



# Implementation of Project Management Techniques for Construction of Building

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## Abstract:

Construction industry is the one of the fastest growing in internationally & second largest in India. To manage construction projects effectively with project management skills and knowledge tailored specifically for the construction industry. An effective project manager recognizes the significance of processes, technology and people to the success of construction projects. A schedule is a listing of a project's milestones, activities, and deliverables, usually with intended start and finish dates. A good network diagram will be a clear and concise graphic representation of a project. The curve introduced in this paper is one against which one may compare actual progress and detect ahead of time tentative problems in project execution. Providing good planning, proper organization, sufficient flow of resources to a project cannot automatically achieve desired result. The main objectives of this study are to plan, schedule, and track a residential project with help of MS Project Software.

**Keywords:** Planning, Scheduling, Construction, S-curve, MS Project, Tracking etc...

## I. INTRODUCTION

Project Management is the use of knowledge, skills, tools, and techniques to plan and implement activities to meet or exceed stakeholder needs and expectations from a project. The construction industry is the largest industry in the world. It is more of a service than a manufacturing industry. Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment. A network diagram in project management is useful for planning and tracking the project from beginning to finish. The logical dependencies between tasks are defined using an activity network diagram that enables identification of the critical path. It represents a project's critical path as well as the scope for the project. S-Curves are used to visualize the progress of a project over time. The development of this curve arose from the need to have a tool for comparing progress. Since no curve with estimated progress was available, the use of a theoretical curve was considered. The curve introduced in this paper is one against which one may compare actual progress and detect ahead of time tentative problems in project execution. <sup>[1]</sup> Planning is a fundamental and challenging activity in management and execution of construction projects. A good construction plan is the base for developing the schedule and the budget for work. Developing the construction plan is a critical task in project management; plan is not written or else formally recorded. During planning a planner begins with scope and he will decide his steps for getting result. In the construction planning include the generation of required activities, analysis of the implications of these activities and the choice among various alternatives methods of performing these activities. A planner must imagine the final design and describe it in plans and specifications. In developing a construction plan the importance is given either cost or schedule. For other projects where time is a critical or the planner ensures that proper precedence among activities is maintained and that efficient scheduling of the available

resource prevails. In such cases a critical path scheduling procedure is followed. <sup>[1]</sup> Project Monitoring acts like a warning mechanism; it is the process of recording, collecting and reporting information regarding project performance that the project manager and others wish to know. Monitoring includes watching the progress of the project against time, performance schedule and resources during actual execution of the project and it identified the lagging areas which require timely attention and actions. It is very common to see project failing to achieve their missions within specified time and budget, the factors causing overrun as stated above inadequate project formulation, poor planning and lack of project management during execution, but the main cause of failure can be attributed to cost estimation failure and management failure. Large projects become more complex and the ability to exchange information on paper within organization on a timely basis gets difficult. <sup>[1]</sup> Scheduling is determination the timing of events in the project that is when and which task will be perform. Putting it in simple words it is a reflection of plan. In other words we can say, planning is How, What and Who whereas scheduling is when and why. Scheduling can be also defined as the detailed plan of the project work tasks with respect to time. A schedule is also a good communication tool between all the stakeholders of the project. Schedule gives an overall sense of expected progress of the project without schedule it is very difficult to explain someone unfamiliar with the project what is going on and what is expected to take place. In the past thirty years project management (PM) has developed substantially as a discipline and significantly increased in visibility. PM tools and techniques are the mechanisms by which PM processes within the organization are delivered and supported. This includes, PM techniques (e.g. work breakdown structure or earned value management), the various guidelines in which the processes of the organization are defined, including the use of software packages. <sup>[3]</sup> Wael H. Ramadan, Gaps and Opportunities review clearly showed that project planning which includes work breakdown structure, scheduling, network diagram is the

most popular research process group and project initiation and closure are the followed research topics. [4] Guru Prakash Prabhakar, Review provides literature search on what is a project, its classification, characteristics, its life cycle, phases, tools etc. [5] Rogelio Acuna project planning using CPM and PERT presents an analysis of the Critical Path Method (CPM) and Project Evaluation Review Technique (PERT) in Project Planning. It highlights the means by which a network diagram is constructed from a list of project activities and the computation involved for each method. Minh Shrestha, hinted that the main function of a software is help, and develop the quality of output with less effort than manual ways. A project has disparate requirements and the aim of the adopted software is to fulfill those requirements effectively in terms of time and cost. In addition, the issues of scheduling, tracking and physical element must be considered while adopting the project management software. [8] Abhishek Sharma says many project suffers time and cost overruns due to improper planning, scheduling and completing works that results in numerous issues like delay in providing facilities, development, cutback in quality of construction and making the project more expensive. A little consideration shows that the time required to complete the project is inversely comparative to the supply of manpower. As the manpower is increased, the completion time of the project is decreased and on the other hand if the manpower is decreased, the completion time of the project is increased. A comparison between the baseline duration and cost to actual duration and cost of manpower of project is also determined using project management software tool Microsoft Project. The schedule report is examined and causes for delay are analysed. Suresh kumar adds that Scheduling using MSP Software is a development which involves estimation, sequencing the activities, resources allocation and timing. The construction scheduling is to complete the project in time and equal the resources with the allocated time. EV Analysis is a standard method of measuring a project's progress at any given point of time, forecasting its completion date, final cost and analysis difference in the schedule and budget of the project. Scheduling using MSP Software gives good controlling .Construction projects nowadays are becoming increasingly convoluted. There are numerous risks involved in the execution of the project. So, unless there is a means of tracking the implementation of the project, there is no way of stymieing the risks and uncertainties involved.

## II. RESEARCH METHODOLOGY

To Execute a project in ordered manner there is need to follow a framework for its completion. Globally 5 processes are followed as mentioned in PMBOK(Project Management Body Of Knowledge).Briefly function of each of phase is mentioned below [2] Project Management Process Groups (or Process Groups):

- ✓ **Initiating Process Group.** Those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.
- ✓ **Planning Process Group.** Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.
- ✓ **Executing Process Group.** Those processes performed to complete the work defined in the project management plan to satisfy the project specifications.

✓ **Monitoring and Controlling Process Group.** Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.

✓ **Closing Process Group.** Those processes performed to finalize all activities across all Process Groups to formally close the project or phase.

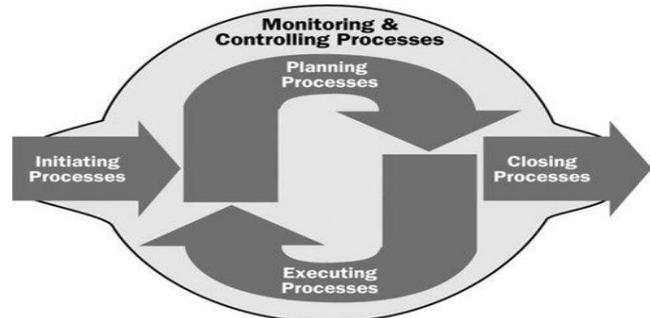


Figure.1.Project Management Processes

## III. DATA ANALYSIS & INTERPRETATION

### 2.1. Defining Activities & Work Breakdown Structure (WBS)

The work breakdown structure, which defines each deliverables. The activity defining is used as a starting point to breakdown the documented deliverables, as well as a guide to assure that the entire scope of the project is covered, but that the activities do not extend beyond the agreed boundaries. In order to produce the activity list it is necessary to examine each break it down into individual work schedule activities. As the name suggests the work breakdown, is a list of all the work activities that must be performed within the project and each one should be linked back to just one work.

### 2.2. Scheduling of Activities

The project schedule is an output of model that presents linked activities with planned dates, durations, milestones, and resources. Although a project schedule model can be presented in tabular form, it is more often presented graphically, using following formats, which are classified as presentations:

Gantt charts. These charts, also known as Gantt charts, represent schedule information where activities are listed and shown on timeline representing dependencies on activities on each other. Project schedule network diagrams. These diagrams are commonly presented in the activity-on-node diagram format showing activities and relationships without a time scale format that is sometimes called a logic bar chart, as shown for the detailed schedule in These diagrams, with activity date information, usually show both the project network logic and the project's critical path schedule activities.

### 2.3. CPM (Critical Path Method)

CPM is a deterministic technique that, by use of a network of dependencies between tasks and given deterministic values for task durations, calculates the longest path in the network called the 'critical path'. The length of the 'Critical Path' is the earliest time for project completion. CPM calculates for each activity, how quickly the task can be accomplished i.e. early start and finish dates of each activity by performing forward pass analysis. CPM then calculates how slowly each task can be accomplished i.e. late start and late finish dates for each activity. CPM does not takes into consideration any resource limitation for this calculation

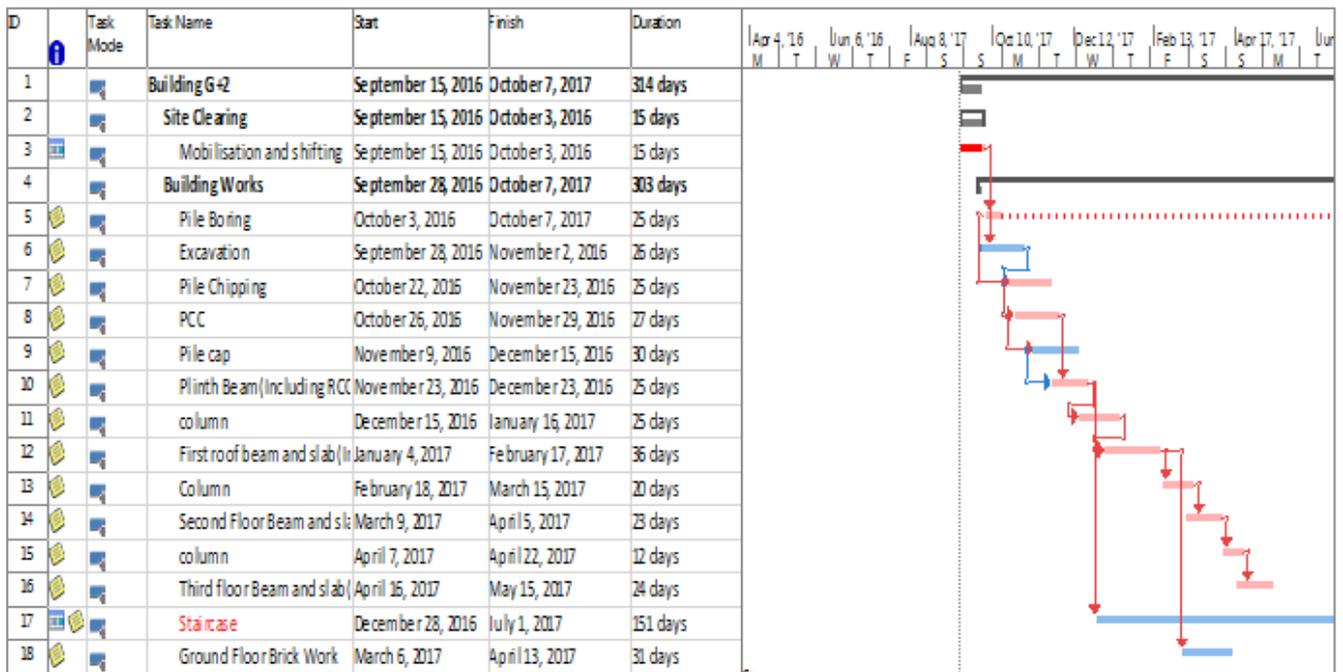


Figure.2. Schedule of Building Construction By Using MS Project

## 2.4. CPM Scheduling

- (i) Earliest Start time (ES): the earliest time an activity can start
- (ii) Forward pass: start at the first node and move forward through the network to determine the earliest start time for an activity.
- (iii) Earliest Finish time (EF): the earliest start time plus the activity time  
 $EF = ES + t$   
 $t =$  duration of activity.

## 2.5. Tracking of the project

Tracking is the process of collecting, entering and analyzing of actual project performance values such as work on actual tasks and actual durations. Tracking is second major phase of project management. Baseline is a snapshot of your project that you make when you complete the planning phase. Baseline is set of data saved in the same file where you track actual progress data. Tracking actual vs remaining values for tasks and

assignments-Once the values are entered we need to compare it with baseline so here we compare actual start, actual finish, % work complete, Actual duration, remaining duration, actual work parameters with different activities of the project also to determine the project is on track or not. next phase of project management is tracking

- (iv) **Latest Start time (LS):** the latest time an activity can start without delaying the completion of the project beyond the critical path time.  
 $LS = LF - t$

Activity Slack **Slack** is computed by:  $S = LS - ES$  or  $S = LF - EF$  Slack enables resources to be temporarily diverted to other activities:

- (i) avoid delays
- (ii) compensate for an inaccurate time estimate

**Late finish(LF):** The latest date that a task can finish without delaying the finish of the project.



Figure.3. CPM analysis by using MS Project software

The main thing to focus on project planning is developing and communicating the details of project plan before actual work starts. When work begins, the did by whom, when the work was done, and at what costs these details are called as actual. Properly tracking actual work and comparing it's against original plan is useful to identify the difference in actual and planned and it enables to adjust incomplete task of the plan.

As schedule based tracking is done by using MS project software as shown graph.. Effort based tracking is done by using MS excel. Fig. shows MS excel based tracking. In cooling tower supply of different part is very important. These parts must be reach at specific time so this will reduce delay in project. So supply scheduling & its tracking is to much important.

#### IV. RESULT & DISCUSSION

In this study, the planned date of starting of project was 15/09/2016 and scheduled completion date was 07/10/2017. The project was suffering from time overrun. It has been found that many activities are delayed from their original schedule. On 30/06/2017, each completed and uncompleted activities were analysed and their percent completion was worked out. On the basis of this analysis it was concluded that the project percent completion on this date was 78%. S-Curves are used to visualize the progress of a project over time. This plot cumulative work,. The name is derived from the fact that the data usually takes on an S-shape, with slower progress at the beginning and end of a project. This can analyze baseline, design or actual work, or baseline, design or actual costs. One of the primary uses of the S-Curve is to compare any two or all three of these Schedule at once. The Fig.8 shows the different graphs. This graphs shows scheduled & actual progress line. We can easily compare planned & actual work as shown below.

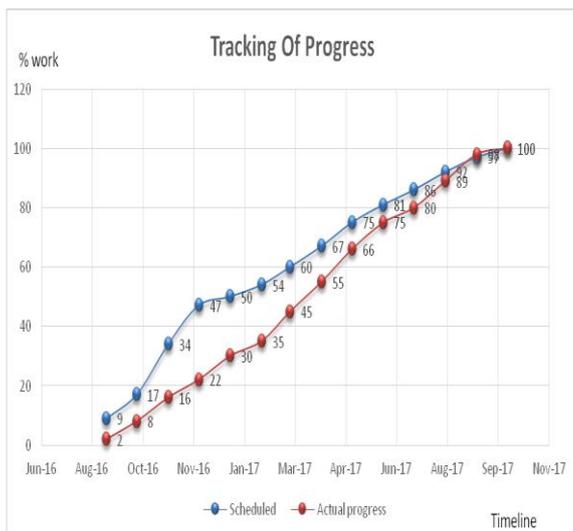


Figure.4. Tracking of Progress (S-curve) using MS Project

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#### V. CONCLUSION

From the above methodology we conclude that project management is most important for managing projects successfully as it is more convenient and easy which majorly contributes to proper decision making. Also from the above study we have to improve some techniques & concentrate on below mentioned points.

- This study has investigated the planning, scheduling procedure of the building construction.
- Activities on the site with respect to execution of the residential project are thoroughly observed and comparison is made between planned and actual executed schedule.
- This study found that monitoring and tracking project using software is useful to keep watch on the project performance.
- With application of more resources we can complete project within scheduled time thus avoiding delays

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