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# A Detailed Evaluation on the Cost Optimization of a G+6 Building

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**Abstract -***The In today's competitive world, the survival of any compromise contractor is mainly dependent on its ability to manage the resources, the ineffective resource management takes an accelerated operating expenses, or even later increases the growth and preparation difficulties. The additional resource requirement in the construction leads to the expansion of the site project duration as the construction contractor delivers to the project fails to do so in case. The main purpose of this project is to prepare a schedule, planning that will complete the work as early as possible with the employed date and further completed by cost optimization using the alternative building material which has more durability and lifespan as compared to the conventionally used material and having a budgeted low cost efficiency. It mainly depends of the demand of the individual (Client) as how much he is imperative about his work to be completed. It also depends on the contractor how efficiently and economically he designs a project so that it can made use of by the investment and gives satisfactory product to the client. The product should be efficient in such a way that it should be completed as early as possible without giving liability to the workers.*

***Key Words***: Construction Management, MSP Software, Optimization

## 1. INTRODUCTION

The world is progressing fast with development in technology. In today's competitive world there are many varieties of sectors which are increasing globalization & civilization such as IT's, Infrastructures, Energy conservative projects. In these, one of the major sector is Infrastructure sector which is profoundly increasing the economy of the country. Leading to this mainly time & cost is exceedingly more into consideration in this competitive world. Everyone wants to be more conservative when it comes into time constraint & within shorter duration work should be done giving more profitable outcomes. by the resource management. Time and cost concerned with the construction sector utilization of resources will also avail the time and cost of the project to a greater extent.

Optimization improves the profit gain and effectively going through a sensible result according to the given state of affairs. The method in which the actual cost should not traverse the estimated cost limit is known as Cost Optimization. Mainly there are two areas where cost is optimized:

i Optimizing during the pre-construction phase of the project which is called as the Design stage.

ii Optimizing while the beginning of the construction by the project manager or the contractor.

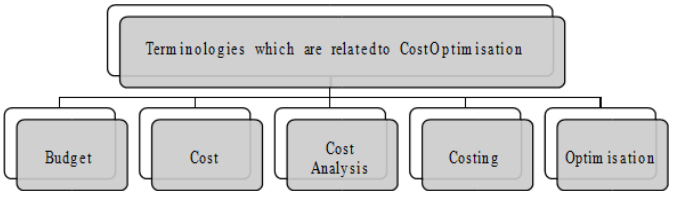



Fig 1.1 Terminological Hierarchies.

i Budget: Consequence which are followed by temperament for forthcoming.

ii Cost: Assessment to be paid for properties & amenities.

iii Cost Analysis: Segmenting the price following dissimilar fundamentals of the convention or structure.

iv Costing: Investigating overheads which later can be apportioned towards diverse developments, or amenities, or treaties, with an intention of establishing cost.

v Optimization: It is an exertion prepared to advance return limits and to attain the unsurpassed results of certain conditions & positions.

### 1.1 GENERAL

The additional resource requirement in the construction leads to the expansion of the site project duration as the construction contractor delivers to the project fails to do so in case. Apart from this, the delay in construction often brings legal disputes between parties, higher upper costs and insulted reputation, and sometimes it results in project failures. Therefore the human development is

Is a mandatory and compulsory task that needs to be implemented fully in the planning phase. In fact, the resources in construction projects include manpower, equipment, materials, wealth and expertise advices, it is not necessary to say that proper management of these resources holds the key to a successful theory of launch. However, construction programs are generated by network scheduling techniques are often characterized by undesirable resource fluctuation, which are unpractical and expensive. The reason for the implementation and execution of the contractor is that, in accordance to the fluctuations in resources, renting and hiring of workers, resources cannot be managed efficiently, they can be more than the contractors supply capacity take. These are delays and can delay the schedule.

### 1.2 OBJECTIVE

The main objective in the construction sector is to complete each project in a timely manner, budget and superior quality. Building execution requires useful effectiveness, organizational persistence, cheap, swiftness and superiority. Following are the objectives:

i. The main aim and goal of this project is to minimize the development period from new time and to meet a target.
ii. To reduce time using crashing and slack (Time Optimization).
iii. Later implementation the construction and completing some specific projects, the worker understands that the scheme is behind the calendar. The contractor is required to increase the missing data on the remaining schedule and avoid late termination.
iv. In certain concern, contractors can get and financial incentives for the end of the schedule.
v. In various cases, the outworker recognizes the date on which he is supposed to fill out the next project. This Boundary of time may require pressure on the current project to release certain resources so that it can be reallocated to the new project.
vi. For cost optimization alternative and different building material are being taken into consideration to reduce the cost and making project more well-organized and less budgeted.
vii. For an assured opinion, a project can demonstrate to be valuable for the contractor to accelerate, as discussed later.

## 2. CONSTRUCTION MANAGEMENT

A project, in common, is tied and bound to the limitations of an assured possibility of efforts and the target for achievements, which stretches to operator some prearranged profits on the conclusions and outcomes of the project. Every occupation of the project is allotted toits finishing point and periods are essential for assets like manpower, references and components etc. The mainstream of the construction projects is to advance approaches and tactics involving relations of both the methodological as well as the directorial attributes. The project also needs a specialized service in innumerable segments and desires that are to be vigilant with the project. Construction managers should enroll their ability in such a way that the execution and precision gives an advantageous as well as an economic output to the organization.

Handling the building project is an outsized practice in which various methods i.e. chiefly contract management, social resource management, contented management, economic management, time management and statistics management to guarantee project achievement surrounded by specified period.

### 2.1 IMPORTANCE OF TIME IN PROJECT EXECUTION

Time is termed to be the chief establishment of structural projects. Hence it must be consequently significant to complete the projects on or before time. In additional confrontations, we can also say that no proper time management will lead to many disputes between the owner and contractor.

Strategies can modify the simple surroundings for the expansions and the efficiency of individual's next movements. To authenticate the operative endeavor's to conclude a suite at a stretch, the variations from the projected managerial proposal undoubtedly be contingent on time factor.

A strategy that has been prepared preceding to the commencement of a project that can actually support escort, synchronize and establish aims, resource expectancy, accounting costs, handling outcomes and encouraging.

### 2.2 MSP SOFTWARE

This package is developed by Microsoft which is mainly used for managing a project and to schedule time and cost that will help in completion of an financial costs. Over and over it has become leading labor and material managing software which overcomes the crisis of over allocation, over usage of resources.

This package helps in getting budgets done according to the price and resources employed in that particular project. The work has always been estimated for the work and assignment of resources, the database computes the price, the amount stands equivalent to the effort, which reels towards the work level formerly aimed at several instantaneous commissions later to the assignment level.

## 3. METHODOLOGY

As we know that the time and cost is the main constraints which overall results in setting an economical benchmark. So, it is very much helpful in providing a proper asset to the contractor as well as the owner. Moreover, these two constraints manage to bring profitable contributory to the project with a profit oriented results in the budget. So, this project helps us to provide a time and a cost which is very much effective according the given step of actual work concluded on site.

Consequently, giving a proper optimized time using crash time and slack time and cost using alternative building material. Providing a proper budget with a good reflective work will make an owner insatiable and helps contractor to take further a profit oriented steps. Reducing time in a project is inversely proportional to the cost of the project. So, it is depending on the owner where he need to be more feasible that is time or cost. Readily Time constraints can be reduced by many methods one of the methods which is widely used in India is overtime allocation to the labor.

### 3.1. CRASHING OF A PROJECT

A crashing of an activity is a method of reducing the overall decreasing the duration of an activity with the help of some techniques. Crashing is the performance that had better use when fast tracking has not hold back sufficient time in the database. In this technique the equipment and manual resources are added in terms of lowest possible techniques and cost. The advantage and disadvantages of the cost and the schedule are evaluated to conclude how to attain the highest quantity of firmness at the lowermost incremental cost.

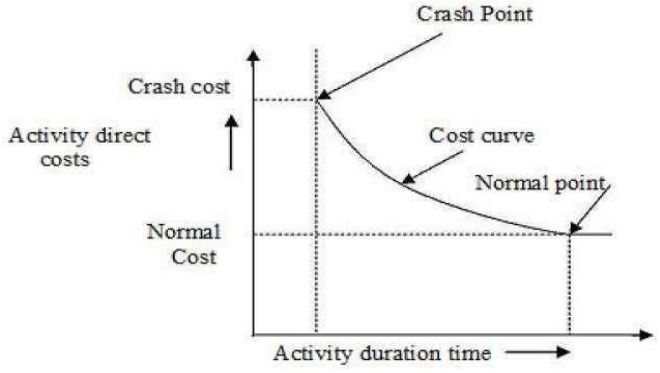



Fig 3.1 Time Vs Cost Slope of an activity.

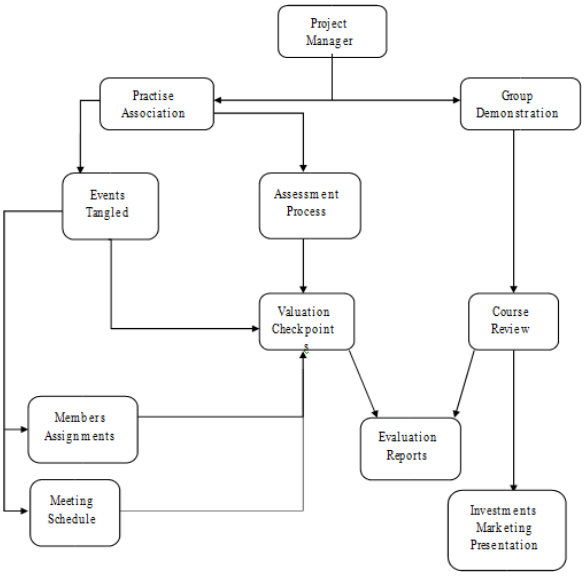
### 3.1. FACTORS AFFECTING CRASHING OF ACTIVITY

i A crashing of an activity is a method of reducing the While planning the project, the initial time given to the project was also 'optimistic' and the realities of land are 'pessimistic'. This problem occurs when the project manager doesn't assume expected or unexpected risks which affects the total duration of the project.

ii Sometimes worker may stop their work due to some unavoidable reasons such as improper or wages not been given in time so that they may stop working. This kind of consequences also adversely affects the project schedule.

iii If a client wants project to be completed earlier than the expected durations then it is required to speed up the project which directly affects the overall costs of the project. Making it more economical is always been hard to execute.

Fig 3.1 Flow Chart of a procedure involved in the project management.



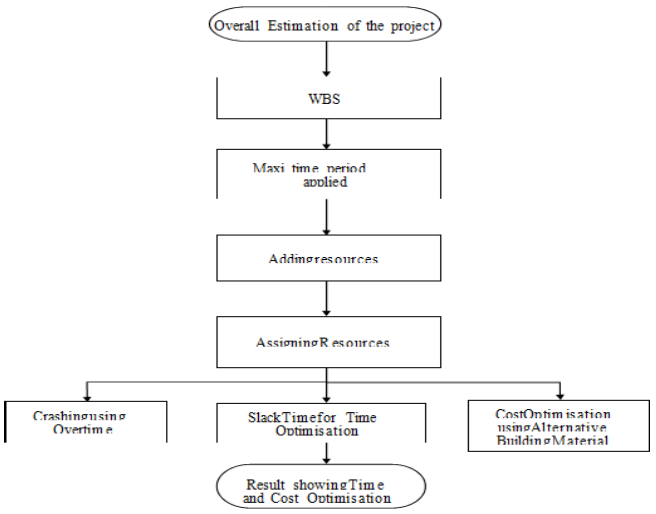




Fig 3.2 Flow Chart of Work Methodology

## 4. CASE STUDY

| Project Frame | |
|---|---|
| Name of the Project : | Proposed Commercial building at Navi Mumbai, Maharashtra |
| Location : | Vashi |
| Project Type | Commercial-Residential |
| No. of Storey : | B+G+5 |
| Project Started : | 24-Jul-20 |
| Height of the building : | 21 m |
| Built up area : | 413.303 sq.m |
| Type of Construction : | R.C.C Frame Structure |

The project is a commercial cum residential project which is located at Navi Mumbai, Maharashtra. It is an RCC structure which is designed for post tensioned material or prefabricated frames. It primarily embraces earthwork and excavation at foundation level up to 2.5m depth from ground level. Excavator and Porcelain is used for the excavation and due to the hard strata of the ground. After going through all the work an initial level check is been done and the level is being measured with the help of Auto level. After getting satisfactorily results or level one can start providing reinforcement to the footings with proper bar bending and with proper number of bars. After going through all of the steps concreting is done. In this project for M25 and M20 concrete grade is used. Based on the detailed drawing of Architect and Structural designer one can easily execute the project by its given schedule and architect layouts. An estimated cost above 5 crores is being estimated which is mainly crashed with the help of MSP software. Moreover, proper slack time is being included in the project.

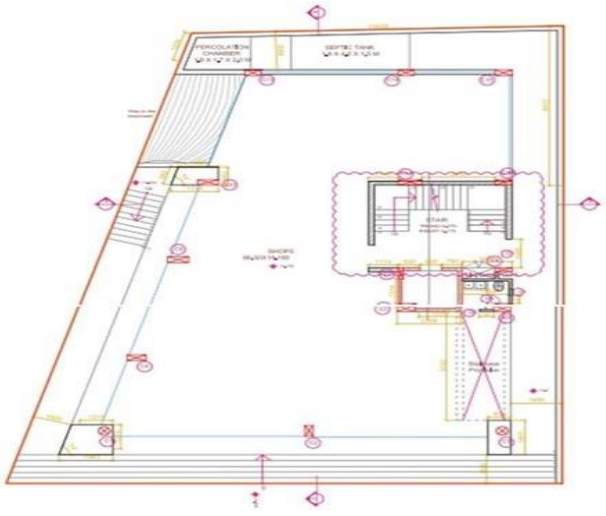


Fig 4.1 Seven Ground Floor Building Plan

## 5. RESULT AND DISCUSSION

Following are the results in terms Time and Cost optimization:

### 5.1 TIME OPTIMIZATION

i This shows optimizing the duration using planning and scheduling. The duration which is conventionally observed is 370 days which is being decreased by crashing and with the help of slack time. The approximately reduced duration is 349 days. Hence these constraints are mainly helpful in considering and reducing the overall costs of an activity or the whole project.

ii These results are mainly helpful to induce more results from labor productivity using the overtime allocation. As we know that an individual labor can do minimum of 8 hours of work a day. But this project eventually distributed certain working activity into number of labors which does not make much hectic to the labor.

iii Moreover, in construction project labors doesn't engage to a specific activity but they are in huge number working of multi sets of work. As from case study practical labors actually applied in the projectis dissimilar to the theoretical calculated labor so the number of labor applied in the software is from the actual working labors and their wages.

iv Proper wages also attract the labors to work more which make project progress more into right way off time optimization.

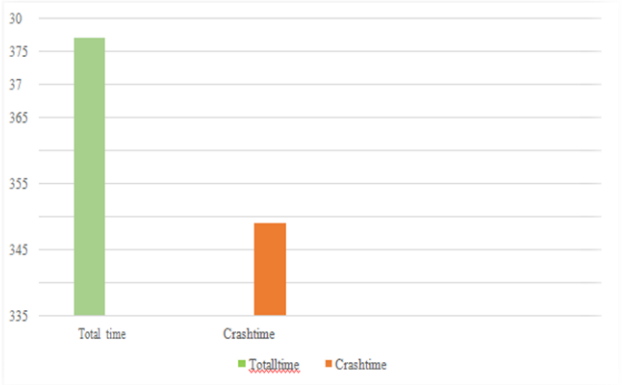



Fig 5.1 Graph showing reduction in time.

### 5.2 COST OPTIMIZATION

i For cost optimization we have used different materials which are reasonable and which are of good quality. Through this technique we were able to reduce the total cost by some margin.

ii So for alternative building material an insulated structural glass glazing is replaced by polycarbonate sheets which cuts the overall cost of the project. The cost of polycarbonate sheet is Rs. 700/sq.m which is considerably very much less compared to insulated structural glass glazing which is Rs. 5850/sq.m as per scheduled rates book.

iii Conventionally it is being seen that the cost of the project is Rs. 50,657,057.83/-, by applying crashing the cost again got increased due to reduction of work time which is Rs. 52,416,091/-.

iv Again, by applying the alternative material cost the overall cost of the building is reduced by Rs. 50371312.580/-. So this method of cost optimization majorly decrease the conventional cost of the project up to Rs. 2044778.42/-.

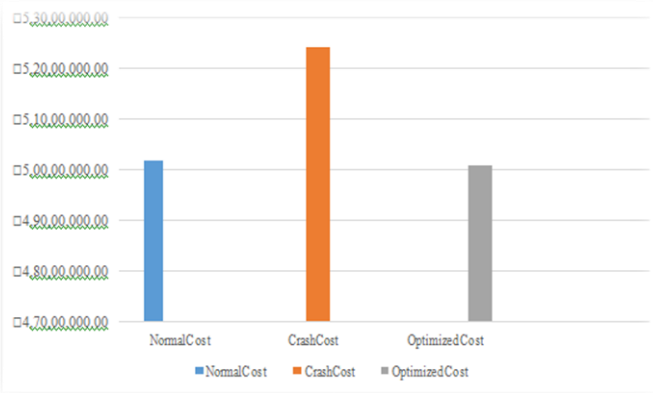



Fig 5.2 Graph showing reduction in cost.

### 6. CONCLUSIONS

i. Every construction project has some of the modern equipment which is employed. But due to improper management and improper scheduling it will adversely affect the duration of the project, increase in cost of the project, improper maintained quality and disputes between the owner and contractor. So having a proper scheduling and proper utilization will make work easier and effective.

ii. Every construction project has its own domain of construction of activity so it is varyingly different from one other activities of construction project of same domain. Therefore, there will be more efficient and economical plan, specification, technologies, human resources, proper planning and training.

iii. We know that construction cost is carried out by cost of material, cost of labor and overhead costs therefore to reduce the cost of the project it is necessary to use this availability with proper dispensation of manpower, proper usage of machineries, raising the proper usage of equipment's, selecting right equipment for a precise construction activity.

iv. Proper cash flow should be determined so that it should not be unsafe to the overall investment made to the project.

v. This project concludes that any relative construction project mainly depends on the Time and Cost constraint which gives a proper economical weightage to any project.

vi. Moreover, it also depends on the project manager and types of resources which is involved in the project. Consequently, how the overtime will influence the project duration by simultaneously decreasing the slack time.

vii. A proper planning and scheduling will also make a huge difference in construction project considering the labor management.

viii. This project also concludes that the project effectively depends on the seasonal variations and the location such that it will be either advantageous or disadvantageous to the owner.

ix. It also concludes that proper maintained work ethics will also helpful to make a project more time and cost bound i.e. economical.

x. We have reduced the overall cost by around 5 percent and the overall duration by about nearly 6 percent.

### 7. REFERENCES:

[1] Anujarajguru and Paragmahatme, "Effective Techniques in Cost Optimization in Construction Project", International Journal of Research in Engineering and Technology, eISSN: 2319-1163 pISSN: 2321-7308, 2016.

[2] D. B. Phadatare and S. B. Charhate, "Impact of Construction Equipment's on Building Site

[3] Productivity", International Journal of Civil Engineering and Technology (IJCIET), Volume 7, Issue 4, , pp. 513–520, July-August 2016

[4] Urmila A Mahadik, "Cost Reduction in Construction Projects", International Journal of Engineering Technology, Management and Applied Sciences, ISSN 2349-4476 Volume 3, Special Issue, September 2015.

[5] Dr.P.HimaBindu , "Approach of Crashing Critical Activity (CCA) and stretching Non-critical Activity (SNA) of Time Cost Trade off problems using Critical Path Method", International Journal of Scientific and Research Publications, Volume 5, Issue 2, February 2015, ISSN 2250-3153. 2015.

[6] Komesh Sahu and Meenu Sahu, "Cost and Time and Also Minimum Project Duration Using Alternative Method", International Review of Applied Engineering Research. ISSN 2248-9967 Volume 4, Number 5 (2014), pp. 403-412, 2014.

[7] J Mrs. Ruchita Shrimali Vyas, "Scheduling Project Management Using Crashing CPM Network to get Project completed on Time", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 2 Issue 2, February-2013.

[8] NuhuBraimah, "Construction Delay Analysis Techniques- A Review of Application Issues and Improvement Needs", International Journal of Civil and Structural Engineering, ISSN 2075-5309, PP 506-531, 2013.

[9] S. C. Sharma, "Construction Engineering & Management of Projects", ISBN 97881-7409-234-2, 2013.

[10] Omar M. Elmabrouk, "Scheduling Project Crashing Time using Linear Programming Technique", International Conference on Industrial Engineering and Operations Management Istanbul, Turkey, July 3 – 6, 2012.

[11] Jong-Jin Kim, "Qualities, Use and Examples of Sustainable Building Materials", National Pollution Prevention Center for Higher Education, 430 E. University Ave., Ann Arbor, MI 48109-1115 734.764.1412, 2012.

[12] Ashok Mohanty, Jibitesh Mishra, Biswajit Satpathy, "Activity Modes Selection for Project Crashing Through Deterministic Simulation", Journal of Industrial Engineering and Management, JIEM-4(4), ISSN 2013-0953, PP 610-623. 2011
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