Networking tools for cost optimization

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ABSTRACT

Cost and time are the main aspects to be considered in every project. The main objective in the construction field is to complete every project on time, within budget and quality. Time and cost are related to each other and it is very important in achieving the project objectives. Cost optimization is an important issue in construction project management. Loss of time always increases cost and saving of time can provide profit to all the parties in the project. We will be studying different methods of time and cost optimization with the objective of minimizing the project cost and duration analysis is performed to identify the relationship between time and cost. The availability of experts is the main problem faced by the contractor in optimizing the cost. The duration of the project and changing environment are the least problems faced by the contractor in optimizing the cost.

Keywords— *Cost Optimization, Project Management, Critical Path Method, Pert, Network Crashing*

1. INTRODUCTION

There is huge competition in the global market. Every construction project is having a planned budget and planned schedule. Construction industries face many challenges like labor cost, rising material price, land acquisition issues, finance-related issues. So proper planning and scheduling play an important role in solving the problem. The project total cost is classified into direct cost and indirect cost which are major types of the cost related to construction in considering the optimization cost. The cost optimization is the process that should be carried out throughout the construction period to ensure that the cost of the building is kept within the estimated cost limit. The optimization cost can be divided into two stages; the optimization of cost during design stages and optimizing the cost by the contractor once the project has started. Over the last several years, CPM has been used in the construction industry for project scheduling and control. CPM is useful for contractors and vendors to discover that when and how many resources are needed and when to deliver the material. The main objective of cost optimization of the project is to gain the maximum profit within a specified period.

2. LITERATURE REVIEW

In the construction project, cost and time are the main aspects to be considered in the planning of every project. It is a difficult task used by project managers in practice, which include evaluation of plans, corrective actions and constantly measuring progress should be taken whenever required. Cost optimization is an important issue in construction project management. The cost optimization technique used by contractor on their sites in were found to include use of overall profit or loss, unit rates, profit or loss based on progress payment, schedules, the project budget, the inspection of works, cost report, site meetings, monitoring of cost of work performance and quantity evaluation using bill of quantities, and others did not have well define technique or did not even know there were traditional cost optimization procedure. (Anuja Rajguru 2016)

In the field of construction, the important objective of every project is to complete the scope of work on time, within the budget and the quality time. Time and cost trade-off are the two important factors in every construction project which are crucial in achieving the project objectives. There is always a relationship between time and cost. The result obtained by using NLIP technique is better in comparison with the deterministic approach in terms of schedule flexibility, critical index, criticality ratio and probability finishing in order to decrease the calculation time and to improve the speed and overall efficiency of the two techniques, it is suggested to use the meta-heuristic techniques. (Mr. Bhushan V., Tatar, and Prof. Rahul S. Patil)

The main objective in the field of construction is to complete every project on time, within budget and quality full. The requirement of construction management is a useful utility, structural firmness, economy, speed and quality of construction. In every construction

project, time and cost trade-off are two important factors it is crucial in achieving the project objective. The objective of this research was time and cost optimization in project execution for construction projects. The critical path methods have been used to find our crash time and crash cost. The relation between crash time crashes costs have led to developing the optimization model. (Shamsul Haque Hamidullah 2017)

3. COST OPTIMIZATION BY NETWORKING TOOLS
3.1 Critical Path Method
CPM networks are used for repetitive type projects or for the projects for which accurate estimates of time for each activity can be made. This method is not suitable for research and development projects as accurate time estimation is not possible.

CPM is a deterministic approach. CPM takes into account uncertainty or variation involved in a job at the planning stage itself. In CPM, activity duration is considered more deterministic. In CPM, the process of forwarding and backward pass calculation to find out the start and finish times, the floats, the critical activities and the length of the critical path are adopted.

CPM is a process of using network analysis to identify those activities which are on critical path i.e. whether any delay in the completion of these activities will cause a delay in project completion.
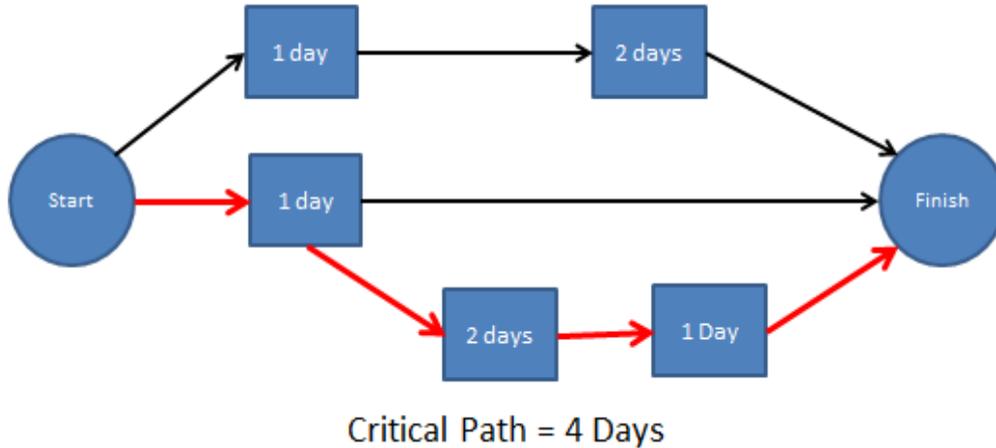

Fig. 1: Critical Path Method

3.2 Programme Evaluation and Review Technique (PERT)
PERT was developed by U.S. Navy engineers while working on the Polaris Missile Programme during 1957-58. PERT is used for planning and controlling the project involving uncertainties. This technique is usually used for non-repetitive projects such as launching satellites, research and development projects. Etc. in which correct times estimation for various activities cannot be made due to lack of past data.

PERT is an event-oriented technique. This technique uses a network diagram consisting of events that must be established to reach the project objective. More stress is given on time in this technique. The uncertainties inactivity times are measured by using the following three-time estimates.
 (a) The optimistic time estimate
 (b) The pessimistic time estimate
 (c)   The most likely time estimate
   - The optimistic time estimate: this is the shortest possible time in which an activity can be completed under ideal conditions. Better than normal conditions are assumed to prevail.
   - The pessimistic time estimate: this is the maximum time that would be required to complete the activity. It represents the time it might take to complete a particular activity if everything went wrong and abnormal situations are assumed to prevail.
   - The most likely time estimate: this time estimate lies between the optimistic and pessimistic time estimate. This is the most probable time which shows a situation where conditions are normal, things are usual and there is nothing exciting
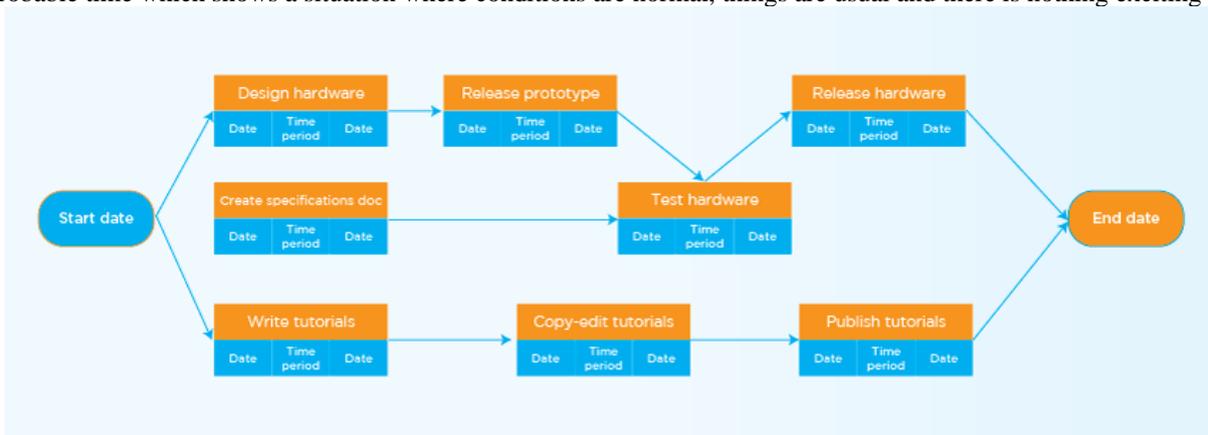

Fig. 2: Programme Evaluation and Review Technique

3.3 Network crashing

Crashing is the technique to use when fast-tracking has not saved enough time on schedule. It is a technique in which resources are added to the project for the least cost possible. Cost and schedule tradeoffs are analyzed to determine how to obtain the greatest amount of compression for the least incremental cost. It is a method for shortening the project duration by reducing the time of one or more critical activities to less than their normal time. It is mainly used to reduce project duration. In this crashing, if time reduces then cost decreases. There are four terms of Crashing

- (a) Nt-Normal time
- (b) Nc-Normal cost
- (c) Ct-Crashed time
- (d) Cc-Crashed cost

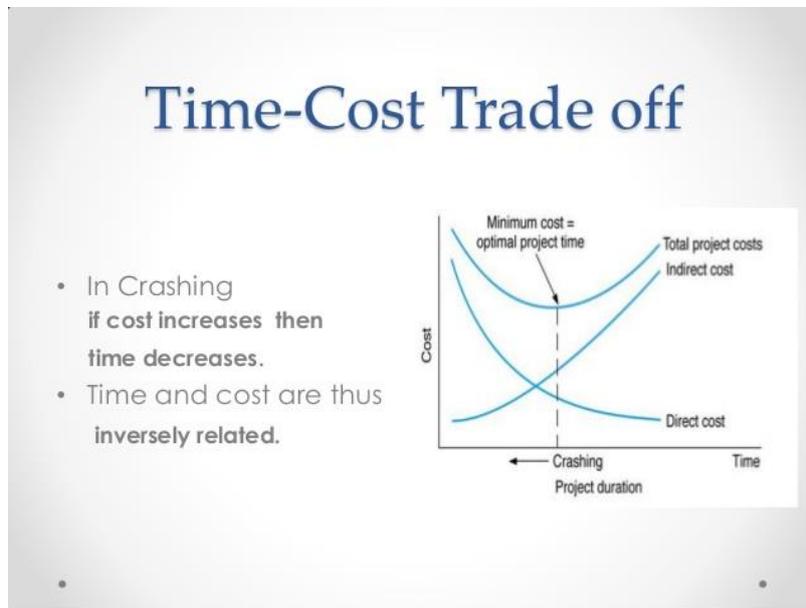$$Cost\ Slope = Cc\text{-}Nc/Nt\text{-}Nc$$

Fig. 3: Time-cost Trade off

4. CONCLUSION

Network crashing is a technique of cost optimization. In-network crashing decreasing of duration is done up to an extent (below which it cannot be crash). and cost which is corresponding to respective crashed duration is nothing but crashed cost. Crashing can be achieved by either compromising in the technical specification (quality of work) or increasing in the utilization of more resources. But the crashing network is generally based on the increase in the use of resources and not by compromising in the quality of technical specifications. While crashing the network from normal duration to crash duration we may get a particular crash duration for which crash cost is minimum (optimum). This duration is called optimum duration and corresponding cost as optimum cost. It can also be observed that crashing below or above the optimum duration will give an increase in cost. Hence cost optimization is minimum cost while crashing network from normal duration to crash duration.

5. REFERENCES

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