



Construction Management Research

Partnering for Value Engineering



Executive Summary

This research study begins with an overview of two commonly used terms within the construction industry. Separately, value engineering is commonly known as a process in which product value and accompanying services are increased, where as partnering is thought to be a management tool to improve project quality within an open environment to reduce confrontation. Together these construction management tools can be implemented to reveal the most advantageous products available in an environment that is full of integrity and communication.

After evaluation of a Partnership for Achieving Construction Excellence conference last fall, research in this depth section was aimed at revealing detached perceptions of design teams from general contractors and construction managers. A survey included in **Appendix C** was used to reveal the opinions portrayed by engineers and general contractors concerning their current involvement within a construction project's value engineering process. Response investigations reveal common flaws encountered within VE. Whether a lack of communication for achieving common goals or poor timing during the design development phase, project teams need to work more cooperatively. Doing so will create a trusting environment where valuable suggestions can be discussed in order to improve the overall worth of any project.

Later, this is related to the VE procedure implemented on the Capital One Lecture Hall Addition. Although a number of cost cutting suggestions were accepted in hopes of lowering the budget, additional measures could have been taken. Had project groups looked at alternative solutions before 75% construction documents and formed an open discussion forum, additional ventures could have been accomplished.



Background

Value Engineering (VE)

The term “value engineering” or “value analysis” and their accompanying methodology have been used over half a century. This commonly misused expression in the construction industry is a methodical advance to improve the overall value of a product and accompanying services. As stated by Lawrence Miles, “value is the ratio of Function to Cost.” In order to increase value, one can either improve a products function or reduce its cost. Most importantly, VE is not to be used to reduce overall quality at the expense of pursuing valuable improvements. Proper methods should use instinctive judgment and an examination of a product or sequence’s function to identify relationships that increase value.

Partnering

As we all know, the construction industry involves a large number of participants with different interests. In some cases, this type of an environment may create an uncooperative and blaming culture. The most common causes of construction problems are adversarial relationships between project participants and unbalanced risk allocation creating a “blame game.” Results may lead to project delays, inflated costs, and an overall uninviting atmosphere.

Over the past dozen years, the term “partnering” has been used as a “management tool to improve quality and program, to reduce confrontations between parties, thus enabling an open and non-adversarial contracting environment”⁵. The key themes behind partnering are teamwork, collaboration, trust, openness, and mutual respect. Mechanisms typically used to formulate partnering are project team building sessions, formulation of a joint project charter, periodic assessment to adherence to partnering principles, guidelines for resolving disputes in a timely and effective manner, and requirements for procedure enhancement and risk sharing. Collectively, preliminary claims have been made indicating that partnered projects have achieved superior results in controlling costs, improved technical performance, and better satisfying customers.



Introduction

PACE Seminar

Given the opportunity to attend the Partnership for Achieving Construction Excellence conference last fall, one would have been able to notice a severe lack of enthusiasm during a “Project Level Team Development” conversation. This topic was geared to discuss owner and design team motivations and issues related to outside parties within a construction project. Within the allotted hour and a half time slot, questions like “how do team members learn what motivates owners,” “what leadership skills and traits are needed to manage design teams,” and “what motivates design professions?” were debated. Unlike an earlier enthusiastic discussion about In-House Teams, this debate did not create the same eager atmosphere and began to fade within 45 minutes. The observations made during the PACE conference leads us to believe that there may be predicaments created between project teams, disallowing each other to understand what drives the other.

Proposal

A detached perception of design teams noticed during the debate mentioned above, may be widespread through the construction industry. The first step to develop these relationships and open communication between teams is to identify that there is a dilemma. A survey included in **Appendix C** and discussed in the following section will be used as a tool to get a better understanding of design team and GC/CM opinions on the process of value engineering.

As projects and teams working on them get larger, open communication and integrity often seem to be put to the side. If design teams and contractors do not accept each other as working for the same cause, many problems may arise during preconstruction and construction phases. Due to the increased flow of communication between project teams during value engineering, it is imperative to have team building and partnering exercises put into place.



Survey

The survey included as **Appendix C**, was intended to pick into the minds of both construction and design teams alike. Its specific purpose was to reveal the opinions portrayed by each side concerning their involvement within a current construction project's value engineering process.

Warming up the subjected industry members to further value engineering discussion, they were requested to verify a date for phases of design documents with a notation of value engineering beginning. Before revealing the purpose of VE and the entities which were the source of suggestions, their judgment towards the timing of VE is exposed. Next, a brief explanation of steps taken to identify the owner's needs and priorities was asked for.

The second section of the questionnaire consists of statements to which industry members are to agree or disagree with, revealing their satisfaction or displeasure on the project. Lastly, the final section is an inquiry of specific project team's opinion of success on a job and triumphant VE processes.

Results and Conclusions

The chart to the right is a representation of the percentage of project team members that feel their value engineering phase began at an appropriate time. Of the surveys collected from design team members, 22% of them felt value engineering occurred at a fitting time, where 78% believed it was inappropriate timing. In addition to this, 60% of general contractors and construction managers thought VE happened too late in the design and 40% were content with its position. Collectively, a small percentage of industry members agreed with their situation compared to the 71% who did not.

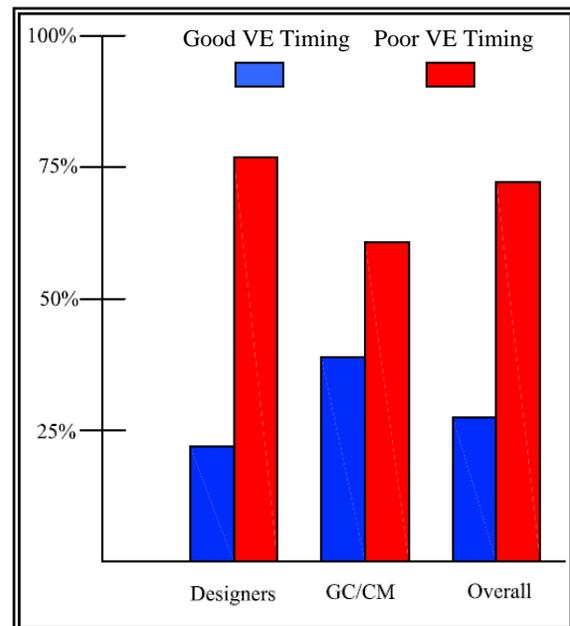


Chart 1. % of Project Teams in Timely VE Processes



Results such as these make you wonder what could be wrong with the VE process. Whether it is strictly timing with design, other project team issues, or a combination of both shall be further investigated. If the case was that either the designers or constructors felt value engineering occurred at a more appropriate time over the other, particular flags may be raised. In this scenario, both sides of the construction spectrum agree that typically VE begins at a bad time, suggesting overall project planning may be at fault. To get a better look into the issue of design and construction phase sequencing, it would be a good idea to look at the addition of value during particular deadlines.

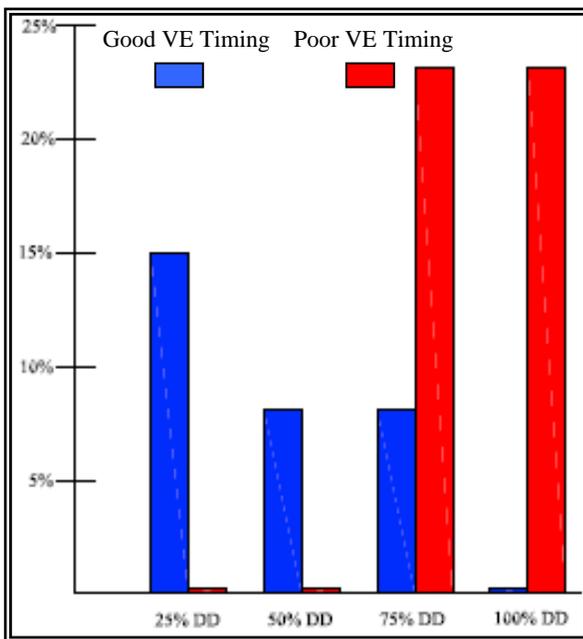


Chart 2. Timely VE of Design Document Progression

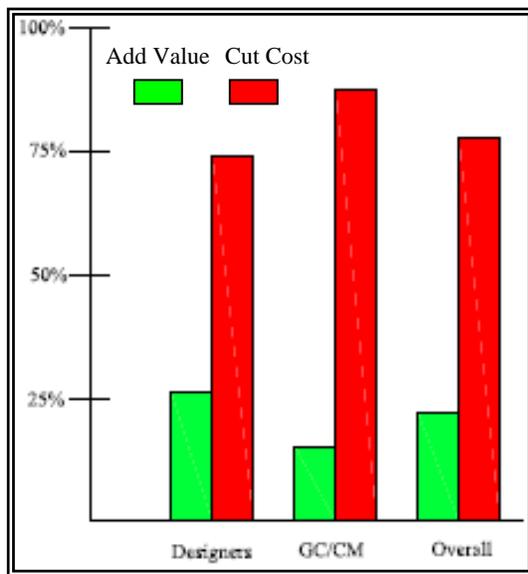
In most processes, projects go through the review of 50%, 75%, and 100% design documents. The accompanying table depicts opinions of the industry members concerning their VE procedures. Within this representation, the appropriate sequence is compared to the progression of design documents. A majority of optimistic agreement between the two parties exist for 25% and 50% design documents. Once design documents progress to 75% and above, value engineering tends to be inefficient or too late. Due to the fast paced nature of construction, general contractors and construction managers are often forced to procure major trades such as steel, glass, and concrete by 75% design.

This makes us believe that the most opportune duration to begin suggestions of adding value in design is around 25% and just after the completion of 50% documents. Some may argue that plans are not sufficiently developed to get a realistic understanding of the structure at 25%, but an honest effort as soon as possible can be very advantageous. Conversely, poor communication between the owner, engineers, and general contractor will result in unsuccessful value adding suggestions. If project teams are aware of future strategies, they will have time to prepare the most beneficial options to an owner.



Now that frequent a deficiency within the procurement of VE activities has been exposed, it is best to examine the actual process itself. As stated earlier, this practice is an advance to improve the overall value of a product and accompanying services, without sacrificing quality. More often than not, today's construction industry promotes cost cutting in order to get projects back under budget. This statement can be seen in the table below. For this study, it was revealed that over three quarters of the time, designers and contractors experience cost cutting tactics.

Although there is an agreement that these steps occur, utilizing "value engineering" to lower project budget can cause dissemination. Common comments made by designers in the survey



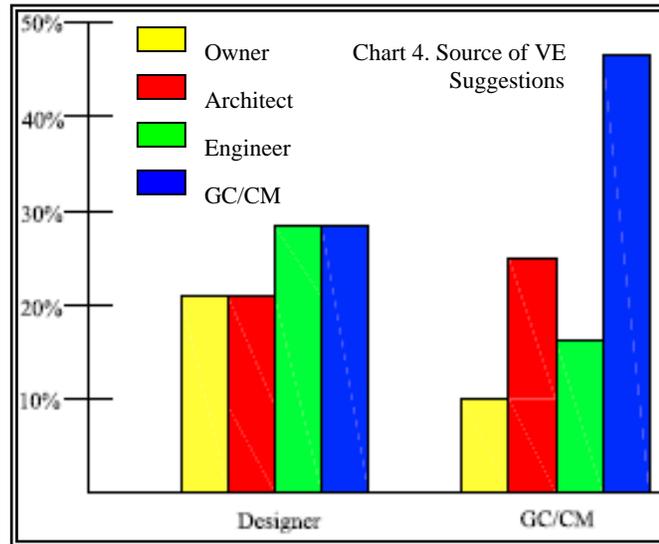
suggest that GC/CM's frequently propose cheaper building components at the cost of quality. As stated by Chris Mellinger of Innovative Electrical Systems, Inc. "a successful VE process is one where the engineers are given the chance to evaluate their own design and offer valid changes that would help save money without degrading their design. Too often engineers are not given the chance to "value" engineer their own design." Actions such as these may percolate untrusting project atmospheres.

Chart 3. VE Cost Cutting vs. Adding Value

A dissimilar response from a structural engineer has an indirect reference promoting the beneficial nature of close and communicative project teams. For his project, the owner, developer, and general contractor are all from the same company. As a result, he claims that a formal value engineering process was never performed, but 95% of their decisions were made with the point of adding value to their project.



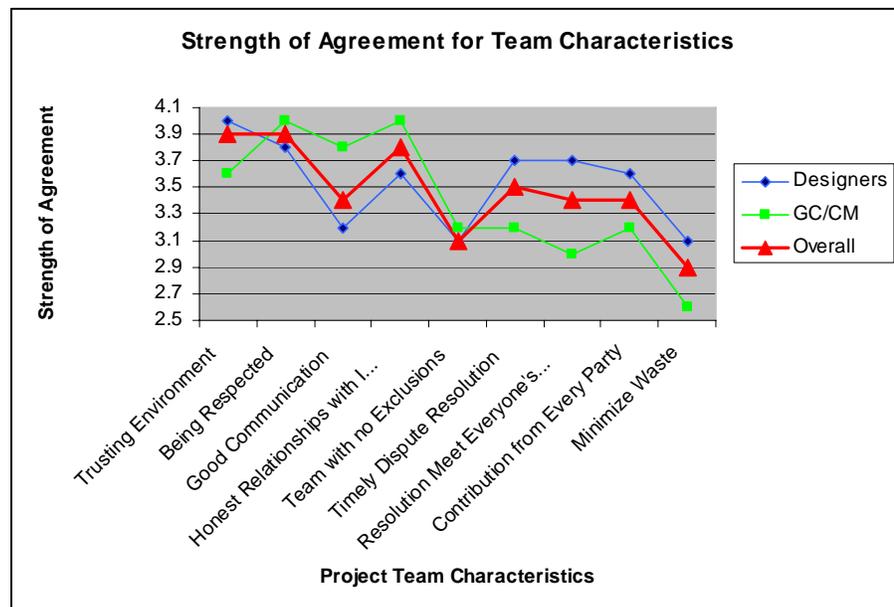
Further investigation of survey responses may prove additional dissemination between design teams and constructors. In the chart below, you can see that designers have a notion that owners and architects may have a slightly smaller influence in the VE process than engineers and GC/CM's. On the other hand, constructors believe they have a far greater influence on suggestions provided during VE. This evaluation only



strengthens the validity of the electrical engineer's statement about their inability to properly re-evaluate their designs and maintain system quality. Above all, both project teams agree that owners typically present the fewest options of value.

The final figure represents data compiled from industry member's responses referencing positive statements of team characteristics. Dealing with their current projects, engineers and contractors agree that they feel less involved in a team atmosphere with no exclusions. Moreover, both parties suggest that every party involved is not attempting to minimize waste from design and construction. On the contrary, trusting and respectful atmospheres have been created, but with room for improvement.

Chart 5. Strength Agreement for Team Characteristics





Recommendations

The research conducted in this study reveals the presence of controversy between project teams during the period of value engineering. Although it does not prove a detached perception of design teams from constructors as initially believed from the PACE seminar, it does however show that their shared motivations for owner/client satisfaction can be different. The major drive in this satisfaction comes from a desire to do repeat work in the future. Where a general contractor's goal may be to hand over a cost efficient and timely project, an engineer's may be to provide the most efficient and functional design.

You may feel that deficiencies created during pre-construction and construction phases are caused by countless things beyond the control of project teams. This may be true, but as long as owners, engineers, and contractors work together at the earliest instant permitted, more solutions may be created. Working as one collaborative team for a common goal, with mutual trust and respect for others, VE can be an invaluable process.



Application to Lecture Hall

Each year, as the owner, Capital One puts aside a set amount of money to be allocated towards particular improvements on their property. Being such a large company, the preliminary maximum figures are expected to be spent, unless additional costs can be saved. Where projects are funded with money and they do not occur over a given time span, these funds will be distributed elsewhere. The final result may even be that the previous project is not pursued for years to come, or never thought of again.

Preliminary budgets were being created throughout the schematic design phase. As the contract documents progressed towards completion, subcontract estimates rose. DAVIS' Interim GMP eventually grew much larger than the maximum pre-determined amount in the 75% Construction Documents. From that point, it was imperative that building systems and site logistics be re-evaluated. While the value engineering process began for the Lecture Hall project, DAVIS was requested by Capital One to create a preliminary list of VE items to be discussed. By that stage in pre-construction, major trades containing long lead items had already been procured. With pre-cast concrete, steel, and glazing contracts already signed, DAVIS had to look into interior savings and other site characteristics.

Although replacing initial wood ceiling tile and wall finishes with less expensive alternatives saved money, it was viewed to be a cost cutting activity. An especially large savings came with DAVIS' recommendation to keep soil excavations on site, to be later used for backfill, instead of removing it. These recommendations were effective at reducing the budget, but additional suggestions could also have been achieved. The analyses to follow will represent a few items DAVIS and Capital One could have profited from had they taken a few extra measures during their VE process.