

**Enhancing the quality and cost by
using Value engineering steps;
in school design and construction.**



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1.0 Introduction

It true that Value Methodology is an organized process that has been effectively used by a wide range of industries to achieve their continuous improvement goals and governments agencies to better manage their limited construction budgets. The success of the VM process is due to its ability to identify opportunities to remove unnecessary costs from facilities, products and services while assuring that quality, reliability, performance, and other critical factors meet or exceed the customer's expectations.

The improvements are the result of recommendations made by multi-disciplined teams under the guidance of a skilled VM facilitator, as a value specialist. The multi-disciplined teams can be comprised of those that were involved in the design and development of the project, technical experts that were not involved with the project or a combination of the two. There are two essential elements that set the Value Methodology apart from other techniques, methodologies and processes.

This study concentrates of evaluation of school projects in general for future study the author prefer to take UNRWA and PA schools in Palestine (Gaza strip) as a case study. Hopping that this study will enhance the quality and cost of their schools. School project with complete educational facilities. This includes the all units which may not be available at one school (laboratories, MPR, SEN, HEU, HCU, etc...) Helping of promote quality school design around the world.

2.0 History & Evolution of Value Methodology

Value Engineering methodology was in the World War II period from 1938 to 1945. Lawrence Miles, regarded as the father of Value Analysis/Engineering, was an engineer for General Electric Company. Miles was assigned the task of "finding, negotiating for and getting" a materials and components that were in very short supply due to the war effort.

Frequently, suppliers, already over-extended, said "No" to increased schedules or new necessary products. In this desperate situation Miles was forced to basics. "If I can't get the product, I've got to get the function. How can you provide the function by using some machine or labor or material that you can get?" Time and again there was a way to do it. Engineering tests and approvals were rushed and schedules met. Thus "function" grew in vitality and was to later mature into the development of the VA techniques.

In March of 1944, he was transferred to Locke Insulator, Baltimore, Maryland, a subsidiary of GE, as Manager of Purchasing. He took line responsibility for delivery and cost of millions of dollars worth of materials and products per year. During nearly the next four years, he developed patterns of engineering, laboratory and purchasing teamwork which limited costs and improved products. He learned first-hand both the productive and the destructive force of human attitudes and practices, and their effect on appropriate designs and appropriate costs. His thinking was becoming more and more "What Function am I buying?" rather than "What material am I buying?" Following the war,

Miles formally developed the basis for today's Value Methodology. In 1954 the U.S. Navy Bureau of Ships implemented the first Federal Government program with the assistance of Miles and his staff. There followed a period of gradual growth in Federal agencies until 1963 when the Department of Defense established specific requirements for a formal program within the three military services. This involved their design and construction activities as well as suppliers, and mandated incentive sharing clauses in construction contracts. Contractors were permitted to propose Value Engineering changes and share in net savings. It also introduced full-time Value Engineers within agency staffs to promote and administer the program. The high level of success achieved by the Department of Defense led to further recognition in civil agencies. Great expansion followed in the next fifteen years. Today every Federal agency with a significant construction or purchasing program employs VE in some form. In addition to defense, such agencies include General Services Administration, Environmental Protection Agency, U.S. Forest Service, Veteran's Administration, the Federal Highway Administration and the Department of the Interior. This was further expanded during the 1980's by the Executive Branch, with the support of Congress, to include requirements for the application of Value Engineering to all agencies within the Federal Government. In addition, a few states and city governments have directed, through legislative action, that value methodology be applied to all capital expenditures. Thus the value technique, born of necessity in a single company, has become a widely used technical methodology for effective utilization of resources.

3.0 Value engineering in school design and construction

Value engineering is a common term in school design and construction that has gained popularity through the years as a way to save the owner (i.e., school district) money while maintaining the overall quality of a project. Telling the school board you are saving the money is a politically acceptable thing to do. It is always met with positive feedback.

As it known from design professionals through the years, the term value engineering tends to strike a nerve. Some will say "value engineering is neither," meaning, of course, that it does not create value and it is not engineering. But perhaps the term is appropriate since often "value" is "engineered" right out of a project.

Cutting the cost of a project while maintaining the overall quality sounds good in theory, but the reality is often quite different. The value is often removed from the project in an effort to save money. Why is that? Perhaps the lure of saving money blinds one to the full impact. In addition, the implications of value engineering are not always fully understood. Cuts made often impact the learning environment, staff, and students in a negative way.

So, the next time you have an opportunity to reduce the cost of your project, take into consideration the following points.

1. Involve the Maintenance Staff

Yes, it is difficult for people to work together when their priorities seem to be polar opposites. An architect is the champion of aesthetics; the business manager is watching the cost; and the custodian cares about maintaining the school. All their duties and perspectives are equally important.

Decreasing or eliminating storage rooms is a common ploy in saving money. It is senseless to cut critical storage or custodial space and still expect the custodial staff to perform well. Having the maintenance staff involved in the design process helps keep these spaces from being unfairly targeted. When storage rooms get reduced and crowded, ugliness occurs.

2. Rely on the Architect

Recently, most of us say that schools project came in significantly over budget. After much angst, the client elected to retain the same architect to redesign and re-bid the project. The administrators had considered firing the architect and hiring another firm. He asked me if I thought they made the right decision. Yes, I agreed with their decision.

Although there are a number of reasons to always try to work things out with your existing architect, one very good reason is that he knows the building he designed. Who better to change the creation than the creator? The architect and consulting engineers who designed your project is the first people you should look to for assistance in reducing cost.

3. Evaluate Life Cycle Cost

Life cycle cost analysis looks at the short-term and long-term costs. If you pay twice as much for a product, but it lasts three times longer than another product, it will have a lower cost over the long run.

It is right to say (unwise to pay too much, but it is worse to pay too little). When you pay too much, you lose a little money—that is all. When you pay too little, you sometimes lose everything because the thing you bought was incapable of doing the work it was bought to do.”

For instance when we compare the using types of toilet partitions, showing two different sides of selecting partitions, and one is ugly.

Eliminating ceramic tile in a toilet room can save a little money but create more maintenance issues.

4. Make Decisions Early in the Process

Making informed decisions early in the design process can help save

significant money. Carefully reviewing overall school size and total building systems produces impressive savings. Making cost-cutting decisions late in the process often negates the reason for including the feature in the first place. Deciding on what alternates to price at bid time should also be done sooner rather than later.

Making decisions like specifying non-electric partitions is definitely something that appears on the ugly side of value engineering.

5.0 How Much Land is Needed for a New School?

When you are ready to build a new school, whether it's replacing an existing facility or accommodating natural growth. One of the first steps in planning a new school is acquiring a site that is both large enough for the building, parking, playgrounds/athletic fields, etc., and is a suitable location for housing a school.

-Site Size

The guidelines for site size in Europe include using a formula to calculate site size, and that formula consists of a base acreage amount plus additional acreage based on the school's capacity.

Minnesota appears to have one of the largest requirements. For a 500-student elementary school, the state recommends 15 to 20 acres. For a 1,500- student high school, 45 to 55 acres are preferred.

In Palestine the most of our schools have more than 1200 student and more than 35 people per class.

Guidelines aside, when it comes to determining how much land you need, there are a number of questions that must be asked, including the following.

1. How many students will be housed in the school?
2. What grades are planned for the school?
3. How many athletic fields are needed for the school?
4. What is the potential for future expansion?

-Site Location

Although site size is an important factor, location may be an even more critical factor. And there are a number of items to consider when determining if a site is a suitable location for a school.

1. Usable acreage:

A site that has mine subsidence, steep terrain or wetlands needs to be larger than one that does not, so that the overall usable acreage is adequate. Quality must be considered along with quantity.

2. More is better:

It is better to have extra land than not enough. When—not if—the school expands, there needs to be room to not only expand the building but also adequate parking, storm water detention, play fields and other amenities.

3. Cost:

The cost of land is only a small part of the total site cost. The cost for infrastructure (utilities, access road, traffic lights, on-site sewer, etc.) should be carefully considered in the site evaluations.

4. Community use:

Many Clients are adding play fields that can be used by the community. In some cases, this can double the number of acres needed for a school.

If you are embarking on a new school construction project, your design professional can assist in the site selection and evaluation process. A careful review of site features and costs ensures that the school makes an informed decision.

6.0 Recommendation

I recommend to start building a value engineering team ,which concerned from PA and UNRWA concerned persons such as :

- Architects ,structural engineers and electro-mechanical
- Client + End user (Teacher, student, driver, sanitation worker and others).
- Staff from maintenance (laborer if needed)
- Specialist (If needed)

Value Engineering can be applied at any point in the development process, but to obtain maximum effectiveness, VE studies should be undertaken as early as possible when the impact of decisions (on life-cycle costs) is the greatest.

A team of 5 to 8 persons with diverse backgrounds seems to work best. The length of time required for a study varies and is dependent upon the complexity of the school project. It shouldn't take more than a week.

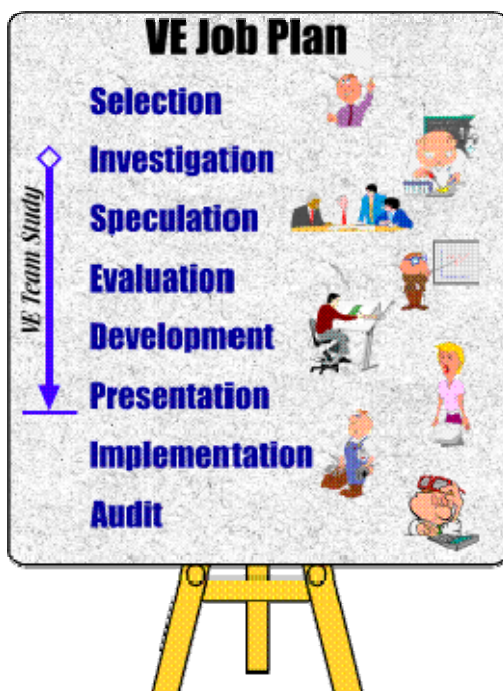
I recommend that the VE team effort be done at one time rather than spreading it over several weeks or months. By doing this the team members do not have to become reacquainted with the project and momentum is maintained.

I define Value Engineering as "the systematic application of recognized techniques by a multi-disciplined team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost."

Referred to in the above definition is embodied in the VE Job Plan. The Job Plan is an organized plan of action for accomplishing VE studies and assuring the implementation of the recommended changes. The Job Plan contains eight phases.

Each phase of the Job Plan includes several tasks. It is the melding of the various tasks and techniques, coupled with finesse in their application that makes the VE process work.

Job Plan



-Information phase

- Review project under VE study.

- Gather background information.
- Update client needs and requirements.
- Establish objectives and goals.
- Define scope.
- Understand current costs
 - cost visibility
 - cost model

-VE workshop stage

This is the main stage in the VE study. The main outcome is VE proposals which will be presented to a senior staff from the PA and UNRWA concerned persons to get their approval and start implementing these proposals.

-VE implementation stage

-VE proposals report & presentation

-Final report

-Technical Support Related to Common Specifications

The VE Construction team should give his recommendations on the construction contract standard, which includes such new items as the responsibility of the contractor, necessity of documentation, clarity of expression and procedure, and introduction of a new performance security system.

Based on this, the common specification for public works was greatly revised. However, we continue to provide support in improvements that match the needs of the changing world.

***Study and Research on the Tender and Contract Systems**

the Value Engineering (VE) method, design-and-build contracting method, technical - proposal type overall evaluation method, and using private sector technologies, such as Project Management (PM) and Construction Management (CM) methods, and the test projects should be implemented.. Conducting study and research on such new tender and contract methods.

***Technical Support on Cost Estimation Standards**

The cost estimation standards for the port construction are widely used by clients, such as local construction offices nationwide and port authorities, and construction companies receiving the contract orders. The standardizing for quantities per unit work (production rate) of non-standardized construction and for standardized construction with provisional quantities per unit work (production rate). Proper and efficient cost estimation through timely revision and planning of cost estimation standards for schools construction.

On a final note Whether it is classroom furniture, toilet partitions, or security enhancements, the key to any successful project is specifying high- quality projects. The most of our schools neither in the UNRWA nor by the PA have using the equate value engineering steps, and I strongly advice both of them to encourage the process of value engineering from the early stage of planning and design.

Analysis of the Problem

The above presentation leads to the following conclusion: VE is most successful in where the owner's low cost mode of operation has led to the

Commoditization of designers and the increase of risk in the functionality, cost, and quality of design. The objectives of design and VE are identical, and the duplication of functions causes decreasing design skills and adversarial relationships between the designer, VE, and owners. A process is needed that minimizes the adversarial environment, forces cooperation and a win-win approach between all parties. My recommendation to the VE team to take the most important planning and constructions point by their preparations of their study into considerations.

Design Recommendation

General Layout.

-External Furniture, proper BW height (external between adjacent schools), green area, shaded area .playground material, Accessibility for disabled student and staff.

-Improvement of the students Toilets (location inside school building-ground floor) ,drinking fountains (height suitable to age) ,

-Improvement of learning support center (Layout, furniture , Equipment)

-Improvement of computer lab. (Layout, furniture , Equipment)

-Improvement of library (Layout, furniture , Equipment)

-Improvement of Multipurpose room (Layout, furniture, Equipment) with two entrances, location on the ground floor is recommended.

Circulation

-Natural lighting, circulation inside corridors, staircase wells (Double sided schools).

-Always Consider accessibility for student/user with disability.

-Head Teacher s room overlooks playgrounds.

-Acoustics Design for Music Room and other related functions.

Fire Safety

-Provide at least two staircases &enlarge flight width to least 2m and exits in each building.

-Provide fire extinguishers.

-Add gate to lock staircase in single sided schools.

-Balustrade at the pavement edge in front of main entrance (protect children).

-Provide pedestrian gate within the main gate or adjacent to it.

-Follow fire safety codes (issue guidelines).

Canteen issue

-Provide more than one window for selling items.

-Provide shading area beside the canteen.

Maintenance

-Reduce size of classroom and specialized room door to 1 m (clear opening) 1.10 m structural opening.

-Door frame to cover overall wall width.

-Identified issue for future improvement QBS &proposals.

The main influencing factors which affect the cost of school construction should include and respect the following points :

-Planning and design methods.

-Construction industry.

-Utilization of local building materials.

-Building cods and regulations.

-Land use and tenure.

-Use of suitable financial programs.

-Others. (Community participation).

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