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ADVANCES IN MANAGEMENT IMPLEMENTATION OF VALUE ENGINEERINGAT DESIGN STAGE

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ABSTRACT
Value Engineering (VE) is a problem solving process that has been applied in numerous ways in the construction industry. The intended purpose of value engineering is to improve the value obtained by the owner from a constructed project. The aim of my study is to find that the application of value engineering is most beneficial in which stage of construction and what are the benefits of its application .

OBJECTIVE

- To find out which stage of project is most benefitted by application of value engineering
- Which stakeholders play a major role at that stage
- What are the benefits of application of value engineering to construction project

1.INTRODUCTION

Value Engineering (VE) is not a design/peer review or a cost-cutting exercise. VE is a creative, organized effort, which analyzes the requirements of a project for the purpose of achieving the essential functions at the lowest total costs over the life of the project. Through a group investigation, using experienced, multi-disciplinary teams, value and economy are improved through the study of alternate design concepts, materials, and methods without compromising the functional and value objectives of the client.

Definition-

- Dell'Isola (1997) "**An organized process with an impressive history of improving the value and quality**".
- Kelly (2004) "**The process of identifying and eliminating unnecessary cost during design and construction stages"**
- SAVE (2005) ""**Value Engineering is the systematic application of recognized techniques which identify the function of a product or service, establish a monetary value for that function, and provide the necessary function reliably at the lowest overall cost.**"

2. LITERATURE REVIEW

2.1-WHICH PHASE SHOULD VALUE ENGINEERING BE APPLIED - STAGES OF APPLICATION OF VE IN PROJECT (Ref Kelly and Male/ WBDG)

The best stage to conduct a Value Engineering analysis is when the design is 35 per cent completed – or after the development of the schematic design – as all costing data will be more readily available in the form of the cost estimate, and therefore savings can easily be identified.Furthermore, any changes to design are easily introduced at this point. During this phase, the design team investigates alternate design solutions and alternate materials and systems. Value Engineering analysis made during this phase will focus on studying the major systems of the project.

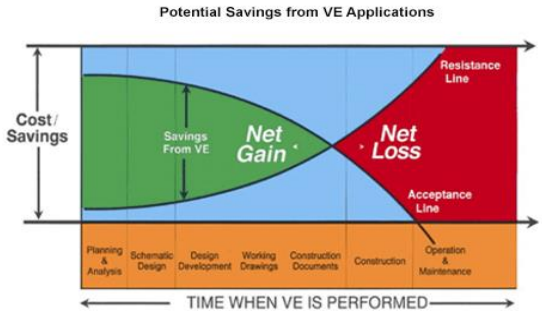

Figure1 –Potential Savings from VE

2.2-WHICH STAKE HOLDERS PLAY A MAJOR ROLE IN DESIGN STAGE(Ref. by Kelly and Male (2004)

During the detailed design phase, the design team evaluates, selects and finalizes the detailed systems and components of the project, and prepares the technical documents, specifications and general conditions. Implementing the Value Engineering program is also very significant at this phase as it may be applied to specific systems within the project, and even at different levels within the system until reaching the subsystem and the component levels of the project. The Value Engineering team will look more into the **details of the selected systems and materials.**

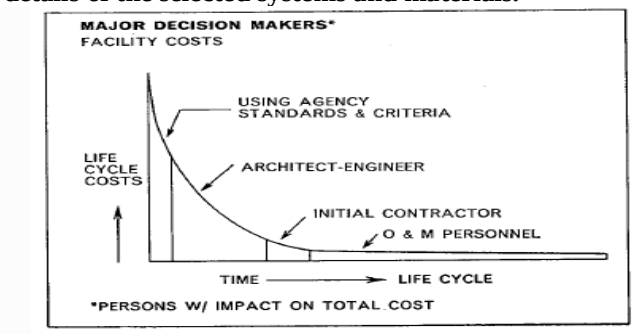

Figure2 (Ref. Dell Isola), is an approximate curve which shows whose decision governs the expenditures of funds, and illustrates the importance of the designer's decisions.

2.3- HOW TO APPLY VALUE ENGINEERING (Ref - AIA):

The Value Engineering Job Plan

In order to study value at any of the project phases and implement the Value Engineering approach, a logical, sequential framework is applied called the Job Plan derived from Miles 1961 job plan.

Summary of Job Plan phases is presented below –

1. **Information Phase –** It includes gathering of data require like drawings, specifications, samples and prototypes etc.
2. **Speculation Phase –** Itincludes identifying different alternatives and possible solutions through brain storming
3. **Analysis Phase –** It includes ranking of alternative solutions in terms of quality with realistic judgement
4. **Development Phase –** In this we develop details of best alternatives into workable solutions.
5. **Implementation Phase –** In which we try to sell proposals to the clients, and include the accepted proposals in the project.

2.4- BENEFITS OF VALUE ENGINEERING APPLICATION (Ref – SAVE)

1. The annual expenditure for the VE programmes ranged from $32,000 to $11,000,000. The average was $364,000
2. The annual savings ranged from $ 243,000 to $ 43,000,000. The average was $ 9,872,000
3. This works out to $ 27 saved for every dollar spent.

3.DATA COLLECTION

Case Study: Use of acrylic paint with ceramic tiles in the walls of wet areas in residentialcompounds

The project under the study is a luxurious residential compound including 758 villas of different designsand styles to meet all needs and tastes, ranging from duplex villas to single villas. In the original designfor the wet areas as kitchens and bathrooms, the architectural consultant proposed the use of ceramictiles to cover the internal walls for decorative and functional purposes. The ceramic tiles were to cover thecomplete walls height. The following paragraphs provide a summary of the steps taken in the differentphases of the VE study.

3.1Information Phase:

At the start of the VE study, the project was in the design development phase. The VE team gathered allavailable data and drawings and met with the decision makers of the project owners to ensure properunderstanding of the project purpose and standards. After preparing a cost model for the project, it wasfound that the current design would result in a total cost of SAR 719 Millions; with 52% of the cost on thearchitectural system. So, according to the PARETO model, the architectural system is the one that shouldbe targeted most in the VE study because of its significant percentage in the cost. For this case study inthe paper, the VE study of the finishing material of the walls of the wet areas is presented.

3.2 Function Analysis

The Basic Function for the finishing material is “cover structure”; and the primary secondary function is “enhance inner-view”. Based on this Basic Function the different alternatives were discussed.

3.3 Design Study

The original design for wet areas was to cover the total height of walls with ceramic tiles. The VE team generated many alternative ideas during the creative phase using brainstorming techniques and these ideas were recorded on the Idea Evaluation forms. The ideas were then discussed, and the advantages and disadvantages of each were listed. The team compared each of the ideas with the baseline concept to determine whether it was better than, equal to, or worse than the original concept (1-5). The team reached a consensus on the ranking of the idea. High-ranked ideas would be developed further; low ranked ones with a score of 3 and less were dropped from further consideration. The VE team studied theoriginal design considering the technical and financial sides. The following points were discussed:

- The aesthetic value of the bathroom considering the luxuriousness of the Residential compound.
- The installation of the ceramic tiles and the required precision and accuracy to have a neat look.
- The cost of the dry and installation for the Ceramic Tiles versus the acrylic paints.
- The Acrylic paint is much faster and easier to be installed than the ceramic, considering the time factor.
- When combining the Ceramic tiles with the acrylic paint it increases the aesthetic value for the area while maintaining the efficiency and the basic function for each material.

3.4 The QBS Study model:

The VE team studied the original design versus the two following alternatives:

- **Alternative 1:** The ceramic cladding covering 65% of the wall height to be covering the part of the walls in direct contact with the water and the rest will be acrylic paint.
- **Alternative 2:** The complete wall height will be acrylic paint.

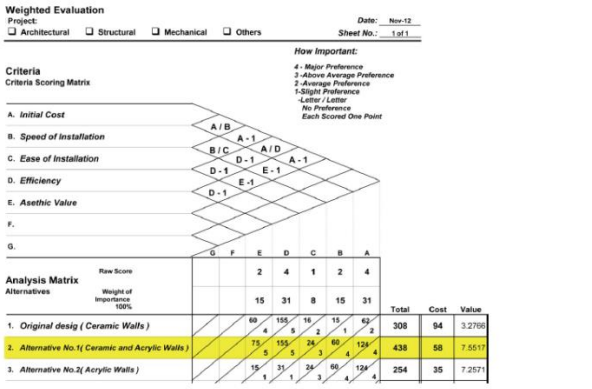

Figure 3: QBS Model comparing between the alternatives of the internal wall covering for the wet areas

To compare between the alternatives, a QBS weighted evaluation matrix is used. The QBS matrix is utilized to transform the non-monetary ideas into numbers, and to

preform comparative evaluation of alternatives both qualitatively and quantitatively, resulting at the end to a number representing the value of each alternative; where the alternative with the highest value is the optimum one. After using the QBS matrix to evaluate the different alternatives versus the original design it was found that Alternative No.1 is achieving the highest value considering the cost and all other parameters that can have a major influence on the efficiency and the basic function.

4. FINDINGS

After the study it was clear that:

- The acrylic paint has an initial cost much lower than the ceramic tiles in the walls.
- Acrylic paint supply and overhead = 35 SAR/m2
- Ceramic Tiles Supply and overhead (considering the tile sizes specified by theconsultant 40*40) = 94 SAR/m2
- The savings achieved from applying Alternative No.1 reached 50%
- When Applying the Proposed Design with the same criteria to any space there will be savingsachieved reaching 40-50% according to the ceramic tiles sizes while maintaining the function andquality of the original design.
- It is an organized approach which allows the VE team to analyse a project quickly by identifying high cost to worth areas and selecting alternatives that minimize costs while maximizing quality
- It encourages the VE team to think in a creative manner , that is, to look beyond the use of common or standard approaches
- It emphasizes lifecycle costing for a project, rather than initial capital cost
- It leads the VE team to develop a concise understanding of the purposes and functions of the facility
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5. PROPOSALS

- It can be used for reduction of unnecessary cost on existing project.
- It can help in determining the possible alternatives, which is best for the project.
- The schedule of the project, which was delayed due to uncertain situations, can be improved.
- Whenever there is threat for risk in project Value engineering can help in reducing risk.
- It is imparted for better quality, reliability and satisfaction of all the needs of customer.
- The performance of organization can also be improved to a better extent
- Standardize the design elements
- Useful in mass housing due to repetition

6. CONCLUSION

When Value Engineering is implemented properly as part of the overall design process, it acts as a useful tool to the designer and project manager for general problem solving, cost optimization and value enhancement.

7 .REFERENCE

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2) Whole Building Design Guide
3) Value Management in Design and Construction by John Kelly and Steven Male
4) Value Engineering Cost Effectiveness... A Tool for the Designer too by A. J. Dell'Isola