Targeting Highest-Cost Project Elements



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Benefits of SAVE VE Methodology Applied to Value Engineering in Alternate Delivery Methods

Design-Build (D-B)

In the D-B arena, the approach to using value engineering for a specific project is much different. **If the owner wants to benefit from value engineering on the project, it must be done at the pre-proposal stage** of the project, when they will reap all of the benefits of the study. Once the D-B team has signed the contract, all value engineering opportunities that are realized on the project benefit the D-B team and not the owner. So, why not look at some alternatives to this approach that benefit not just one side of the team, but the entire team and the project?

1. **Pre-Proposal.** The D-B team uses the SAVE International value engineering methodology in an effort to help focus on the needs of the owner—both performance and life cycle—to develop their proposal. This information can then be provided to the owner in the proposal to **show a strong understanding and commitment to meeting the agency's goals for not just short-term accomplishments, but also their long-term operations and maintenance concerns.**
2. **Post Selection of D-B Team.** Once the firm has been selected, and prior to the final negotiations, the D-B team offers to conduct a formal VE workshop to include the agency personnel along with the D-B team. The approach would be to evaluate opportunities against the proposal document and standards, and explore any new ideas. Any savings would be split equally between the agency and the D-B team. This will **ensure a team approach and a potential win-win for all involved**. The actual selection and implementation of any ideas must be agreed upon by both the agency and the D-B team. As needed, the contract documents would then reflect the changes and the project to be designed and built[11].

Construction Manager at Risk (CMR) and General Contractor/Construction Manager (GC/CM or CM/GC)

Since both the contractor's and designer's contracts are held by the owner, bringing the two together for a formal VE workshop gains the insight and experience of the construction team. This is best done when the contractor is first brought into the project. However, if the CMR firm is hired at the same time as the designer, a formal VE session should be added to the overall schedule to allow team members to take a couple of steps back and **look at the entire project in a more holistic manner**. This will help ensure that everyone is focusing on other opportunities, not just reducing costs. The great thing with this process is that the entire team is already familiar with the project, so much of the Information Phase is reduced. The team may also be able to reduce or eliminate the time to do complete write-ups of the ideas. However, it is important to note that the ideas need to be documented and costed. Then, it can be determined whether they should be accepted and in what form documented. They would then be turned over to the design team to add into the project scope. What is important is that the **ideas and opportunities are documented. This helps to identify the positive aspects of the CMR and/or GC/CM process that would not have been possible in a design-bid-build scenario.**[12]

[11] VE Benefits in Design-Build Contract Delivery, Renee Hoekstra, July 2010
[12] VE Benefits in CMR and GC/CM Contract Delivery, Renee Hoekstra, July 2010

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VE Job Plan

Table 2. SAVE VE Job Plan, Plus Preparation and Implementation

Phase	Activities	Results
Preparation (Pre-Study)	▪ Define study scope and objectives ▪ Identify participants, obtain time commitment ▪ Coordinate logistics, agenda, venue, etc ▪ Gather and distribute project information—scope, designs, reports, estimate, cost models, schedule, risks, and constraints	▪ Clear understanding of study priorities ▪ Defines expectations ▪ Offers a thorough overview of the whole project
Information	▪ Review project information (team members and facilitator) ▪ Define project performance metrics ▪ Kickoff Meeting with client, designers, stakeholders, VE team members, and facilitator ▪ Site visit	▪ Brings all team members to a common, basic level of project understanding, including its challenges and constraints ▪ Establishes the benchmark for which to identify alternatives
Function Analysis	▪ Define and classify basic and secondary project functions ▪ Model functional relationship via Function Analysis System Technique (FAST) ▪ Establish function costs and worth relative to performance ▪ Select specific functions for study	▪ Validates that the project satisfies customer needs and objectives ▪ Provides a comprehensive project understanding by focusing on what the project does, rather than what it is ▪ Identifies value-mismatched functions and focuses on functions with the greatest opportunity for project improvement
Creativity	▪ Performance-focused brainstorming ▪ Generate ideas for alternative ways to perform functions	▪ VE team develops a broad array of ideas that provide a wide variety of possible alternative components or methods to improve project value
Evaluation	▪ Eliminate obvious "fatal flaw" ideas ▪ Rank ideas based on performance criteria and study goals ▪ Discuss conflicting rankings	▪ Prioritizes ideas for development—focusing on those with the highest potential performance improvement and cost savings ▪ Value = Performance/Cost
Development	▪ Validate idea concepts ▪ Compare to original design concept ▪ Define implementation requirements	▪ Provides side-by-side comparison of baseline and alternative— concepts, initial costs, life cycle costs, drawings, and performance metrics
Presentation	▪ Present key developed ideas to client, designers, and stakeholders ▪ Draft report	▪ Ensures management and other key stakeholders understand the rationale of the value alternatives and design suggestions
Implementation (Post-Study)	▪ Obtain implementation commitments ▪ Follow up ▪ Final Report	▪ Demonstrates the success of the VE study