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Duration and Quantity Based Project Control Using Time Segments Scheduling Technique

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Abstract: ***Construction Projects consists of various activities and management of such projects deals with completion of all activities which are interrelated to each other. For this, Project managers are using the management tools like Critical Path Method (CPM) and Gantt Charts to determine the interrelationship of activities, overall project duration and the activities float times. Such data provides important information about the degree of flexibility with respect to the project schedule as well as the critical and noncritical activities.***

Though these tools are used by managers from many years some drawbacks make these tools insufficient for project tracking, monitoring and reviewing of projects because both these tools are based on only duration of project activities. But, it is found that in actual construction projects activities are interrelated to each other with respect to duration as well as the quantity of work. This makes a project unable to perform as per planned schedule requirements.

To overcome above CPM and Gantt chart drawbacks, this study presents a modified scheduling technique using Critical Path Segments (CPS) mechanism, with its mathematical formulation, that offers a daily tracking, monitoring and reviewing of project schedule instead of periodical review of schedule by decomposing the duration as well as work quantity of each activity into separate segments.

This modified scheduling technique is expected to help project managers to achieve a better level of control over projects with better visualization, optimization and decision support for meeting project success.

Keywords-: Construction Management, Project Tracking, Monitoring and reviewing, Critical Path Method (CPM), Gantt Charts, Interrelationship of activities, Critical Path Segments Scheduling Technique (CPS), Work quantity, Project control.

I. INTRODUCTION

Construction Projects consists of various activities and management of those activities is a challenging task to project managers. The Critical Path Method (CPM) and Gantt Charts have proven to be a useful tool for planning and controlling construction projects. CPM enables project managers to evaluate the early and late times at which activities can start and finish, to calculate activity float (slack), to define critical activities and to evaluate the impact of changes in duration and logical relations on the overall project duration while Gantt charts are useful for Planning and scheduling of project which provides interrelationship of various activities, activity's start and end times, overlapping of activities, start and end date of whole project which serves the guideline to project managers for performing, and controlling the project. Though these techniques are used for Planning, Scheduling, and Project Control by Project Managers from many years, Projects are unable to perform as per planned schedules.

Project Control in execution phase of Project:

Once the project enhanced to execution phase project tracking and monitoring process is very important to control and evaluate the project performance with respect to baseline plan and schedules of project. General practice of project control includes tracking and monitoring of each activity with respect to its planned start and end time and periodic revision of whole plan to minimize further delays in project duration. As the CPM and Gantt charts are used for project planning and scheduling, project control process is also depends on these two techniques only.

Critical views on using CPM and Gantt charts for Project Control:

Both these techniques are when acts as baseline for measuring progress, it is difficult to use it to initiate appropriate corrective actions for recovering delays and overruns. The following list shows the most critical views of CPM and Gantt Charts.

- Difficulties in multiple complex relationships: CPM considers only Finish to Start (FS) relationship of activities while many construction activities consists Start to Start (SS) and Finish to Finish (FF) relationships. Gantt Charts shows all types of relationships between activities but unable to determine critical and non-critical activities. Also, both techniques are unable to provide exact critical days of individual activities.
- Both techniques considers only time relationship of activities but construction activities are interrelated to each other with respect duration as well as work quantity of work.
- Both techniques are inefficient for decision making and daily revision of project plan and schedule.

II. CRITICAL PATH SEGAMENTS SCHEDULING (CPS) TECHNIQUE

To overcome some CPM drawbacks discussed earlier, Tarek Hegazy introduced Critical Path Segments (CPS) mechanism has three innovative fronts- 1) representing activity duration using separate time segments. 2) Better representation of activity progress. 3) Mechanism to incorporate project constraints into the CPS analysis

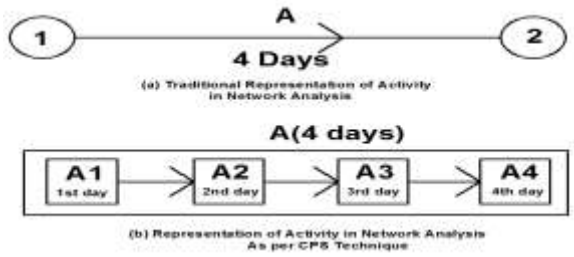
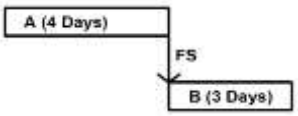
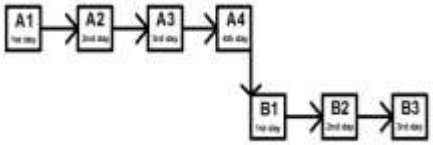
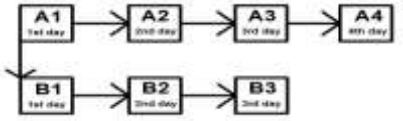
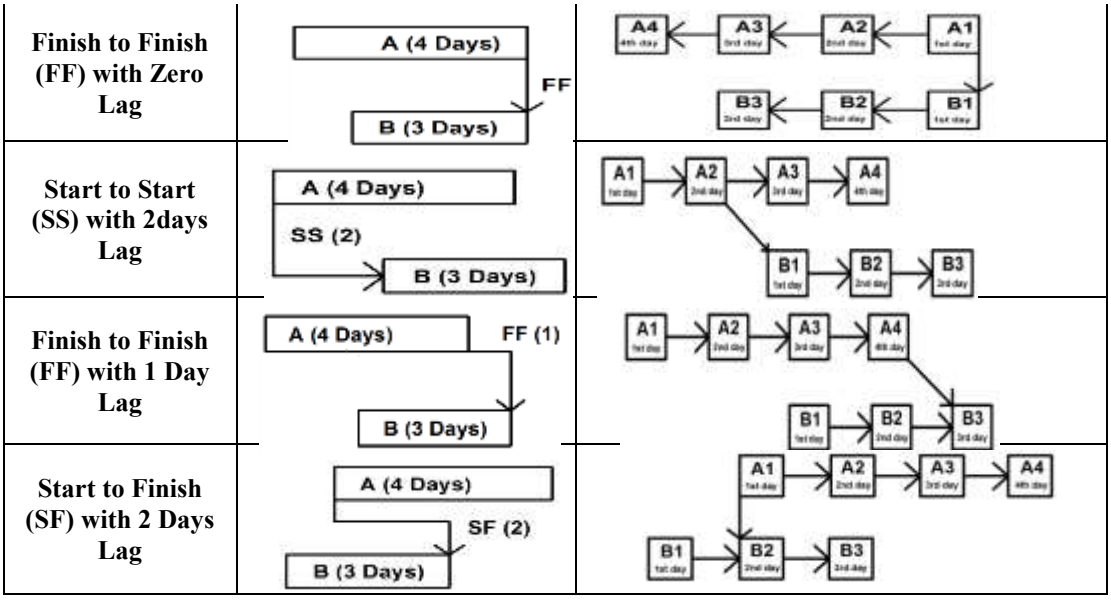


Fig. 1: Representation of activity duration in CPS technique

Table No. 1 Representation of network constraints in CPS technique

Type of Constraints	Traditional Representation (PDM)	Time Segments Scheduling Representation (CPS)
Finish to Start (FS) with Zero Lag		
Start to Start (SS) with Zero Lag		



Representation of Activity in CPS Technique:
As the representation of activities and their durations is the basis of schedule calculations, improvement using CPS technique in representation of the activities minimizes the problems mentioned earlier. CPS represents each activity as number of separate consecutive time segments that add up to the total duration of activity instead of traditional representation of activity duration as a continuous block of time that spans the activity duration. For example, an activity 'A' having duration of 4 days is represented by four separate time segments as shown in Fig.1.

Advantages of Time Segments representation:

- It permits all logical relationships like Start to Start (SS) and Finish to Finish (FF) by converting it to Finish to Start relationship without the lag times which causes float calculation problems in traditional CPM and PDM. (Examples shown in Table No1)
- It provides exact critical days of individual activity instead of total critical activity.
- It provides a combine representation of CPM and Gantt chart.

Project Control using Time Segments Scheduling Technique:

Use of separate time segments scheduling technique enables project managers to achieve micro level planning and scheduling which helps to achieve better project control, monitoring and revision of schedules.

Step-by Step Project Control using Time Segments Scheduling Technique:

1. Determine detailed work quantity of each activity.
2. Determine duration required to complete work quantity of each activity.
3. Generate a regular baseline schedule using CPM and Gantt chart.
4. Generate a Time Segments Schedule from baseline schedule by converting total span of each activity into unit time segments
5. Determine the work quantity required to complete on each time segment.
6. Track and monitor each time segments on the basis of time as well as work quantity with respect to planned time segment schedule.
7. Revised next time segments of each activity with respect to time and work quantity as per requirement.

Following example illustrates use of Time Segments Scheduling Technique for Project Control Consider two activities A and B with duration 4 days and 3 days respectively. Activity B starts 2 days after start of activity A. Fig shows network representation of relationship between both activities with respect to time and work quantity. Network representation shows that for activity A target or Planned work quantity in unit time segment is 25% as duration of activity is 4DAYS. Similarly, for activity B it is

33% as shown in Fig.2

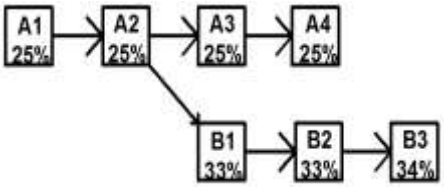


Fig. 2

During execution phase this new representation of network allows to track and monitor each activity with respect to time as well as work completion at any unit time segment. Suppose Activity A starts on planned date but completes only 22% work. So, on next date the revised planned work quantity will be 28% Fig No 4 shows the progress representation of planned schedule.

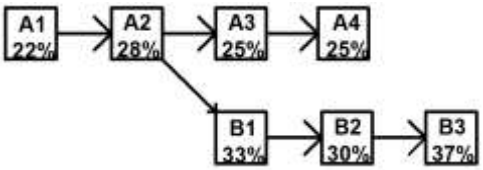


Fig. 3

Advantages of using Time Segments Scheduling Technique for Project Control during execution phase:

- It allows monitoring of exact critical days of critical activities at any time during execution phase.
- It allows to evaluate the project performance with respect to duration as well as quantity of work associated with activities.
- It allows to track progress of project with baseline for each time segment of every activity which helps decision making during revision of schedule at any time during performance of project.

Approach towards use of Time Segment Scheduling Technique for Project Control:

Based on the above example, Time Segment Scheduling Technique could be a time consuming process in planning phase for converting each activity duration in separate time segments. But that can be minimized by developing the technique using computer applications which will increase the efficiency of scheduling and project control process.

CONCLUSION

This paper presents an approach for micro level project analysis, particularly suited to progress report, project control and schedule and performance analysis. Activity duration as a chain of separate time segments facilitates the efforts required to complete target work on unit time segment of every activity that corresponds to detail analysis. It facilitates accurate schedule analysis by simplifying complex relationships and avoiding the use of leads and lags. It also provides a flexible representation of project variables that offer a wide range of possible solutions to project constraints.

Ultimately, this method of project tracking using separate time segment is expected to assist project managers in preparing reliable schedules that better reflect reality and offer better support for planning, corrective action, and schedule analysis decisions.

REFERENCES

1. Hegazy, T, and Menesi, W. (2010). “Critical Path Segments (CPS) scheduling technique." Journal of Construction Engineering and Management, ASCE, 129(4), 396-404.
2. Baweja, S. S. 2006. “CPM schedules—why and how.” ASCE. 131(5), 505-512.
3. Galloway, P. D. 2006. “Survey of the construction industry relative to the use of CPM scheduling for construction projects.”J.Constr. Eng. Manage. 132 7, 697–711.
4. Hegazy, T. 2006. “Simplified project management for construction practitioners.” Cost Engineering J., ASCE Int., 48 11, 20–28. PMBOK guide 5th Edition.