

Non Conventional Principles of Cost Effectiveness in Construction

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Abstract:- Cost Effectiveness in Construction is well know pain area prevailing around in the industry for a long and lot of efforts have been made to establish an effective cost model .Unfortunately all the effort have been made to keep control on following conventional parameters

- Schedule Control
- Material Management
- Effective Monitoring and Controlling

Even various Management Information Systems and EPR modules have been used to majorly control above mentioned parameters. Above mentioned parameters are limited to the duration of construction but economics of constructed structure is more complex and require extended evaluation not only limited to the construction duration. Cost effectiveness requires a project life cycle perspective where tangible benefits should be evaluated over the period of project economic life.

In spite of an effective system to keep track of above mentioned parameter construction companies are finding it difficult to sustain in such a competitive market and they are in continuous hunt to achieve the smarter way to establish cost effective model which could eventually help them to sustain , survive and flourish in today's competitive market.

Following are few project life cycle factors which should be considered for cost evaluation

- Initial, Design & construction cost
- Ongoing Maintenance and Operation Cost
- Parts replacement Cost
- Scrap and Salvage Value

This paper will high light the need to exploring some other non conventional ways of controlling the cost and achieve the cost target. It will also establish the ways and mechanism to utilize the MIS to effectively apply the Non conventional principles of cost effectiveness in construction.

Key Words: Cost Management, Cost Effectiveness, Life Cycle Cost Analysis.

I. INTRODUCTION

The following three major non conventional principles associated with cost effectiveness in construction

1. Cost Management thought-out the Planning, Design & Development Process
2. Economic Analysis to evaluate the design alternative
3. Non-Monetary Benefits for cost effectiveness in construction such a Aesthetic, Security and Safety

• Cost Management through-out the Planning , Desing & Construction Process

It is the point of important consideration that project budget should be established by setting up project requirements by considering life cycle costs. Once the overall cost and budget has been established it's important to have continuous review of the project expenses by applying cost management in all the phases viz planning , design and development. Cost management is nothing but application of cost control mechanism via value engineering. Value Engineering is a systematic process of evaluation to analyze the functions of materials, systems, processes and building equipments to get required output ensuring lowest possible cost.

• Economic Analysis to evaluate the design alternatives

In the beginning of each project, it is very important to establish economic tools and models to evaluate other building investment expenses in addition to first costs.

This other expenses typically include

- Projected cost of energy and utility use
- Operation & Maintenance Cost
- Future System Replacement Cost

The technique like life-cycle cost analysis (LCCA) typically offer comparisons of total life-cycle costs based upon net present values.

• Non-Monetary Benefits for cost effectiveness in construction such a Aesthetic, Security and Safety

Though it's difficult to ascertain non-monetary benefits as they are intangibles in nature yet various mechanisms can be established to quantify cost associated with these benefits such as

- Aesthetic
- Security
- Safety

II. AIM

- An aim of this project is to establish ‘Non Conventional Principles of Cost Effectiveness’ in Construction”.
- This paper will explain the phase wise approach of cost management.
- Another purpose of this study it explain the tangible and intangible benefits associated with cost effective construction design.
- The overall purpose of this paper is to explore the nonconventional ways of cost effectiveness in construction.

III. OBJECTIVES

- The overall objective of this paper is to establish, explore and implement the conventional ways of achieving cost effectiveness in construction.
- The research intended to explain phase wise approach of cost management to control the cost in every step forward of construction process.
- Economic evaluation of various design alternatives is another objective of this study to recommend most cost effective, suitable and accurate design for the project.
- The paper also explains the importance of monitoring and evaluating the tangible and intangible benefits associated with construction projects with its long term cost advantages.
- Cost Analysis, evaluation and comparisons of project by CONSIDRIGN and NOT CONSIDERING nonconventional ways of cost effectiveness and its demonstration by case study.

IV. LITERATURE REVIEW

Cost Management through-out the Planning , Design & Construction Process

During the various phases of Project viz planning, Design and Development, Cost management should be used as a means to control the Project Scope, Quality and Budget. A strict monitoring and balancing of these three components are required through-out the life of the project.

The technique ‘Milestone Cost Estimate’ should be used at various stages of the processes to effectively manage the cost. Cost management should not be limited to cost estimate but it should also include the Risk management as Risk might have potential impact on overall cost of the project. Therefore an early identification of risk is crucial to keep the cost within the budget. The cost reserved for the contingencies can be optimized if risks are calculated and mitigated appropriately.

The firm or entity responsible for cost management should ideally be engaged directly by the owner and should be independent from Design and Construction firm to ensure fair cost management.

Cost Management during Planning Phase

An effective Cost management during planning phase is must to have better control on overall cost. In order to establish an appropriate budget its essential that owner and designer should agree on anticipated cost early in the

planning stage. An inaccurate budget can lead to stress, compromise with quality and scope and ultimately resulted to customer dissatisfaction.

A common mistake during planning stage for cost estimate is to apply the standard cost method to derive the cost without considering following factors

- Size of Project
- Nature of Construction
- Location(Has market survey done to understand the demand in the location)
- Price changes due to inflation
- Method of procurement
- Specific Quality Requirements
- Water Availability & location
- Labor Availability
- Competiveness in the local market

Preliminary cost estimates should be done in the early planning phases to match owner’s need, quality and scope requirements. The proposed method of delivery approach should also be identified during planning phase. The following are various options available

- The Traditional lump Sum
- Construction Manager as Constructor (CMC)
- Design-Build
- Integrated Project Delivery (IPD)

Each of the above method has pros and cons in terms of Cost and Risk so method selected also be considered while ascertaining the Project Budget.

Cost Management during Design Phase

During planning phase, Initial cost should be established, Scope should be defined and Quality parameters should be agreed and documented. In order to achieve the cost effectiveness, cost monitoring should be continue during design phase by employing a series of increasingly precise cost estimating techniques. As a part of ongoing cost management and to evaluate the alternate construction designs, systems and material, it’s essential that intermediate estimates during the various stage of construction design should be employed.

Following are some of the practices should be exercised to achieve the cost effectiveness in large projects:

- A Professional estimator should be employed to continue monitor the cost and budget and provide the according suggestion for design alternatives.
- The drawing and specification should constant and constructive review process.
- An independent review team should be employed to ensure completeness of construction documents, cost effectiveness design solution and general code compliance.
- A market survey should be carried out to evaluate local market potential , Major subcontractors capacity etc.

The estimate goes through the refinement along with design refinement.

The Earn Value Analysis in one of the effective cost management tool in which cost of the each component of the project is tracked against budgeted initial estimate and adjustment can be made to keep track of overall cost. It also helps in future cost planning.

Cost Management during Construction Phase

During Construction Phase focus shifts from Proactive cost estimate to Reactive cost management for construction changes. Changes in construction can arise from various sources for example:

- Unforeseen Condition
- Owner generated changes
- Drawing Errors for mistakes
- Specification Errors
- Code issues
- Contractual claims

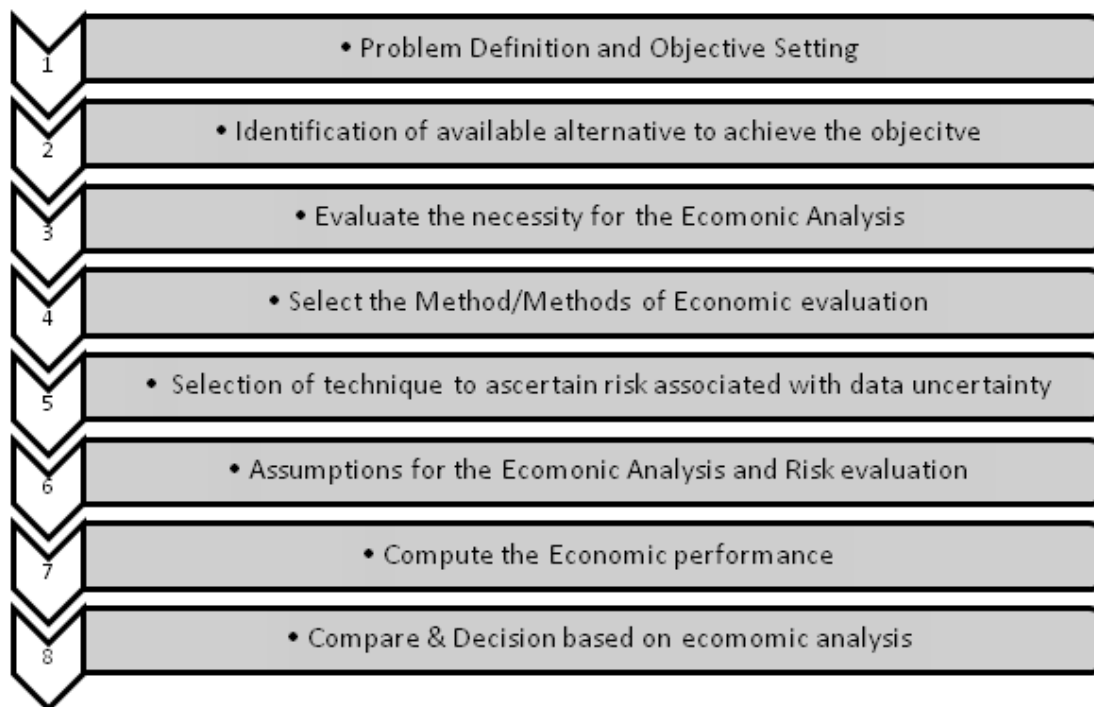
- Due to proactive cost management by design team or contractors

For all the changes, owner should established the robust review process where contractor and subcontractor should review the change before putting it forward to owner in specified template. Changes should also be reviewed by design team to determine in-scope or out of scope changes. Ideally changes should be agreed before the construction commences.

Economic Analysis to evaluate the design alternatives

Use of Economic Analysis is to determine the most cost effective design alternative among the available ones. It's a monetary evaluation of alternatives available for the given objective.

The evaluation is based on a comparison of short term discounted cost and benefits over a fixed period of time.



The above mentioned process is based on cost-benefit analysis and applicable where cost and benefit differ among the alternatives. When benefit is equivalent then analysis is purely based on cost comparison or cost-effectiveness.

Life Cycle Cost Analysis

Life cycle cost analysis is the cost effectiveness technique for the comparison of construction projects. Life cycle cost includes total cost of construction over its entire service life which includes construction, operation and maintenance and disposal. Available alternative can be evaluated based on the discounted cost or net saving.

Value Engineering

Value Engineering is the systematic evaluation approach to analyze the materials, systems, processes, and building

equipments to achieve the project objective at the lowest cost.

Following questions should be asked while doing the Value Engineering Analysis

- What is it
- What does it do?
- What must it do?
- What does it cost?
- What other material or method could be used without compromising with performance and quality?

Value Engineering focus on elimination or modification on anything which adds cost without having any impact on project functional requirements.

Compromise with Project scope, quality or standard doesn't consider as Value Engineering.

Most of the major construction projects may undergo Life Cycle Cost Analysis and Value Engineering study at a time, though they serve separate purposes yet their consideration of design alternative is interrelated.

Non-Monetary Benefits for cost effectiveness in construction such a Aesthetic, Security and Safety

Cost and Benefits both should be considered while evaluating the cost effective in construction. Cost can be quantified then benefits as it has got amount associated with it but benefits can be both tangible and intangible. During analysis benefits should also be considered as they are as important as cost and should be considered serious by construction companies and owners.

Tangible Benefits

The Cost Benefit Ratio should be determined when output of the investment can be quantified and uniform annual cost can be derived from the life cycle cost analysis.

Intangible Benefits

There are some benefits which can't be quantified but those are very important and play an important role in achieving the cost effectiveness in construction such as

- Good Quality of working Environment
- Preservation of culture and historical resources
- Safety and Security of the Building users

Though such intangible benefits are difficult to assess but these should be given proper consideration during life cycle cost analysis

A very detailed and accurate documentation should be done for all such qualitative benefits. Though this is not very

preferred method of analyzing the benefits due to subjectivity and lack of precision but in some conditions, it can be sufficient.

A To formally include the intangible benefits in the decision making process, the Analytical Hierarchy Process should be adopted, this is one of a set of multi attribute decision analysis methods that consider in tangible attributes in addition to common economical analytical attributes while evaluating project alternatives

One point worth mentioning here that in addition to benefit, sometimes information related to negative aspect of alternative also help in justifying the analysis. Such information may be very important and crucial during decision making process particularly for community at large and can play a decisive role while taking the final decision on available alternatives.

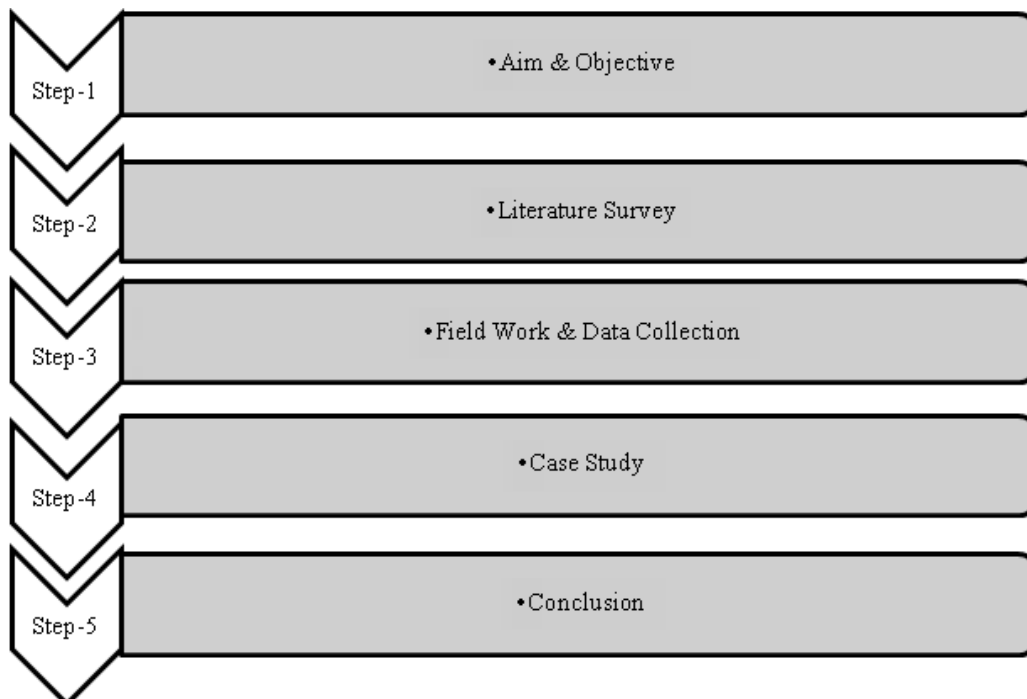
External effects or spillovers can also be considered during analysis as it can be benefits or disadvantage and both the cases it should be considered.

In summary, as such there is no standard recommendation or format for benefit analysis but most important is content, in case of benefit, content is critical. So approach should be justify the benefits by contents, comprehensive documentation and long term benefits.

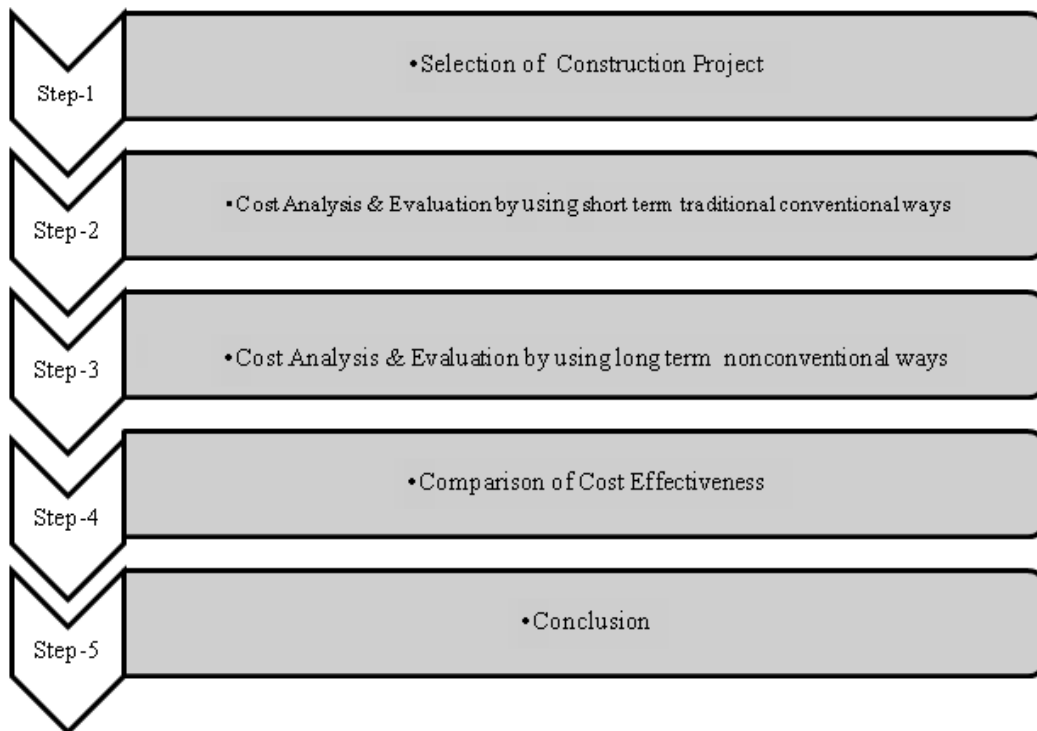
V. METHODOLOGY

The purpose of this study is to explore other nonconventional ways to control the cost and achieve the cost effectiveness in construction.

In order to achieve above stated purpose, following methodologies are outlined:



VI. CASE STUDY APPROACH



VII. CONCLUSIONS

This paper proposed an effective ‘Non Conventional Principles of Cost Effectiveness in Construction’.

This paper explained the phase wise approach of cost management.

This paper explains the tangible and intangible benefits associated with cost effective construction design.

This paper also explained the importance of economical evaluation of various design alternatives.

The overall purpose of this paper is to explore the nonconventional ways of cost effectiveness in construction.

VIII. ACKNOWLEDGEMENT

It gives me an immense pleasure and satisfaction to present this Dissertation Stage-II report on **“Non Conventional Principles of Cost Effectiveness in Construction”**

which is the result of unwavering support, expert guidance and focused direction of my guide **Prof. A. A. Warudkar** and PG Co-ordinator **Prof. Abhijit N. Bhirud** to whom I express my deep sense of gratitude and humble thanks, for his valuable guidance throughout the presentation work.

The success of this Dissertation Stage-II has throughout depended upon an exact blend of hard work and unending co-operation and guidance, extended to me by the supervisors at our college. Furthermore, I am indebted to our HOD, Dr. A.W. Dhawale, Principal Dr. Sachin V. Admane whose constant encouragement and motivation inspired me to do my best. Last but not the least, I sincerely thank to my colleagues, the staff and all others who directly or indirectly helped me and made numerous suggestions which have surely improved the quality of my work.

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