

OPTIMIZATION IN CONSTRUCTION MANAGEMENT

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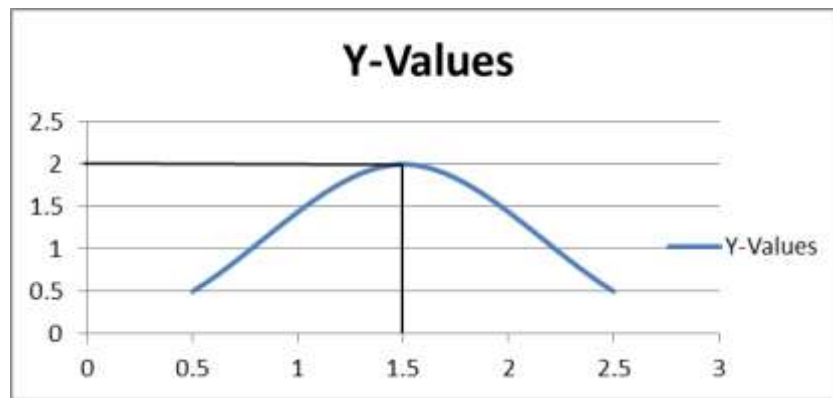
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Abstract - Construction industry is among one of the important industry for a nation it builds its infrastructure. The main objective of a construction project is to gain maximum profit with ensuring customer satisfaction and desired quality of construction. The larger the project complicated it gets to manage, but using certain software's for management helps construction manager to handle the project. Time and cost optimization is also important in construction management. The early completion of project leads to saving of cost and increases profit margins. Traditional ways like PERT are also used to ensure this optimization.

Key Words: construction, tradeoff, Logistics, time-cost optimization, schedule compression.

INTRODUCTION

Optimization can be put forward as the systematic process of selecting different sets of inputs so as to gain desired output or it is the systematic process the increase profit margins under given sets of input conditions. Consider the below diagram where y-axis represents output and x-axis represents corresponding inputs. For change in input there is change in input but optimization is obtained at x-optimal where there is maximum output observed.



Time cost optimization aims at attaining least possible project cost within given time and ensuring desired quality. It is also involves design stage as well as execution stage of the project. Project design involves minimum time possible and execution requires constant updating and monitoring the project as per the planned schedule.

THEORY:

Logistic optimization: [OPTIMISATION OF CONSTRUCTION PROCESSES, Thordur V. Fridgeirsson Jerzy Roston.]

Logistic optimization is the process of maintaining efficient flow between the point of origin and point of consumption. It involves flow of construction materials as well as information. It includes:

- Supply chain management
- Transportation
- Site supply
- Storage of materials
- Transportation
- Shifting

Logistic manager also manages movement of goods and people on site. Study shows that logistic optimization causes 10-30% cost saving in logistics of project. It causes decrease in site traffic and ensures faster project deliver and also results in minimum wastage of material.

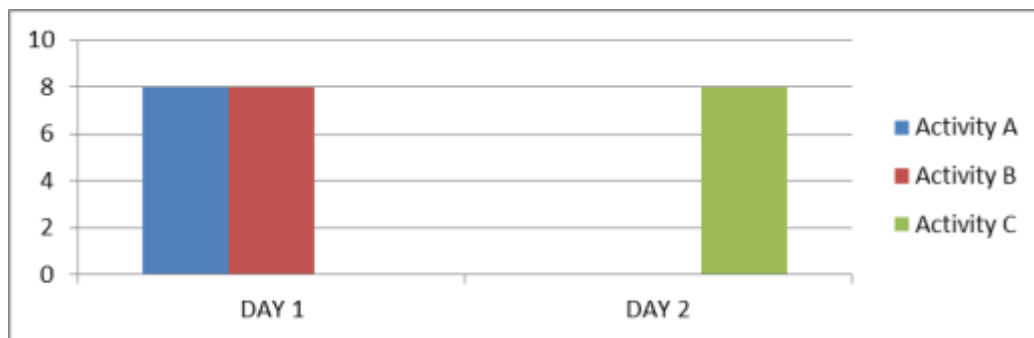
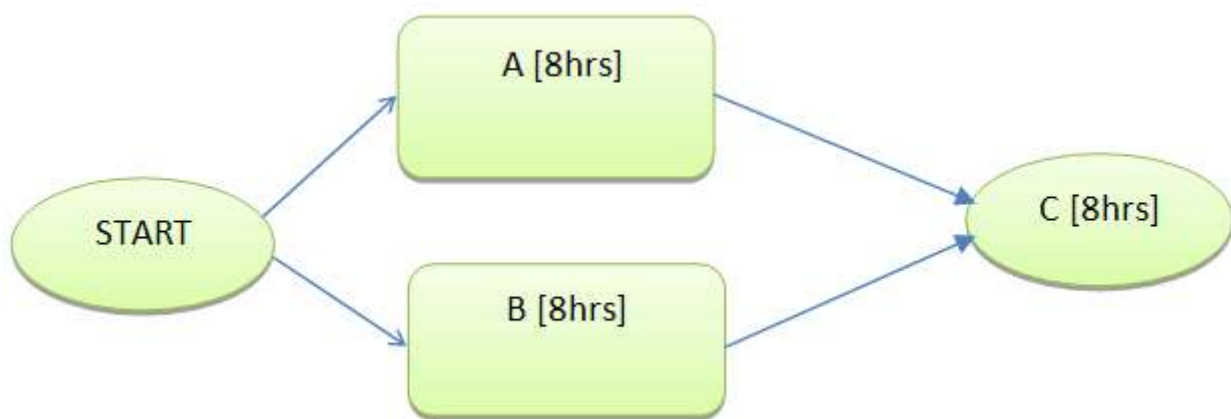
Construction management software's:

According to a study 85% of project manager time spent is in communication and 75% of project documents are paper based. Use of digital platform will always save the time spent in communication and a proper and clear hierarchy in the company will also increase the working efficiency. Use of project management software's will help a faster communication and more efficient planning and scheduling. MSP is software used for Construction planning and scheduling and ERP is used for material management like goods in stores.

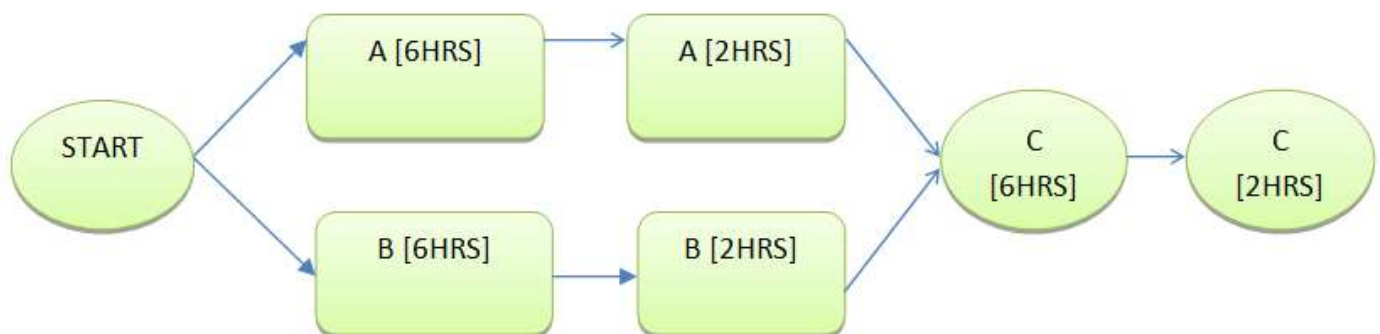
Resource optimization:

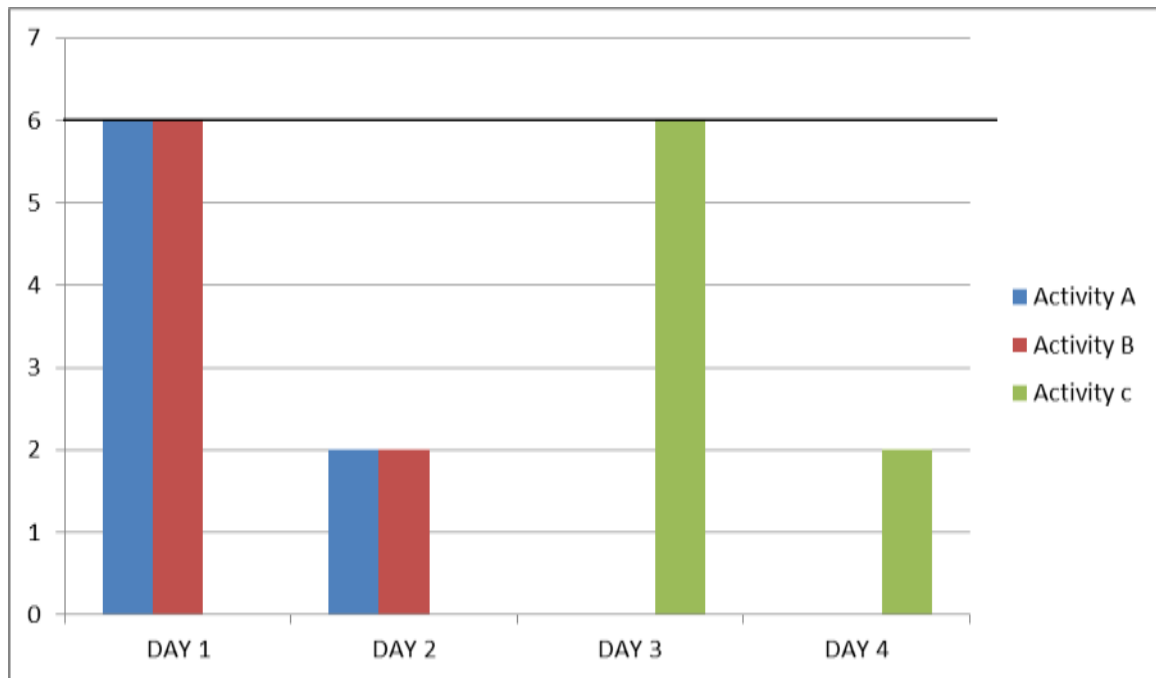
Once we have project schedule view we want to make optimal level use of resources so as to reduce risk.

Resource levelling: Resource levelling is a technique in which start and finish dates are adjusted based on resource constraints with a goal to balance the demand with available resources. Resource levelling can cause original critical path to change. It is used when the common required resources are available in limited quantity or for limited time.



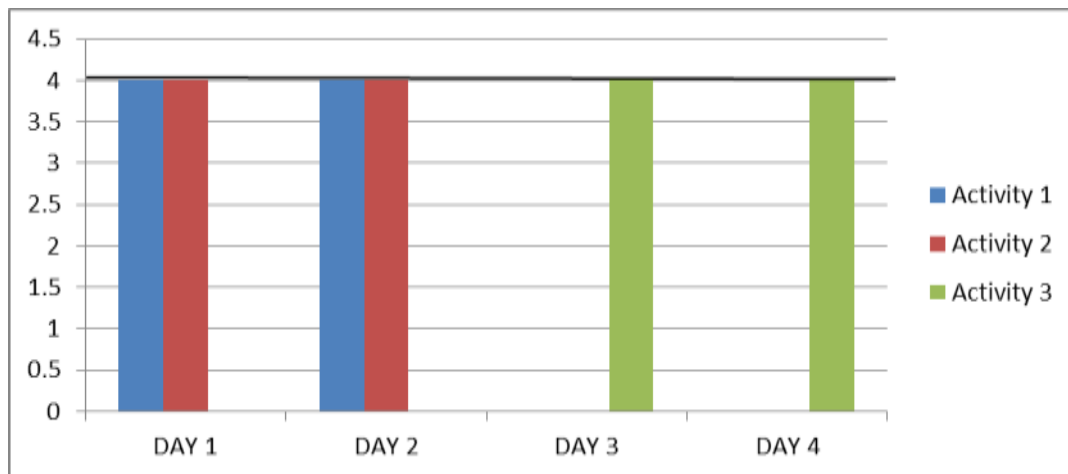
Now if the limit for daily work is 6 hrs. Then resource levelling is done as follows:





As a result of resource levelling no any day exceeds 6hrs working timing which results the increase in completion duration from 2 days to 4 day

B. Resource smoothing: Resource smoothening is done when time constraints are important. In resource levelling resource constraints are applied and peaks are cutoff without changing the time period. Continuing the above example for resource smoothing:



Schedule compression technique:

In construction industry project activities may not go as scheduled in schedule management so it is necessary to do schedule compression for early or timely completion of project. The sole purpose of schedule compression technique is to reduce project duration. There are two techniques used for schedule compression:

[A] Fast tracking: AS per PMBOK “fast-tracking is a schedule compression technique in which activities or phases normally performed in a sequence are done in parallel for at least a portion of their duration”. In fast tracking the critical path of project schedule is studied and the activities that can be performed in parallel are identified. Simultaneously it is checked that the time period of activities other than critical path is not increased. Fast tracking involves risk due to overlapping and should not be performed beyond limit.

[B] Crashing: As per PMBOK “crashing is a technique used to shorten the schedule duration of the project for the least incremental cost by adding resources”. In crashing the critical path of the project is studied and the activities which can be

completed by increasing the resources allotted to them are identified. Resources allotted for that activities are increased and their completion time is decreased. Due to increase in resources the cost also increases and therefore cost benefit analysis should be done before creating.

Cost optimization problems: [*Effective Techniques in Cost, Optimization of Construction Project, International Journal of Informative & Futuristic Research*]

It was observed that the problem in optimization was not the techniques but poor planning and implementation of them. There the workers were not aware of performance targets due to lack of communication between supervisors and workers. Also lack of expertise with management in contractors added to extra cost.

RECOMMENDATIONS & CONCLUSION

[1] Use of logistic optimization software's is recommended logistic manager for logistic operation process is recommended as these steps will cause 10-30% cost saving in logistics.

[2] Communication through digital platforms saves time and establishing a proper hierarchy in project team with assigning the responsibilities is must.

[3] Resource optimization in every construction projects either large scale or small scale ensures optimal use of available resources and this should be done in management process.

[4] Fast tracking in schedule compression should not be continued after certain limit as it increases risk.

[5] Crashing in schedule compression should involve cost benefit analysis before its application as too much allocation of resources may increase cost by many folds.

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