VALUE ENGINEERING: WHERE QUALITY MEETS COST CONTROL

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LEARNING OBJECTIVES

After reading this article, you should be able to:

+ **ASSESS when value engineering delivers the most value.**
+ **LIST several key benefits of value engineering.**
+ **DESCRIBE how to implement the value engineering methodology.**
+ **DISCUSS why accurate construction cost data is important for value engineering.**

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Design professionals are interested in drawing, planning, and designing functional and aesthetically pleasing facilities and buildings. That's what drives them. But they are also in the service business; they have clients to keep happy. In the name of relationship-building, landing a project, or navigating financial constraints, they are obliged to find ways to maximize budget. To make the most of a client's every dollar, design professionals engage in value engineering, but they often do so begrudgingly.

Make no mistake, value engineering is difficult. But for architects, it's more than that. Architects are creative people. They approach every project thinking big and aiming high. Architects dream of designing buildings that will please people, win a slew of awards, and reset expectations for the local architectural community. With

Value engineering allows design professionals to identify cost-effective alternatives while still meeting the requirements of a project. But finding alternatives takes work, open communication among team members, and reliable data.

each step in the value engineering process, those dreams get reduced.

Value engineering goes beyond mere cost-cutting. The goal isn't to trim the bottom line, but to maximize function at the lowest possible cost. Product quality is still the name of the game. Value engineering is a methodology that ensures the owner is not overpaying for quality when an equally effective, less expensive option exists.

This course covers the history of value engineering, the benefits it provides (even those beyond the budget), the value engineering methodology, when value engineering should and should not be used, and how a national AE firm uses construction cost data to effectively value engineer for its clients.

VALUE ENGINEERING: BORN OF WAR

A quick history lesson: Lawrence Miles was responsible for purchasing raw materials for General Electric during World War II when manufacturing was at its peak. Sounds like a great gig, but the war caused extreme material shortages, leaving Miles searching for suitable alternatives that functioned similarly. This was the birth of value engineering.

The practice has spread since Miles's time. Today, value engineering is used to solve problems, identify and eliminate unwanted costs, and improve function and quality. In other words, to find products that meet performance requirements at a lower cost, delivering value to the project owner.

According to Miles, he invented and systematized value engineering techniques to save money by showing "why … unnecessary costs exist in everything we do and how to identify, clarify, and separate costs which bear no relationships to customers' needs or desires."

The next section describes how value engineering helps meet several customer needs and desires.

BEYOND COST-CUTTING: DISCOVERING THE BENEFITS OF VALUE ENGINEERING

The most obvious benefit of value engineering for owners is budget control and cost savings. After all, the methodology is meant to maximize client budget without sacrificing quality.

But there are ancillary benefits to value engineering as well. Environmental stewardship is one such benefit. The team may find a way to incorporate responsibly sourced materials to improve sustainability or streamline transportation of goods and equipment to reduce carbon footprint. These results are not only good for the project, but also for the surrounding community.

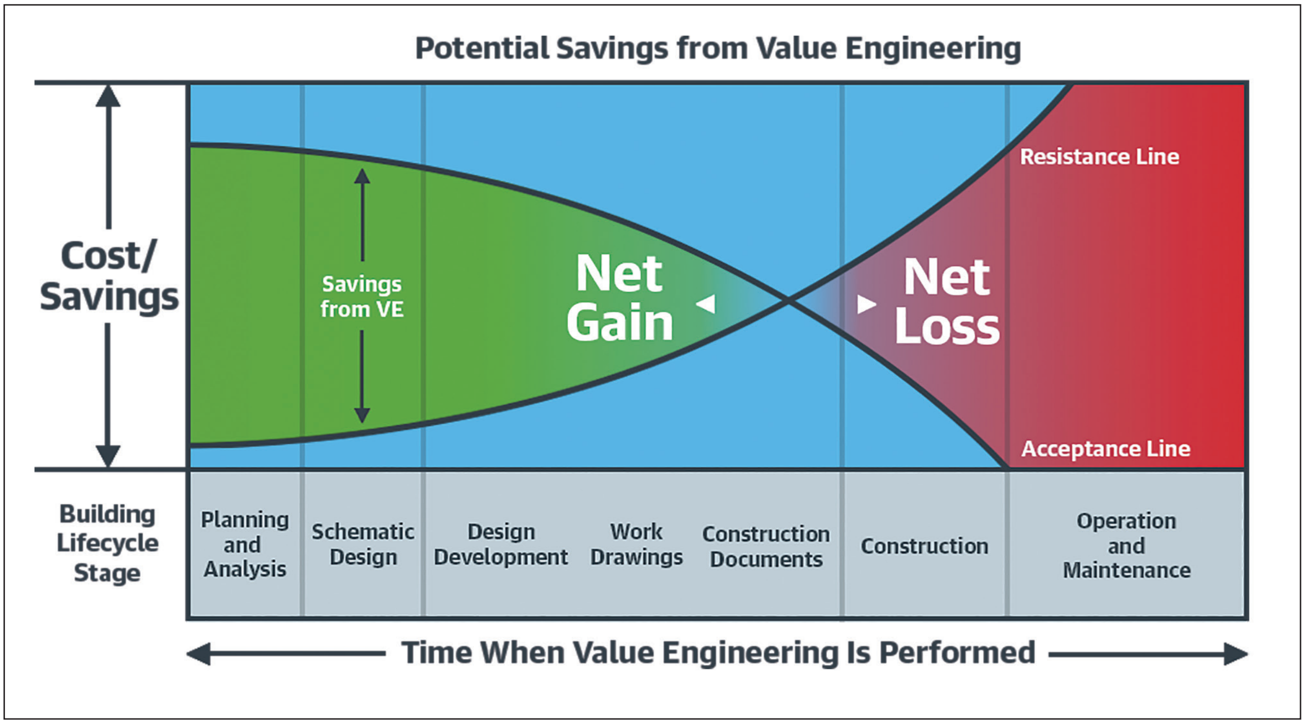
There are intangible benefits associated with value engineering as well. Communication between key project stakeholders early on often results in stronger relationships over the life of the project. Collaboration in the design phase carries over into later phases of the build. Ultimately, value engineering creates trust and teams that trust one another do great work.

WHEN TO VALUE ENGINEER

Technically speaking, there's no wrong time to value engineer. But there are times when value engineering is more, well, valuable to the entire team. The closer the process is to the schematic stage, the better. Once the design team begins creating working drawings, the gains from value engineering begin to diminish. The closer you get to work starting, the less value there is to changing the plans. Once value engineering becomes rework or causes project delays, it is no longer beneficial to the project. The accompanying graph shows when value engineering moves from presenting a financial gain to a financial loss.

Generally speaking, the earlier the value engineering process begins, the better. In the next section, you'll learn who should participate in value engineering and how to follow a systematic method that maximizes function while lowering costs.

Value engineering is not up to the architect or designer alone; it's a team sport. Generally, a group of project stakeholders—including engi-



Potential savings are usually greatest the earlier in the project that the team implements the six steps of value engineering.

neers, contractors, and project leads—is involved in the exercise. The Society of American Value Engineers International (SAVE International) defines value engineering as a "function-oriented, systematic, team approach to provide value in a product, system, or service."

The team should always include design professionals, owner's representatives, and the construction team. It may also include estimators and facilities teams responsible for long-term management. The entire group must be clear on the project owner's expectations and requirements and understand why the project is being built. The client's goals must be the starting point of all value engineering discussions and cannot get lost in the effort to maximize budget. Similarly, everyone must be on the same page in terms of the budget, the current schedule, and any constraints or circumstances that might threaten the project's timeline. Once all are aligned, it's time to get down to brass tacks.

THE SIX STEPS OF VALUE ENGINEERING

Fortunately, value engineering is not just a concept, it's a methodology. Whether a team wants to substitute one material or system for another, consider alternative building methods, or limit environmental impact, the process of value engineering remains generally consistent. The process starts by understanding the designs as they are.

Step 1. Identify the material makeup of the project. The team needs to know what materials and systems they are planning to use. Be sure to work smart in this initial step. The team should focus on big-ticket items like HVAC and electrical systems. Searching for alternatives to the high-dollar elements of the design are likely to deliver the most value. Once you know what you're dealing with, you can begin to talk function.

Step 2. Analyze the functions of the elements identified in the previous step and evaluate their necessity to the goals of the project. Discuss whether the owner and the users will still be served appropriately if those elements were to be replaced.

Step 3. Develop alternative solutions for delivering necessary building functions. Here's a quick list of questions a team should ask when brainstorming alternatives:

- What is it (the original material or system)?
- What does it do (i.e., why is it required)?
- What does it cost?
- What else would do the job?

At this stage of the game, no viable options are eliminated, even those with serious flaws.

This step is all about information-gathering and collecting all possible solutions. Next, designers and their teammates will prune the weak alternatives from the strong ones.

Step 4. Assess the alternative solutions. In the previous value engineering step, the team threw everything at the wall. In this step, it'll see what sticks. Using the answers to questions asked previously, the team can begin weighing alternatives against one another. The primary focus of this discussion should be how well each alternative can perform the function of the original solution. This may involve getting into the weeds of where the facility will be built, how it will be used, and the weather in the area. The details matter.

It is important to remember that these decisions are not made in a black hole—every choice has consequences. A change in one area of a facility can affect any or all other areas of the facility. The team must discuss the holistic effects of every alternative.

Owner expectations matter too, so they must be part of the discussion. It's easy to get wrapped up in the process and lose perspective. Delivering value is tremendous but if the facility does not do what the owner intends it to do and the vision is not executed, then the team has missed the mark.

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At the end of this step, the team should be left with the most viable options for further discussion.

Step 5. Allocate costs to the alternative solutions. Now the team seeks to answer two vitally important questions: How much will this solution cost today? And how much will this solution cost over the facility's entire life cycle?

The design team's best tool in this step of the process is accurate construction cost data. It's likely that everyone around the table has cost data on hand from previous jobs. This historical pricing is great for a rough projection of costs for known materials, equipment and tasks, but it may prove inadequate in the value engineering process.

In order to effectively identify today's costs, project estimates need to be detailed down to the unit costs. To help get to this level and assess feasible alternative solutions, many architects, owners, engineers, and construction professionals rely on accurate cost data from a reliable industry expert. For example, RSMeans data from Gordian is a highly trusted construction cost database with more than 85,000 labor, material, and equipment costs. Such a robust resource is ideal for value engineering because it contains tens of thousands of viable alternatives.

Third-party construction cost providers also offer life cycle cost products to help you answer how much the alternative solution will cost over the long term. Input from the maintenance team is essential at this point, as they are on the front lines of upkeep efforts and often know better than anyone how much those efforts cost year over year. At the end of this step, the team will likely have three options to choose from: the original design, one that costs a little more now and less later, and one that costs a little less now and more later.

Step 6. Develop the alternatives with the highest likelihood of success. These actions can take many shapes depending on the project timeline and available resources. The team may create sketches or digital square foot models during this step. They may verify cost estimates or validate other decisions and assumptions. At the very least, the team needs to assemble all recommendations, their advantages and disadvantages, and implementation plans to present to project owners.

Value engineering views a project with a wider lens. Considering the intersection of function and cost, it allows architects and other design professionals to identify cost-effective alternatives while still meeting the requirements of a project. But finding alternatives takes work, open communication among team members, and reliable data.

While value engineering has successfully maximized project budgets without sacrificing function, it is not suitable for every situation.

There are times when a design team should not engage in value engineering.

WHEN VALUE ENGINEERING IS INAPPROPRIATE

There is one area where the design team should never compromise: safety. Any change that would result in a violation of building code or otherwise jeopardize the health and well-being of the people who use the facility should be rejected immediately. Creating risk is never a good idea.

A quick hypothetical example: A member of the design team discovers significant savings by switching from one material to another. There's just one problem: The original material is fire-retardant, and the alternative material is not. This is an unacceptable change because it could put people in harm's way.

Should a project owner or owner's representative pressure anyone to make a design change that will ultimately put people in harm's way, the design team should deny that request in writing.

70 YEARS OF QUALITY IMPROVEMENTS

Since the days when Lawrence Miles introduced the method to his team at General Electric, value engineering has been a process that seeks to maximize a project's budget without sacrificing an ounce of quality.

Seventy years later, Miles's method has been refined and adopted by industries outside of manufacturing. Today, the value engineering process is still trusted by design teams to build trusting client relationships and help project owners make the most of their resources.+

+EDITOR'S NOTE

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CASE STUDY

FIRM USES CONSTRUCTION COST DATA AS BASIS FOR VALUE ENGINEERING

COURTESY GORDIAN

WITH 30 YEARS OF EXPERIENCE in the AE field, including more than 26 years as a licensed architect, John Bolton knows his way around a construction project. In his current role as Senior Architect at CTA Architects Engineers, a national AE firm serving the commercial, education, government, and healthcare markets, Bolton uses his expertise to create the most cost-effective designs for clients without sacrificing an ounce of quality.

To provide the foundation for value engineering, Bolton and the CTA team need reliable, comprehensive cost data to demonstrate the real impacts of any given choice. Details matter.

To power its value engineering efforts, CTA uses in-house software backed by RSMeans data from Gordian. Using information from an objective third party goes a long way to establishing credibility with clients.

According to Bolton, "The level of detail we are able generate shows CTA understands the details of our designs. Our estimates indicate to the client a real possibility of potential cost impacts versus a lump sum number."

Itemized costs allow CTA to demonstrate the financial impact of each choice made during the value engineering process and using current third-party cost data has proven valuable. CTA estimates generally fall within 3–8% of contractor estimates during design-build projects.

As Bolton explained, "RSMeans data allows the design team to incorporate costs into a project as we understand the impacts, we are able to coordinate with contractors to achieve the best costs for the client."