

A COMPARATIVE STUDY OF LINEAR SCHEDULING TECHNIQUES AND CRITICAL PATH METHOD IN HIGHWAY CONSTRUCTION

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Abstract: *Developments of highway, tunneling, water channel, pipe laying, pavements and lying of railway track are the probably the best instances of linear projects. The most taken on strategy of planning in construction field is the CPM and PERT. These methods may likewise be called as the regular methods of planning as these procedures are followed for a long time and generally broadly followed planning procedure. Indeed, even the most following scheduling programming resembles Microsoft office project and Primavera is additionally created based on CPM. Aside from CPM and spunky extraordinary linear, it is additionally accessible to schedule procedures which are seldom followed or inconspicuous. The linear scheduling procedures have many benefits and merits than the CPM and PERT. PC software's are likewise evolved on the premise of Linear Scheduling procedure. TILOS is one of the Programming created based on linear scheduling procedure. In this proposition the common timetable of a highway project is created in both CPM and linear scheduling procedure. The upside of CPM over the linear, it is examined to schedule technique. Be that as it may, the linear planning is better reasonable for straightforward direct task and not for confounded various rehashing exercises like multi story building and so on. In such case the timetable might be created on both CPM and LSM for better preparation.*

Keywords: Linear Scheduling, Highway Construction, Techniques, Critical Path Method

Introduction

In light of an audit of distributed writing, this report presents an essential strategy and contextual investigation pinnacle direct planning (otherwise called the linear

scheduling method or LSM) and recommends the upsides of LSM over other booking procedures (eg. critical path method - CPM) as an arranging apparatus for direct activities in the development business. The exploration for this report centers essentially around road construction in any case, the information, ends and suggestions communicated thus may similarly be applied to a wide range of linear construction activities. The extent of this report connects with essential linear construction activities and the benefits of LSM over CPM for linear operations. The report isn't expected to fill in as a total manual for each likely use of direct planning or every one of its intricacies. It is well understood in the construction industry that all projects require some degree of planning and scheduling; as the complexity of the project increases, so does the need for a systematic methodology. Currently, the construction industry predominately utilizes some form of network analysis to determine the "critical path" and generate a bar chart schedule.

This is often done with the aid of commercial software such as the Primavera Project Planner. Some public agencies use standard specifications so stringent that, regardless of the circumstances of a particular project, the successful bidder is forced to use a particular scheduling

technique, or even specific scheduling software. Within 30 calendar days after the contract has been executed or at the preconstruction conference, whichever is earliest, the successful bidder shall submit to the Engineer a critical path method (CPM) schedule for the project. The entire progress schedule specification consists of several pages of specific requirements. In this proposition work the benefit of linear scheduling technique over the critical path method is contemplated and thought about for scheduling highway project. The booking is finished by utilizing computer programming's, for CPM in Microsoft office project office and for linear scheduling method utilizing the product TILOS. The MS office project is the most generally involved programming in India in both field level and schooling level. The TILOS programming is seldom continued in India.

Review of Literature

Fatma Abd El-Mohye Agrama (2011)

Linear operations address an enormous part of the construction industry. Parkway, pipeline and passages are genuine models that show redundant attributes where a similar unit is rehashed a few times. Booking of direct tasks generally address a significant test to project supervisors. These undertakings require plans that keep up with asset progression for a movement starting with one unit then onto the next one and accomplish rationale limitations simultaneously. The line of balance (LOB) strategy is appropriate for booking such ventures. Bookkeeping sheets are productive computational apparatus utilized in many field with wide scope of estimations. The prerequisites related; inside sensible slack between continuous non-runs of the mill rehashed exercises are

created in an accounting sheet calculation. In this review, the timetable times for every action consecutively from unit to the following can be arranged and graphically showed in LOB plot. Subtleties of the model turn of events and electronic execution are portrayed. A model application is introduced to show the proposed approach. The benefits and future augmentations of the proposed approach are then examined.

Fu-Shiung Hsieh and Jim-Bon Lin (2015)

Perhaps the most significant and testing issue in development project the board is to plan exercises to meet the development project necessities under asset imperatives. In this paper, we will focus on the advancement of a work process planning framework that can be applied in development supply chains in light of the connections of elements. Execution of work processes that handle actual parts in a development task may rely upon area. In spite of the fact that work process the board issues have been broadly read up for quite a long time, area data of work processes has not been viewed as in existing writing. We propose a procedure that incorporates demonstrating of area mindful work processes in development projects in light of formal work process models and create a method to change work process models to form and tackle a venture planning issue. We propose a structure to carry out a model framework in light of a FIPA-consistent multi-specialist framework stage and Google programming interface.

Tarek Salama et.al (2017)

Incorporation of dull and non-tedious planning techniques uses the benefits and interesting highlights of those strategies.

This paper presents another booking strategy for dreary tasks that incorporates linear scheduling (LSM) and critical chain project the management (CCPM) techniques. The proposed technique presents a system for planning of dreary tasks; representing limitations of assets progression and vulnerabilities related with movement terms. It presents another support, named resource conflict buffer (RCB) to represent postpones that might happen because of contention in controlling assets among replacement and ancestor exercises. The created strategy gives a deliberate system to recognizing a few basic chains to supplant the visual ID technique that is right now utilized in direct booking. The elements of the proposed strategy are outlined for a situation model for booking of dreary tasks utilizing a mix of LSM and CCPM planning procedures. A conversation of results is performed and ends are attracted to feature the highlights and capacities of the proposed technique.

Sushma.H et.al (2017)

The framework advancement plays a significant job being developed of country. Street transport plays a significant job in financial development for a non-industrial nation like India. The development of streets achieves an assortment of advantages by every one of the areas of economy. Expressway developments are the measuring stick to gauge the turn of events of country. Project the board is the vitally key job in the development industry. Any development project requires legitimate preparation and planning for its culmination inside time and cost. In this project the well-known primavera apparatus/programming is utilized. Arranging and planning is very significant in development projects for lessening and

controlling deferrals of the undertaking. Significant measure of time, cash, and assets are squandered every year in a development industry because of inappropriate preparation and planning. With globalization the development projects have become huge and complex. Arranging of such requires gigantic measure of paper work, which can be decreased with the assistance of undertaking arranging programming. Giving great preparation, adequate of stream of assets to a task can be consequently accomplished wanted outcome.

Methodology

The approach makes sense of the methodology and arrangement of steps that are outlined to continue in the venture. The approach is partitioned into six distinct stages; in like manner the undertaking strategy is isolated. The approach is portrayed in a stream diagram design for simple agreement. A Schedule or BOQ of a highway project is the data required for this examination work. The different exercises associated with the venture must be examined and checked on alongside the relating span and assets required for the Project. The arranging ought to be done so that the timetable follows the asset accessibility and the asset is arranged by the timetable. The timetable arranging is first done in the Microsoft office project. This product is essential venture arranging instrument all over the planet. It is created based on CPM. In MSP the planning is finished by posting the exercises alongside term and the asset. The TILOS programming is created based on LOB extraordinarily for Linear Projects. Looking at and dissecting the outcome result of timetable arranged in both the product for

properties and elements.

Scheduling of Highway Project

Two timetables are ready for same Highway project in different Planning Soft products. The planning is done in Microsoft Office Project created based on CPM furthermore, TILOS created based on LSM.

S.No.	Activities	Resources
1	Site Clearance	Backhoe, Machinist and assistant
2	Excavation	Machine Operator and worker
3	Marking and Leveling	Labour, Surveyor and surveyor assistant
4	Embankment Fill	Compactor, Machine Operator and Tipper
5	Sub Grade	Tipper, Boulder, Compactor
6	Aggregate Base	Compactor, Tipper, Machine Operator, worker and Aggregate
7	Asphalt base	Compactor, Tipper, Machine worker, Asphalt, Paver, and Aggregate
8	Asphalt Binder	Asphalt, Labour and Compactor

Table 1: Resources needed for executing the project

Microsoft Office Project Planning

It is the most generally embraced arranging programming for some sort of venture arranging. The MSP is considered as one of the essential protect arranging programming. The MSP programming is created based on CPM. In this software the rundown of exercises associated with the undertaking is rattled off alongside the span in coherent relationship. On the premise of movement recorded with replacement and ancestor relationship, the network model of timetable is produced. Different data sources like asset and cost can be characterized later. The timetable can be checked on in both organization model introduced in Gantt diagram and in exercises recorded as information data. The cycle like asset allocation and resource leveling can likewise be done in Microsoft office project. It permits production of a project portfolio, including work processes, facilitated midway, so that the data is accessible all through the venture, indeed, even from a program. It likewise incorporates detailing devices to make merged reports out of the undertaking information. MSP is generally reasonable for nonlinear project arranging like development of dam, industry, and commercial building and so on. It is exceptionally easy to understand than the other project arranging programming.

TILOS Planning

The TILOS programming is created based on LSM. This product is created by a German based development firm. This product is extraordinarily modified to design direct Projects like highways, pipeline, and tunneling, transmission line,

water canal and so forth. The very data source that is given in the Microsoft office project is utilized in TILOS moreover. Aside from this the geographical insights regarding the working site and map plan of the project can likewise be given as info data in instance of TILOS.

Analysis

Looking at the Schedule result of Highway Project arranged in Microsoft office project and TILOS.

The Following Attributes are to be broke down in the Plan yields.

- Simplicity of Planning
- Assigning the Resource
- Representation of the Schedules
- Resource Continuity
- Resource Leveling
- Imagining with ongoing example
- Simple Updating

Simplicity of Planning

In LSM the scheduling is done outwardly considering the length, amount and put on working action. The CPM is network representation in which the action logical based as well as analytical based.

Assigning the Resource

In LSM the resource assigning doesn't slow down the work progression of the task. If there should arise an occurrence of CPM the Resource designation really do rely upon the arrangement of the action, which meddle the work coherence of the venture.

Representation of the Schedules

In LSM the timetable is addressed graphically which empowers simple arrangement and the whole timetable stick be addressed in a solitary page. In CPM the timetable is addressed in both text design

and network model. This doesn't give the moment of the project progress.

Resource Continuity

The Resource can be consistently made by making no asset is inactive, which is finished by allocating the asset to any another movement. This sort killing asset inactivity and making effective utilization of asset is extremely intense cycle and isn't simple as in LSM.

Resource Leveling

In LSM the planning is done based on accessibility of asset, which makes the asset evening out more straightforward, so the asset evening out and booking is eat at the same time. In Case of CPM the planning is totally rationale based which can't be changed based on asset accessibility.

Imagining with ongoing example

The geological example and the guide plan can be adjusted with the timetable. This empowers compelling learning of venture normal methodologies. No such additional information can be remembered for CPM plans other than the length, asset and the expense, which should likewise be possible in LSM Schedule.

Simple Updating

Any progressions in arrangement because of unavoidable explanation, the timetable can be effortlessly updated. The updating in CPM is conceivable; however it is exceptionally drawn-out cycle and makes other interaction like resource allocation leveling out even more complicated.

Conclusion

The characteristics of both CPM and LSM were distinguished and analyzed for the

most appropriate strategy for planning for highway projects. The details of the project schedule are conveyed effectively in LSM when contrasted with CPM. The LSM is easy to deal with and simple to prepare. The graphical representation of the timetable in LSM depends on the time versus distance. In CPM the distance of the safeguard progress isn't outlined in Gantt graph as in LSM planning. The perusing and comprehension of the schedule is extremely easier when contrasted with the CPM. The product TILOS created based on LSM have assortment of unique choices that is required for a Highway Project. The superb worry during a Project arranging like Resource requirements and Work Continuity is accomplished really in LSM. On the analysis of the few factors and properties, it is suggested that linear scheduling method is more appropriate than critical path method in scheduling highway project.

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