AN ASSESSMENT OF VALUE ENGINEERING PRACTICES ADOPTED IN NIGERIA

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ABSTRACT

Value Engineering (VE) is a management technique widely used in many industries focusing at enhancing necessary functions reliably at the lowest cost. The emphasis here is removal of unnecessary cost, a concept that can proof very effective in this period of the global economic melt down. This study examines the practice of VE in Nigerian Construction Industry with a view to assess compliance with the generally accepted approaches as identified by Society of American Value Engineers (SAVE). Interviews were conducted with professionals who claimed to have been involved in VE exercise in Lagos and it was noted that the most adopted approaches in practice are modified forms of the Design and/or Construction Audit; The Package Review or a combination of the two and the Contractor's Change Proposal, coming only came as an attempt at cost reduction: Value Engineering Team was not seen in place nor do any exist in Nigeria (Olawuyi, 2009). This study hereby offers that the "VE" techniques if properly applied to all construction projects will ensure effective function maximization and removal of unnecessary costs.

KEYWORDS: Value Engineering, Package Review, Concurrent Study, Contractor's Change Proposal, Design and/or Construction Audit, Cost Control.

INTRODUCTION

The recent incidence of global economic melt down calls for a second look at our design of construction projects with an attempt at cost reduction while still maintaining/enhancing function, a major focus of Value Engineering (VE) Technique. This is a management technique which is widely used in many Industries (be it Manufacturing or Construction), and it enhances the provisions of necessary functions reliably at the lowest cost.

The origin of the technique can be traced to the United State during the World War II in 1940's, where it started as a search for alternative product components, a shortage of which had developed as a result of the war. The alternative components later being unavailable due to the war thereby led to a search not for alternative component, but to a means of fulfilling the function of the component by an alternative method. This process known as "Value Analysis" was later seen to produce low-cost products without reducing quality and thereby maintained as a means of both removing unnecessary cost from products and improving design; hence came the birth of Value Engineering processes based on analysis of function (Palmer, et al., 1996).

Value Engineering's first application to construction process was in the 1960's but it became widespread in the 1970's especially by the public sector bodies. Indeed it was often mandatory for general services administration contracts in the United States, and considerable success in its use was recorded.

This technique is totally new in Nigerian Construction industry with no much records of its practice while most clients and professionals in the industry are ignorant of the techniques and the numerous benefits to be derived from its application.

This paper is a follow up on a study earlier published in July 2009 edition of "The Professional Builder" which sought to offer answer to the following research questions.

- How acquainted are various professionals in the Construction Industry with the concept of Value Engineering as a management technique?
- What approaches of Value Engineering is being adopted and what level of cost savings is achieved?
- What are the factors militating against the application of Value Engineering as a management techniques in the Nigerian Construction Industry?

In line with the above, the under-listed hypothesis was tested:

- Most of the Construction Industry professionals are ignorant of the concept of Value Engineering as a management technique.
- The approaches being adopted for Value Engineering in the Nigerian Construction Industry are informal, while the cost savings achieved is below 25%.
- The practice of Value Engineering in Nigerian Construction Industry is being hindered mainly by Client's Ignorance and Unhealthy Professional Practices (Olawuyi, 2009).

The particular emphasis in this work now is a critical look at the experiences of practitioners on Value Engineering attempts to which they were involved in as identified in the earlier paper within Nigeria while Literatures on VE was also further enriched.

METHODOLOGY

Oral interviews were conducted with those that have been involved in VE application for detailed discussion on the approaches adopted and problems encountered in their practice.

The paper also looked at past works of other authors, to discuss their views on the concept, highlighting the various approaches on record and the generally accepted procedure of a Value Engineering exercise. This is to serve as a foundation upon which this study is built.

The data collected was presented in an essay form reporting the response of the interviews with deductions made thereby. Lagos environment served as the study area while inference was made on Nigeria as a whole. Lagos State being the seat and headquarter bases of most organization in the Nigerian Construction Industry.

The constraint to the study was the non-challant and lukewarm attitude of respondents. The interview guide was made very simple while it took persistent efforts to get scheduled interviews with the supposedly very busy professionals.

Value Engineering Methodology: The approach to value engineering (VE) can vary for each project, but it is customary to provide a job plan to establish the format to be adopted. A job plan should comprise a recognizable set of processes as discussed below.

Phase 1: The information stage should cover the assembly of all relevant information appertaining to the project under review and the assimilation of analysis of this information. The design is critically examined to identify the elements of the project that might benefit from the VE exercise. Generally speaking, these items incur the greatest in detail asking the question:

- *What is it?*
- *What does it do?*
- *What else does it do?*
- *What does it cost?*
- *What is its value?*

In the words of Seeley (1996), a cost benefit analysis of objectives should be undertaken having regards to the client's or end user's method of calculating value, for instance through Functional Analysis System Techniques (FAST) and the construction of cost models. By this process the VE team can identify the basic and the secondary function of each element. It has been advocated that the function of any element should be identified by two words, a verb and a noun: For example, the function of a first floor construction could be described as "support loads," "suppress noise (absorb sound)", "retain heat" etc. since the information stage is factual identifying; the function is relatively a straight forward process (COEM, 1995).

Phase 2: The Creativity/Speculation stage which comprises the generation of suggestion as to how the required function can be performed or improved. It is to generate alternative design ideas and will largely be creative, in the sense that they will differ from the original.

This is not a simple design appraisal, neither is it intended to be a criticism of the original design. It is an attempt to produce good alternatives. The method used by the VE team will normally include such techniques as brainstorming, synetics etc. For this stage to be effective, a large number of design alternatives should be proposed (COEM, 1995).

Phase 3: The Evaluation/Analysis stage consists of the evaluation of ideas generated in the creativity phase for example by collective or individual rating system (Seeley, 1996). This phase looks at these ideas and justifies rather than criticise each alternative design suggestion. It compares each solution, making changes, as appropriate. In some cases it may be necessary to combine design ideas in order to achieve the best possible solution. If it is found that any of the suggestions or ideas is not functional in any way, they must be immediately discarded. At the end of this phase, all feasible options are listed in order of merit, perhaps using a weighing system if the functional systems are met in different ways (COEM, 1995).

Phase 4: The Development stage, where the ideas considered at the evaluation stage to have merit are examined and potential savings are valued, with consideration being given to both capital cost and the effect of operational and maintenance costs (life cycle costing). The VE team would develop the best design alternatives and thoroughly analyse the costs, selecting the best alternative design. The assessment of the new idea must be totally objective, ensuring that the basic functions required of the elements are fulfilled at a reduced cost. Seeley (1996) advocates the use of cost model and computer aided calculations. Any ideas which either cost more than the original or are found to reduce quality are discarded. Possibility of energy utilization should be included. The cost analysis should be looking at the present value of the element under construction and comparing it with the present value of the original value (COEM, 1995).

Phase 5: The Presentation/Proposal stage, comprising the presentation of the refined idea considered to be worth implementing, supported by drawings, calculations and costs. At this stage, the VE team reports their recommendation to the original design team. The recommendations must be communicated clearly and the merits of any suggested change stressed rather than attempting to criticise the original design. A visual presentation plus a written report is normally required. How the recommended changes could be implemented also need to be indicated.

This phase could be argued as the most difficult part of Value Engineering in that it is necessary to convince the original design team that the recommended changes are worthwhile. If the original team has not been party to the value engineering exercise, then there is a danger that they will resent the changes that are being suggested (COEM, 1995).

Phase 6: The implementation/feedback stage, where the ideas agreed to be worthwhile are then implemented. Feedback from the sponsors of the value engineering (VE) exercise should ideally be passed back to the VE team to complete the learning cycle (Smith, 1993).

Timing: Another important thing of concern in Value Engineering concept is the timing. Clearly we would not wish the original design to have advance too far before looking at value engineering. On the other hand, enough of the design must exist to allow the value engineering exercise to proceed.

The timing of the VE study can be critical and figure 1 produced by Carter (1992) illustrates very clearly the optimum time for conducting such a study. Currently, such studies/workshop is conducted at between 10 to 35 percentage of the design process, using team chaired by a VE team coordinator or by an independent VE team.

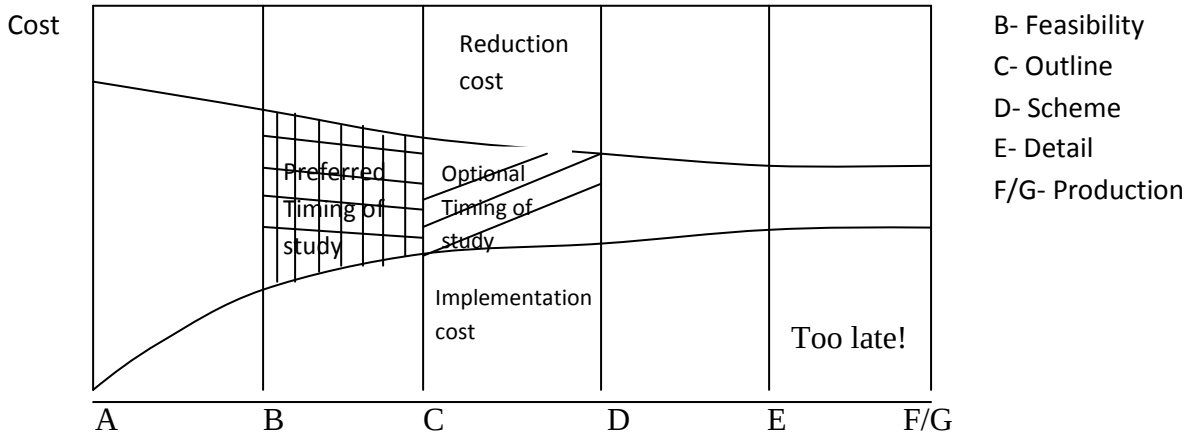

Figure 1: Value Engineering: Optimum Timing for Study
Source: Carter, T. G. (1992)

The Value Engineering Team: The value engineering team should be multi-disciplinary and preferably contain at least one member of the original design team, although conversely at least one member of the value engineering team should not have been involved with the original design. It will normally consist of five or six professionals with strong link with the Construction Industry. For majority of construction contracts we would expect an architect and a quantity surveyor to be present, together with an estimator or cost engineer, a structural or civil engineer, and if possible, the

project engineer or builder. At least one of this team should have been part of the original design team (COEM, 1995).

Kharbanda, et al. (1987) is as well of the opinion that value engineering is inter-disciplinary and all embracing. He calls for typical VE team to comprise a designer, an estimator, a producer, a purchaser, a salesman and a value engineer. The value engineer acts as the coordinator in the team. One member from each function is quite sufficient; although it is advisable to rotate membership in order to generate fresh ideas says Kharbanda, et al. (1987). An important member of the team is the value engineer who will normally act as chairman of this little committee, as well as coordinating their work. He may be a specialist in any branch and should have had reasonable exposure to other disciplines with which he now works and extensive training in value engineering as such. The other members of the team ought to also be intimated into the masteries of value engineering, through a sort of orientation before they start working together. The team members have to work as a team, hence they have to get on the same "wavelength". The best person to conduct the introductory course is the value engineer himself or an outside consultant can be used (Kharbanda et al., 1987). All this demands that the value engineer must be fully senior in his organization, reporting directly to top management.

The involvement of top management is fundamental to effective value engineering. The effective value engineer must be a champion in the process. The difference between a winner and a runner-up in a race is sometime very small indeed, but what a difference in the reward. Winners need a coach: experience always has a role to play here. Kharbanda et al. (1987) stated that "the value engineer must combine youthful imaginations with mature judgment and sound technology". He must be a psychologist, engineer and salesman all rolled into one, yet must as well have the ability to see the problem through the eyes of his management. He must be able to lead and direct a multi-disciplinary team, with perhaps members from the design, production, and estimating, purchasing and sales departments. He must be an innovator, not an inventor. The invention must already be made available to him. And to crown it all the value engineer must be humble opines Kharbanda, et al. (1987). It is only with all these qualities that the value engineer can deliver and it surely takes real managerial ability to pick such a super being out of the multitudes.

Identifying Unnecessary Costs: Unnecessary costs could be defined as the costs that contribute nothing to the value of the product or to achieving the required functional solution (COEM, 1995). If two or more designs are compared each producing the same functional and aesthetic requirement, then difference in cost would be unnecessary cost. Many a times, the unnecessary costs would be due

to an unnecessary component: for example a decorative feature on a column which does nothing for the function and has dubious aesthetic effect. It could also be due to unnecessary materials, meaning material that have been chosen without considering weather a less expensive material would have done the job just as satisfactorily.

Unnecessary cost could also be in terms of buildability. This essentially relates to the inefficient use of labour and plant. Consideration of life cycle costs is also necessary. This will include capital expenditure, running costs, maintenance and salvage. By selecting material, components or techniques that result in a lower net present value, significant overall saving may be achieved (COEM, 1995). Finally unnecessary costs could include failure to identify opportunity costs: for example neglecting to maximise floor space, improving the function, even at increased costs, may result in opportunity costs which could reduce or eliminate certain unnecessary costs.

Alternative Design Solutions: It is rarely possible to identify unnecessary cost from a single design; hence alternative designs are required to allow for comparisons to be made. The design demands creative thinking and analytical approach, and it is important that the VE team is capable of such an approach. It is of importance here to note that the designer working on his own will normally select the first design that works (COEM, 1995).

RESULTS AND DISCUSSIONS

Interviews were conducted with four Professionals randomly selected from those who had been involved in "VE" exercised, with a view to establish the approach adopted. The result reveals that the exercise were although not called Value Engineering, had another look at the original designs towards cutting down the project cost but enhancing an achievement of Client's requirement/value. The following identified cases are therefore presented.

CASE I: Balogun Shopping/ Trade Fair Complex Project, Lagos.

The project involved all professional in the Design Team while Balogun Business Association was the Client. The initial concept was to have 8,500 numbers of shops constructed at a "Delivery Cost" of #350,000/shop. Although the initial preliminary design had the roof designed for concrete roof slab of 100mm thickness combined with Aluminium Roofing Sheet fell within the cost target, estimated cost being about #340,000/shop. The need to appraise the design arose when individual shop owners could not agree to pay up to #350,000/shop.

The various designers had a re-look at their design towards coming with alternative design or material specification at a cheaper cost while maintaining the required quality. The architectural design was thereby reviewed, and the roof was alternatively opted to be made of Amiatos Roofing Sheets, this is known to give the required adequate fire rating of about 2-3 hour as the Concrete Slab and the Aluminium Roofing Sheet combined. This exercise brought down the cost of the element (Roof) by about 15-20%. The Structural Engineer also came up with alternative design for the foundation with an Element at Cost Saving of about 25%.

The whole exercise by the various design outfits individually brought the "Delivery Cost" of the project down to #250,000/shop as requested by the client. Meanwhile, the alternative designs were preferred by the same outfits that made the initial preliminary designs. It did not involve any organized workshop/study as specified by "SAVE".

CASE II: Mobil Group Complex in Eket

This project comprised of an office Building, Residential Quarters and Recreation facilities (Squash Court, Swimming Pool etc.) in the Mobil Group Compound situated in Eket. It was given as a Design and Build arrangement to DEAWOO Nigeria Limited.

The initial concept was to be framed structure of pre-cast concrete Slabs, Beams and Columns arrangement. This was valued and found to exceed the client's budget; hence the need arose for a second look at the design towards cost reduction.

The Consultant Structural Engineering Firm (DINA EMMS PARTNERSHIP) to DEAWOO therefore came up with an alternative scheme which made use of clay pots for the floor slab. This was combined with little concrete work for ribs and toppings (about 50-75mm thick) while the columns was designed to be cast Insitu of same function as the solid concrete slab and beams concept especially for office and residential building. This was achieved at a cheaper cost due to reduction in the quality of reinforcement and volume of concrete work involved.

It was noted in the case that the same structural engineering outfit responsible for the alternative design did the original design. This can therefore be seen as a modified case of concurrent study.

CASE III: Drainage and Road Network of Co-operative Villas in Badore.

This project has Urban Housing Co-operative (UHC) as the Client and Developer while the design was handled by a consultancy outfit but construction to be done by the in-house team of "UHC". The

main requirement of the client was that the Road and the entire Estate should be flood-proof through-out the year.

The initial concept had reinforced concrete walls for the drainage which was linked up to a main channel of 5m width and about 1:1000 slope. The client called for a review of the design due to inflation trends which had resulted in very high increase on cost of construction materials. The initial design having been done since about three (3) years before actual construction work takes off. The re-appraisal was thereby called for, by the client just at the inception of construction work towards cost reduction.

An alternative design was therefore proffered by the in-house team of "UHC". This entails the use of reinforced block-wall for the external wall of the drainage while the reinforced concrete wall was maintained for the internal wall (1.e. the road-side retaining wall). The channel was also redesigned to have a width of 10m and slope of 1:2000.

The new concept provides a shallower but wider channel, offering effective drainage of the entire Estate as the initial concept. It offers an additional value in form of a river-way now created by the wide channel. This was seen as one of the initial requirements of the client but not met by the first design. It also eliminates about half of the fillings and also the form work required in the first design.

Saving of about 30% on construction cost and possible additional cost of about 10% on maintenance is being envisaged over the channels life span, on adoption of the alternative design.

This "VE" exercise was seen not to have involved the Consultant Designer at all while there was no need for establishing any saving sharing ratio between contractor and client. This is because the construction phase is handled by the in-house team of the project client.

CASE IV: Contractor's Change Proposal on Project of an Ignorant Client

This case is similar to CASE II but the client here is an illiterate in construction practices. The contractor after having been awarded the contract colluded with the consultants (client's representatives) to approve changing the solid concrete slabs, beams and columns arrangement designed for to clay pot concrete arrangement in the floor slabs. The client being ignorant was not informed about the changes and all the savings achieved was kept by the contractor. He had to engage and pay a new structure engineer for the alternative design after having bribed all clients' consultants who could have raised an eye-brow.

This can be seen as a case of professional fraud, for proper practice requires the client to be fully informed about all activities and decisions made on this project. His interest ought to be supreme. Although the exercise reduced unnecessary costs as well as enhance the expected function of the element, a formal contractor's change proposal must be approved by the client.

SUMMARY OF FINDINGS

In a concise form, the findings of the study can be outlined as follows:

1. The term "Value Engineering" is not very popular among professionals in Nigerian Construction Industry. Although the concept is observed to be incorporated in the cost control and reduction approaches being adopted by some of the professionals in the Industry. The most adopted approaches in practice are modified forms of the Design and/or Construction Audit. The Package Review or a combination of the two and the Contractor's Change Proposal.
2. No Value Engineering Team is known to exist in practice in Nigeria, while the sampled professionals are yeaning for an involvement in an organized Value Engineering Team or Workshop.
3. The study observed that unlike the practice in United States of America and the United Kingdom, Value Engineering as practiced in Nigeria is engaged in only as a later thought. Mostly born out of the need to reduce the cost of construction

CONCLUSION AND RECOMMENDATION

Value Engineering (VE) is not merely a cost cutting exercise; it takes account of the three-way relationship between function, cost and value. The formal concept of the "VE" technique entails the establishment of a team, component of assessing a design, proposing alternative design solution and evaluating the cost as accurately as possible.

The informal approach seen has being adopted presently in Nigeria, accounts for the low level of its popularity among professional and clients. This can be directly linked to the ever-increasing cost of projects and occurrences of non-functional economic designs. The technique requires inputs from the various parties and professionals in a project and a value analysis of a proposal/design possibly by non-members of the proposing team.

This study hereby offers that the "VE" techniques if properly applied to all construction projects will ensure effective function maximization and removal of unnecessary cost.

This is really a necessity for maximum utilization of the scare resources of the nation in the provision of functional and efficient shelter and all other infrastructure facilities. In line with the aforementioned findings and conclusion, this paper offers the following recommendations.

1. The approaches of Value Engineering presently being adopted in Nigeria should be improved to accommodate inputs from all the various parties and specialists involved on the project.
2. The various professionals should imbibe the teachings of their professional ethics. Professionalism, implying rendering service to the environment and humanity should be their watchword and not the amount of money made from the project. They should see themselves as partners in progress and work effectively as a team to offer the client maximum value for his financial commitments.
3. The professionals should receive inputs from others and accommodate it in their work. A contractor's change proposal should be encouraged and not seen as a challenge of their own professional competence.
4. Government should encourage the application of the "VE" technique on all her projects. Laws should be enacted to back its practices with proper clauses included for effective savings sharing ratio between Client and Contractors/Consultants as appropriate.

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