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Value Analysis

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Value analysis is an explicit set of disciplined procedures designed to seek optimum monetary value for both early and long-term investment. Value analysis uses tools such as function analysis and risk analysis and relies on collaboration and creativity coupled with accurate cost estimating.

Summary

Why a Client May Need These Services

- To achieve more effective cost management
- To better align scope, performance/quality expectations, and budget

Knowledge and Skills Required

- Technical facilitation and group leadership
- Knowledge of basic economic principles
- Knowledge of scheduling and sequencing of design and construction processes
- Ability to communicate and interact with multiple disciplines
- Understanding and appreciation of interdisciplinary issues
- Creativity and the ability to think outside the box

Representative Process Tasks

- Define scope and value objectives
- Compile background information
- Brainstorm alternative solutions
- Evaluate ideas generated
- Develop recommendations
- Prepare reports

As defined by the Office of Management and Budget, value analysis (VA) is "an organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving essential functions at the lowest life-cycle cost consistent with the required performance, reliability, quality, and safety."

"Value analysis" is the most generalized term associated with the application of value-based processes. Other terms include "value management" and "value engineering." Historically, value management (VM) has focused on organizational and management processes, while value engineering (VE) has been applied to manufacturing processes and procedures. In the construction industry, the terms have been used interchangeably and often applied to cost reduction efforts that use few, if any, value-based processes. To start afresh, the term "value analysis" is used in this topic.

Value analysis concepts have been applied to construction projects in numerous ways for more than 30 years. Despite this history, value analysis has generally been viewed skeptically in the construction industry. To some, value analysis is the answer to every problem project, and to others it is a cost-cutting, quality-reducing exercise that infringes on both the design team and the owner. In fact, value analysis is a process for identifying and solving problems. When properly applied to a suitable problem, it yields excellent results. When applied incorrectly, it can create problems of its own.

Application of VA procedures requires patience, concentration, and a certain amount of discipline. Probably the most important premise is that participants should agree on objectives and be willing to work toward common goals. When VA is incorporated into an overall project delivery approach, the design team can find it an extremely useful tool for general problem solving, cost/function optimization, and value enhancement.

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In 2000 57% of AIA member firms offered value engineering services. Of these, 21% offered VE as a stand-alone service.

AIA Firm Survey 2000–2002

This topic addresses value analysis as a distinct service an architecture firm can provide to a client. However, VA can also be integrated into the procedures of an architecture firm to add value to design and other services the firm provides to its clients.

CLIENT NEEDS

Today's owners are demanding that designers and builders pay more attention to their clients' financial and economic objectives. Owners want their design and construction team to demonstrate effective management of cost and, ultimately, of value.

Regardless of industry, location, or financial situation, owners expect architects and contractors to manage project costs in an accurate and responsive manner. They expect a well-defined budget early in the process, and they want design and construction to deliver the quality and performance specified in the project scope while staying within the budget. These expectations demonstrate that owners not only expect excellence in design but demand excellence in cost management. Invariably, they consider cost a prime determinant of perceived success or failure regardless of the quality or other attributes of a project. Often, meeting a budget may be necessary to justify a project financially.

The purpose of value analysis is to improve the value an owner receives from a constructed project. This value can be shown as the relationship between the functional benefits of a project and the cost required to obtain them. Improved value results from optimizing this relationship as expressed in this equation:

Value = Functional benefits ÷ Cost

Potential benefits of value analysis:

- **Reduced project construction costs**
- **Decreased operation and maintenance costs**
- **Less paperwork**
- **Simpler procedures**
- **Improved project schedules**
- **Less waste**
- **Increased procurement efficiency**
- **More effective use of resources**
- **Development of innovative solutions**

SAVE International

To improve value, the relationship between the elements of the equation can be manipulated in a number of ways:

- Improve benefits, maintain cost
- Maintain benefits, reduce cost
- Improve benefits, reduce cost
- Reduce benefits, reduce cost*
- Increase benefits, increase cost*

***If benefits remain within needs and cost within limitations**

Although cost is relatively easy to measure, benefits can be difficult to interpret. Functional benefits may include reliability, maintainability, security, expandability, sustainability, safety, durability, convenience, accessibility, flexibility, and adaptability. Other benefits, such as the image the building projects (how it is perceived by users and visitors), are more subjective.

The aspect of value analysis that differentiates it from other methods of making an item more effective at less cost is a focus on function. This focus starts with a basic point of view that looks to optimize the functions of an item (whether a building design, an HVAC system design, or a widget) rather than the item itself. Typically, the results of cost-oriented optimization are limited to a solution similar to the item itself. Function-oriented optimization, on the other hand, can lead to a creative solution that is radically different from the original item.

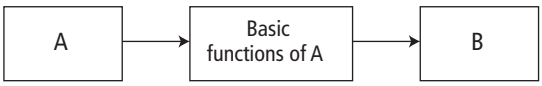
The owner is responsible for defining quality expectations, and the designer is responsible for delivering a design that meets them. Realistically, owner criteria, standards, and program requirements usually define only the lower limits. Designers, with good intentions, often exceed these minimums because they believe better quality is always better value. This is not necessarily true, however, since value is cost-dependent and the relationship between cost and quality is usually not linear. An incremental improvement in quality may come at an incremental cost two to three times greater. When too many items in a facility design approach a vertical cost curve (large increases in cost are required to achieve modest increases in quality), the budget is exceeded and problems occur. To avoid this, a basic quality cost curve, as shown in the accompanying graph, can be applied to most building systems.

Value analysis focuses attention on the quality-cost relationship by seeking solutions

Cost Optimization vs. Function Optimization

Cost-oriented optimization involves looking at item A and asking, "How can item A be made at a lower cost?" The result usually is item A^1, a modified version of item A, as shown below:

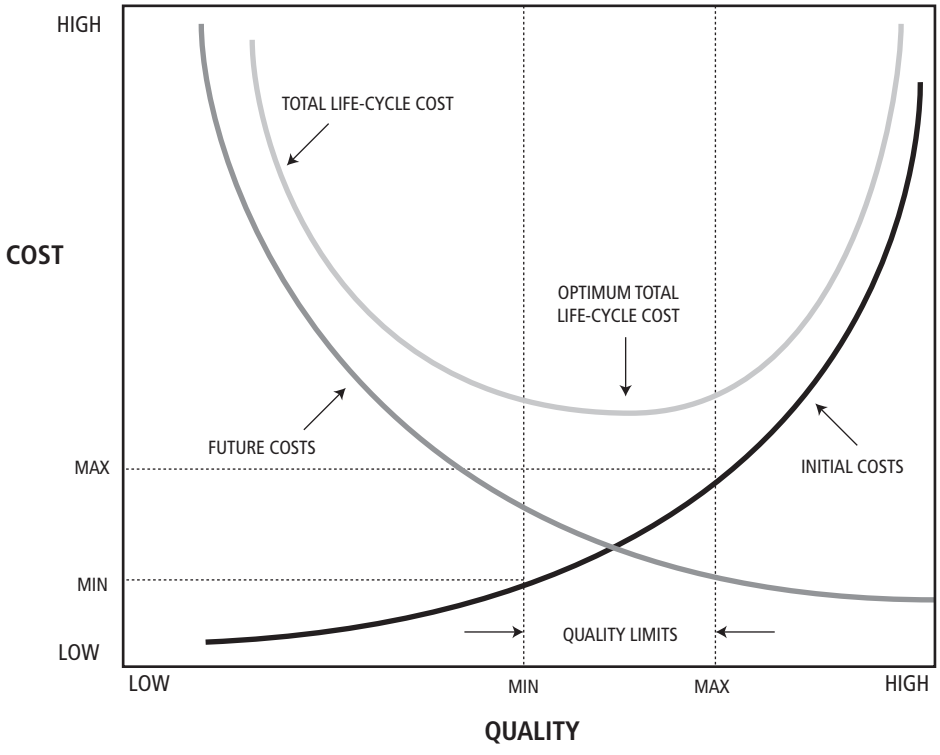
Value analysis involves looking at item A and asking the question, How can the basic functions of item A be provided at a lower cost? The result is item B, which is sometimes a completely different item, as shown:

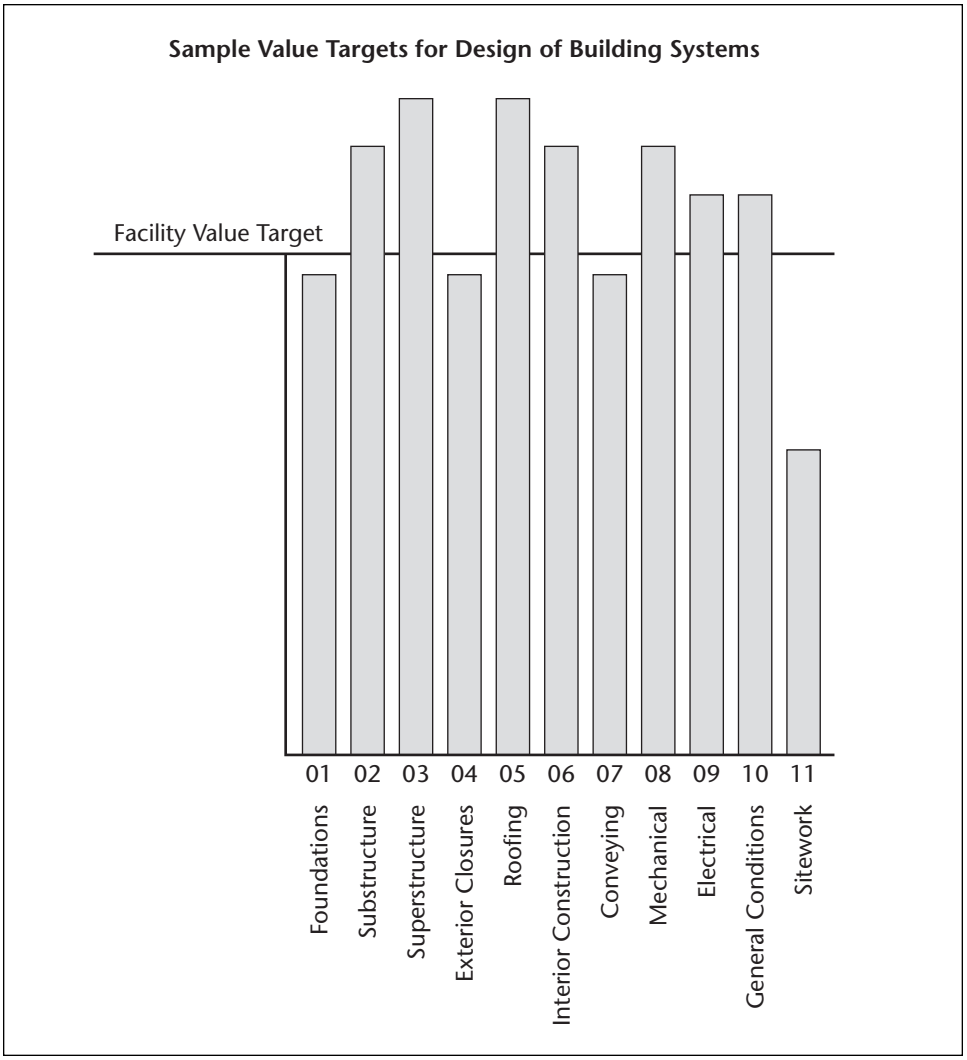


that provide required quality at minimal life-cycle cost. Increasing the quality of a facility or items in a facility is certainly desirable, especially when added quality can be obtained at a low incremental cost. However, when added quality incurs a large incremental cost, decisions must be made with care. Often, value analysis proposals present a client with the cost implications associated with improving quality. Therefore, a sound overall goal for the architect is to balance quality and cost in a design to achieve the best life-cycle cost.

Another VA objective for the architect is to strive for reasonably equal quality among all building elements. The accompanying graph demonstrates how value targets could be assigned for building systems in a design project. Establishing a value target for a project as a whole and for each element can help balance the quality of all building elements, resulting in a project that gives the client the best overall value.

Relationship between Quality and Cost





SKILLS

Value analysis combines technical skills associated with the design process (e.g., planning, programming, architecture, engineering, and specialty disciplines) with a formal problem-solving process. There is no substitute for excellence in technical skills. Any concepts or proposals presented by a VA team will be only as good as the technical skills of those preparing them.

Effective team members typically possess many attributes, including the ability to think outside the box and a willingness to examine solutions beyond the standard ones. Team members also must be able to lead the technical facilitation process.

VA team members must have good communication skills, particularly an ability to explain technical and management issues to an audience from multiple disciplines and backgrounds. An understanding of basic economic principles and knowledge of construction methods and materials are important. Familiarity with scheduling and an ability to sequence events associated with design and construction are essential. Being a team player is important, as the objectives of the team are more important than individual agendas.

►SAVE International administers a broad-based education and certification program that culminates in the designation "certified value specialist," or CVS.

A qualified facilitator should be engaged for the VA process, if possible. The facilitator's role is to maintain the schedule and ensure that a proper and comprehensive work plan is followed, that the team remains focused on key drivers, and that attention is paid to value considerations and relationships. Ultimately, the facilitator produces a report documenting the proceedings of the study. Generally, the facilitator should be skilled and experienced in VA studies and sufficiently independent to maintain objectivity. This skill set is defined by SAVE as that of a certified value specialist (CVS).

The appropriate level of effort for a value analysis is a function of several variables,

including the magnitude and complexity of the project, the degree of repetition within it, the owner's willingness to commit time and money, and the status of budget, schedule, and constructability issues. The importance of the role of the facilitator should not be underestimated, but the owner should decide whether or not to use a professional VA facilitator.

As a general rule, projects of less than $10 million in construction value can be accommodated with a two- to three-day study using a team of four to five professionals, including a facilitator and a cost professional. Larger or more complicated projects often require a team of ten or more people and may require a full five days to complete.

PROCESS

Historically, most formal value analysis has been conducted by an outside team of planners, architects, engineers, and construction specialists facilitated by a value analysis specialist. More informal VA by design teams, construction managers, and owners often has been conducted without a formal plan and process. While there is no right or wrong approach, experience has shown that informal VA tends to veer in the direction of single-discipline design review or cost-cutting exercises in which value is often overlooked or sacrificed. A more formal value analysis process can help the VA team focus on finding a good balance between cost and function.

Cost Cutting vs. Cost Reduction

Simply reducing cost at the expense of quality, performance, and scope is not value analysis. Reducing costs without consideration of value is simple cost cutting. Problems and fractured relationships often result when cost cutting masquerades as VA. Nonetheless, if cost reduction becomes necessary because of limited funds, VA can be an excellent tool. A careful assessment of which aspects of quality, performance, or scope are above minimum needs can guide sensible cost reduction. The distinction is between reducing cost to achieve desired ends and cost reduction as an end in itself.

Successful VA requires a consolidated team effort that focuses on major cost drivers and respects interdisciplinary issues. The owner, design team, and construction management team select appropriate VA team personnel. Three basic approaches to conducting a VA study have generally been successful:

1. A VA specialist facilitates a study using an outside, independent "cold team" of planners, architects, engineers, specialists, and cost professionals.
2. A VA specialist facilitates a study using a team of personnel not associated directly with the project, including representatives of the design firm, the owner's consultants, and the owner.
3. A VA specialist facilitates a study using the existing design team and owner's personnel associated with the project.

All of the approaches above can provide meaningful results, especially if the study is conducted during conceptual or schematic design, as the opportunity for value improvement is most significant early in project development. When studies are conducted later in the design process, it is more difficult for the design team of record to be objective and open-minded about changes. Moreover, when a study is conducted early in the design process, there is time for a second study to focus on details and constructability issues. Many owners with long-standing VA programs use this two-step approach.

Establishing Value Analysis Objectives and Constraints

At the beginning of the value analysis process, the client, the architect, and other project partners must agree on the scope of the project, the budget, and the expectations for the finished building. The objectives of any specific value analysis should be consistent with the overall philosophy and objectives of the owner and mindful of the individual requirements of the project. To achieve the project the client desires, the cost and function of the

overall design and of the individual building elements must be kept in balance throughout the design and construction process. This balance is the primary goal of the VA process.

►The key to success in using value analysis is development of a precise and appropriate definition of value for a particular project.

A number of tools and techniques are available to focus the VA team on critical decisions that drive cost. Function analysis is used to categorize, analyze, and assess the function of the building design as a whole as well as the function of individual building elements. Quality assessment is useful in defining ranges of quality that can be achieved for corresponding ranges of cost. Risk analysis can be utilized to identify major areas of cost-related risk that affect the project. Careful analysis of risk-related decisions may lead the VA team to identify program and design changes that could help mitigate risks.

When a project's estimated construction cost is within budget, the emphasis should be on maintaining or improving value in terms such as operations, flexibility, and expandability while staying within the budget. If improved value can be delivered at reduced cost, then cost reduction becomes a secondary goal.

When project cost exceeds the budget, a VA study by necessity emphasizes reducing construction cost without compromising the program of requirements or eroding the value of the finished project. Cost reduction can often be achieved by precisely aligning quality, performance, and cost with owner objectives. Cost reductions of 5 percent to as much as 10 percent can be achieved by meeting essential project quality and performance objectives with a less expensive solution.

Substantial cost reduction (more than 10 percent) requires reconsideration of the project scope and program and thus should include active participation by both the owner and the design team of record. Determination should also be made of the accuracy of the cost estimate for the project and the estimated cost benefits of VA proposals. Substantial cost reduction requires integration of cost management into the VA process. However, it is important not to sacrifice long-term value for short-term cost reduction, and the VA study should not be used as a device for cost cutting without considering value.

Owners often want to set limits within which the VA team must work and to keep certain issues off the table. Such limits must be clearly communicated and understood by the VA team before any analysis is undertaken. As a general rule, though, the team should be free to examine all aspects of a project.

Programmatic requirements are typically open to challenge by the VA team, as they look for programmatic inefficiencies that can be eliminated without sacrificing basic project objectives and intended functional features. Even governing criteria, except as required by code or law, can be open for challenge, providing that value and cost benefits are worthwhile and important project functions are not compromised.

The VA team is expected to use the rule of common sense in challenging design decisions or criteria that are deep-seated and important to the owner and the design team. Common sense should also preclude the team from expending valuable time on far-fetched or frivolous ideas that have little or no chance of acceptance.

A Basic Approach to Value Analysis

►Generally, it is not reasonable for value analysis to start at A and methodically work toward Z, both because there is not enough time and because this approach would steer the process toward a design review. Although VA does constitute a review of the design, it is not a design review per se. Rather, VA focuses on the 20 percent of design elements that will ultimately affect 80 percent of the project cost.

Effective value analysis generally follows a basic VA work plan and procedures. The Value Society International, SAVE International, and other groups have proposed models. Despite variation in the terminology used to label the phases of these plans, all VA work or job plans follow the same basic approach.

A VA work plan is structured to obtain maximum effect from the effort expended to perform the analysis. Use of a formal plan assists the VA team in a number of ways:

- It provides an organized approach to analyzing a project by quickly identifying areas in which value improvement may be possible and selecting alternatives that minimize costs while maximizing quality.
- It encourages the VA team to think creatively and to look beyond the use of common or standard approaches.
- It emphasizes total ownership costs (life-cycle costs) for a facility, rather than just initial capital costs.
- It leads the VA team to develop a concise understanding of the purposes and functions of the facility.

The phases or steps of a VA work plan can be tailored to suit a particular project or VA team. A basic version includes an information phase, speculation/creativity phase, evaluation/analysis phase, development and recommendation phase, and report phase. The highlight of the process is a group workshop, which usually takes place over a two- to five-day period. The VA work plan organizes activities to prepare for, support, and follow up this workshop.

The Information Phase

Thorough preparation is the first step of a value analysis study. During the information phase, the VA team gains as much information as possible about the design, background, constraints, and projected costs of the project. The team prepares a function analysis and relative cost ranking of systems and subsystems to identify potential high-cost areas and areas where value improvement is most likely. The following items are generally prepared prior to the VA workshop:

- A review of program and scope
- Cost model(s) using the project cost estimate
- Function analyses for total project and pertinent high-cost systems, as appropriate
- List of key issues and value objectives

The following material is typical of what is gathered for review prior to the workshop. Copies should also be available for reference during the workshop.

- Project program and budget development documents
- Drawings for the level of design under study
- Outline or definitive specifications of major construction elements
- Space analysis with respect to the program
- Line item cost estimates for the level of design under study
- Definition of major systems and subsystems, including architectural, structural, mechanical, electrical, sitework, and utilities
- Plot plan, topography, and site planning information (photographs are useful when available)
- Verification of utility (power, sewer, gas, etc.) availability for selected site
- Soil report with response for foundation design concepts indicated on drawings
- Special systems or requirements
- Economic data, budget constraints, discount rate, useful life of facility
- Financial information, including staffing costs and other appropriate figures

A goal during the information phase is efficient preparation for the workshop. The VA team may assemble a workbook that includes the items listed above and conduct a meeting before the workshop to arrange logistics and clarify objectives. Obviously, the preparation time will be reduced if design team personnel serve on the VA team.

The Speculation/Creativity Phase

This phase is the brainstorming and idea-producing portion of the value analysis workshop. Through a collaborative process, the VA team identifies alternative ideas for accomplishing the function of a system or subsystem, improving value, and mitigating key risks. While this phase of the work plan is relatively short (half a day to a whole day), the ideas generated are the key to success of the process.

The Evaluation/Analysis Phase

At this point in the process, the team screens the ideas generated during the speculation/creativity phase. Ideas are evaluated according to the needs of the project, the status of the project budget, and the important objectives for the study as identified by the owner. The ideas that show the greatest potential for value improvement are selected for further study.

The Development/Recommendation Phase

The VA team researches selected ideas and prepares descriptions, sketches, and life-cycle cost estimates to support recommendations chosen for presentation as formal VA

proposals. A proposal consists of a description of the recommended change, the cost of implementing the proposal, sketches, and the advantages and disadvantages of making the change. The cost data included should indicate the probable magnitude of cost savings (or added cost). As they develop the recommendations, it is important for team members to remember that the VA process is intended only to make recommendations. The selection and implementation of any changes are the responsibility of the design team and the owner.

The Report Phase

The results of a value analysis may be presented in several stages. At the conclusion of the workshop, the VA team often makes an informal presentation to the owner, designer, and other consultants. The VA facilitator may also meet with the owner and design team after the VA workshop to help the designer prepare responses and comments on the workshop results and to clarify any misunderstandings that might arise.

The VA team produces a preliminary written report in collaboration with the designer and the owner's representative. This summarizes the results of the value analysis to date and should assure the owner that the final recommendations will meet the VA program objectives. Emphasis should be placed on innovative recommendations that avoid simple cost cutting and are tailored to fit the project, its objectives, the overall budget status, and especially the key value objectives.

The final report presents the researched recommendations for consideration by the owner and the design team. This should be a concise yet self-sufficient document that contains enough technical description so that someone not intimate with the project can understand the major issues. Individual VA recommendations should clearly describe each proposed concept and the original concept on which it is based, and demonstrate the advantages, disadvantages, and economic consequences of accepting the proposal. Summaries should be presented in a manner that allows for a quick review and provides the designer with a simple means for integrating the proposal into the design.

Implementation Assistance

The owner and the designer, along with other owner's consultants, are responsible for administering the implementation process. However, the VA team can help implement VA recommendations and provide technical backup as needed. Some suggested ways to improve implementation are discussed below:

If the designer has not been directly involved in the value analysis process, be sure he or she fully understands the nature and benefits of each VA proposal being considered. If necessary, the VA team can provide additional information to clarify any proposal.

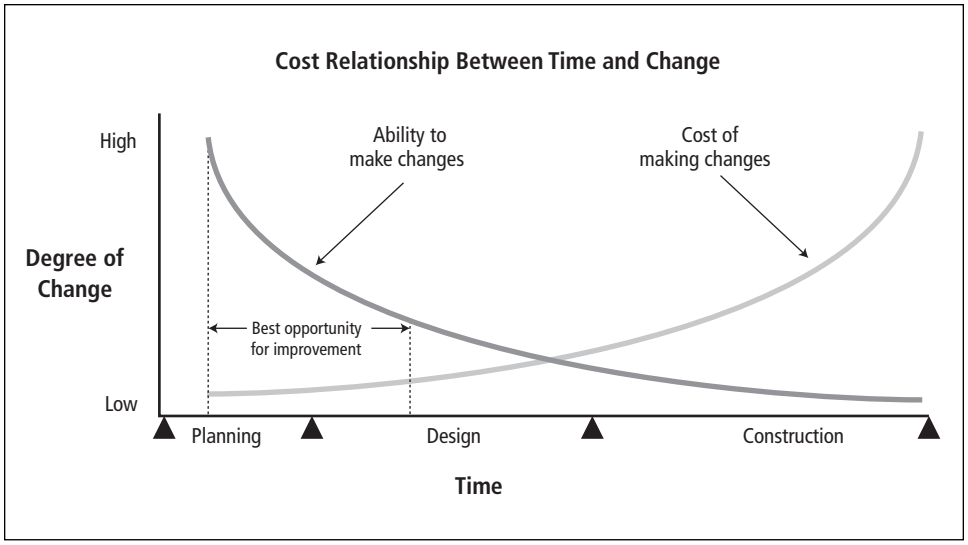
Proposals should be rejected for technical reasons rather than as a critique of the validity of the VA proposal. In other words, an inadequately documented VA proposal may still be a good idea. Rejections should be accompanied by distinct technical analysis. When choices represent opinions, they should be stated.

If a proposal addresses an issue the owner or designer has previously studied and rejected, determine whether the conditions of the previous study still apply. Note that the failure of one idea is not necessarily justification for the rejection of a similar idea, especially if the circumstances are different.

New and comparatively untried ideas should be investigated carefully before acceptance, but newness by itself is not a valid reason for rejection.

Disagreement with a VA team's cost estimate is not by itself a reason for rejecting a proposal. When there is a disagreement over whether a savings actually exists, the proposal should be evaluated on other merits. In other words, cost savings are not a sufficient reason for acceptance, but neither is lack of cost savings a sufficient reason for rejection.

The cost and/or time required by redesign are not by themselves reasons for rejection but are just two of many considerations. Substantial redesign effort may require additional compensation. A major reason for conducting a study early in the design process is to identify and make broad-based changes in design direction before detailed design begins and the cost of change becomes more prohibitive.



Proposals that provide improved value irrespective of added or reduced cost should be considered. If added cost is required, other proposals that reduce cost could offset the added cost. In other words, any cost-savings goals are collective to the project and not individual to proposals.

Proposals that offer substantial reductions in life-cycle cost should not be summarily rejected because of increased first cost, even on a project with actual or potential budget overrun problems. Life-cycle cost savings and sustainability improvements should not be passed over simply because a project is over budget or was not adequately budgeted for at the outset.

CURRENT DEVELOPMENTS IN VALUE ANALYSIS

VA appears to be moving in two somewhat contradictory directions. The first continues to rely on mandated requirements from government and corporate entities. The other emphasizes VA as a value-added service that becomes part of the overall design and construction process. Techniques such as "zero-based design" have evolved in the industrial sector as a means for applying value analysis techniques to plant design and construction. Many VA practitioners believe VA can be better integrated into the design process, a concept called value-enhanced design.

The increasing use of design-build as a project delivery method also creates new opportunities to apply VA during design and construction. In the design-build environment, VA can be applied for the owner's benefit, the designer-builder's benefit, or that of both.

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The AIA provides a contract document designed especially for these types of architectural services. The AIA suggests a two-part agreement:

B102–2007, Standard Form of Agreement Between Owner and Architect without a Predefined Scope of Architect's Services provides terms and conditions only.

B204–2007, Standard Form of Architect's Services: Value Analysis, for use where the Owner employs a Value Analysis Consultant provides the architect's scope of services only.

Together they equal a complete owner-architect agreement.

AIA Document B204™–2007 establishes duties and responsibilities when the owner has employed a Value Analysis Consultant. This document provides the architect's services in three categories: pre-workshop, workshop and post-workshop. The services include presenting the project's goals and design rationale at the value analysis workshop, reviewing and evaluating each value analysis proposal, and preparing a value analysis report for the owner that, among other things, advises the owner of the estimate of the cost of the work resulting from the implementation of the accepted value analysis proposals. B204–2007 is a scope of services document only and may not be used as a stand-alone owner/architect agreement. NOTE: B204–2007 replaces AIA Document B204™–2004 (expired on May 31, 2009).

For more information about AIA Contract Documents, visit www.aia.org/contractdocs/about

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