

# The Scheduling Tools and Methods in Construction Industry: An Overview

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## Abstract

In this research paper an summarised overview of bar/ Gantt charts, S-curve, Critical path method, Program Evaluation and Review Technique, Precedence Diagram Method and software tools such as Primavera and Microsoft Project is carried out to understand scope and limitations of them

**Keywords:** *Scheduling methods, Scheduling Tools.*

## 1. Introduction

All projects have a finish date because project is a temporary Endeavour taken. 'In order to complete project on finish date and most appropriate cost management's task is to manage technical, non- technical men & women, material, and machineries in most effective way'. The above mentioned statement is ideal scenario. The Management's task is to achieve it. The project scheduling is one of the task need to be performed to achieve the ideal scenario. The project schedules are prepared by professional/s involved. Project schedule essentially should include all activities, planned start date of the project, planned start date of each activity, planned finish date of each activity, estimation of duration of each activity, planned finish date of the project, resource assignments, flow sequence of activities, an identified critical path, total float and free float

## 2. Data Collection

### 2.1 Introduction

The scheduling tools are majorly classified as computer assisted tools and manual tools. Manual tools are fundamental project management scheduling methods developed over time before introduction of computers. Computer assisted tools are classified as software solutions, Integrators, spreadsheets. Software solutions are based on fundamental techniques. Advantage of using software solutions is they save time required for computation of data. Software solutions assist computerised scheduling of projects. Integrators software can link different types of files and automate certain tasks. Spreadsheets are capable of doing arithmetic's calculations with given formula by user. Some of the scheduling tools and methods are discussed.

### 2.2 Bar/ Gantt Charts

Bar charts are graphical presentation of work against time in form of rectangular bars. Time is plotted on x-axis and activities are plotted on Y-axis in sequence from start to end. Each activity represents the bar. It can represent critical path with help of colors. It cannot determine critical path because it does not host features of network logic. Resource assignments and project monitoring can be done with help of bar charts.

### 2.3 S-curve

Two line graphs are plotted with time on X- axis and Planned and actual expenditures on Y-axis.

### 2.4 Critical Path Method

Critical Path method can determine critical path as it have features of network logic. Critical path is longest path in the network diagram. Critical path consists of critical activities. It represents interrelations and delay in any critical activity or group of critical activities will move further end date of the project construction manager can manage to give his/her maximum attention to critical activities with help of this method. Thick line or red line is drafted to denote critical path.

### 2.5 Program Evaluation and Review Technique

PERT is modified version of CPM and network based scheduling method and the activities in the network does not have defined time.

### 2.6 Precedence Diagram Method

It is also based on network logic. It allows four kinds of activity relationships.

### 2.7 Work Breakdown Structure

Child level in the Work Breakdown Structure essentially represent 100 percent of the work applicable to higher or parent level of Work Breakdown Structure.

### 2.7 Primavera

It is tested software solution developed by Oracle for Project management. Some of the features of this are explained

#### 2.7.1 Enterprise Project Structure

It is hierarchical ordering of Enterprise/s within the parent Enterprise. Project is part of the one of the enterprise belonging to this hierarchical tree of enterprises within the parent enterprise. It is possible that the tree may have more than two levels. Each enterprise is denoted by golden triangle.

#### 2.7.2 Project Window

Projects are opened through project window. Project window has color bands to represents hierarchical ordering of enterprises. Projects belonging to same enterprise are listed in single list. Every project is represented by gray color envelope like symbol.

#### 2.7.3 Activity Window

After opening project through project window activity window gets opened. It represents all activities listed within project and their interrelations and interdependencies. These activities are listed as per activity ID not as per their occurrence in the project.

### 2.8 Microsoft Project

Microsoft Project is software solution designed to develop plans of projects, to assign resources to the tasks, to track progress, to manage progress, to analyse workloads. It represents activity relationships and interdependencies with gantt chart and network diagram.

#### 2.8 Effect of Human nature on progress of work

Parkinson had worked on the phenomenon and proposed Parkinson’s Law which can be expressed from below example; consider time allotted to complete work is 10 days. It is possible to complete work is 5 days although it is unlikely that office executive will complete in 5 days. He/ she will wait till deadline.

## 3. Comparison of Scheduling methods/ Tools

Table 1: Comparative chart of Scheduling Methods

Item	Bar/ Gantt chart	S -curve	Critical Path Method	Program Evaluation and Review Technique	Precedence Diagram Method
Represents All the activities	Yes	No	Yes	Yes	Yes
Planned start date of project	Yes	Yes	Yes	Yes	Yes
Planned start date of each activity	Generally Not mentioned	No	Generally Not mentioned	Generally Not mentioned	Yes
Planned finish date of each activity	Generally Not mentioned	No	Generally Not mentioned	Generally Not mentioned	Yes

Planned finish date of project	Yes	Yes	Yes	Yes	Yes
Flow sequence of all activities	Manager has to put it correctly	Manager has to put it correctly	Manager has to put it correctly	Manager has to put it correctly	Manager has to put it correctly
Total Float and Free Float	No	No	No	No	Yes with help of forward and backward pass method
Updating progress of project	Not possible on same bar chart	Expenditure is tracked with progress of project	Network Diagram cannot represent updated progress with time	Network Diagram cannot represent updated progress with time	Network Diagram cannot represent updated progress with time
Resource Assignments	Yes with modified Bar chart	No	Network Diagram cannot represent resource assignments	Network Diagram cannot represent resource assignments	Network Diagram cannot represent resource assignments
Auto Scheduling	No	No	No	No	No

Table 2: Comparative chart of computerize Scheduling tools

Item	Primavera	Microsoft Project
Represents All the activities	Yes	Yes
Planned start date of project	Yes	Yes
Planned start date of each activity	Yes, in table it is mentioned	Yes, in table it is mentioned
Planned finish date of each activity	Yes, in table it is mentioned	Yes, in table it is mentioned
Planned finish date of project	Yes	Yes
Flow sequence of all activities	Yes with auto sequencing as per data input	Yes with auto sequencing as per data input
Total Float and Free Float	Yes	Yes
Updating progress of project	Yes	Yes
Resource Assignments	Yes	Yes
Auto Scheduling	Yes	Yes

#### 4. Tables, Figures and Equations

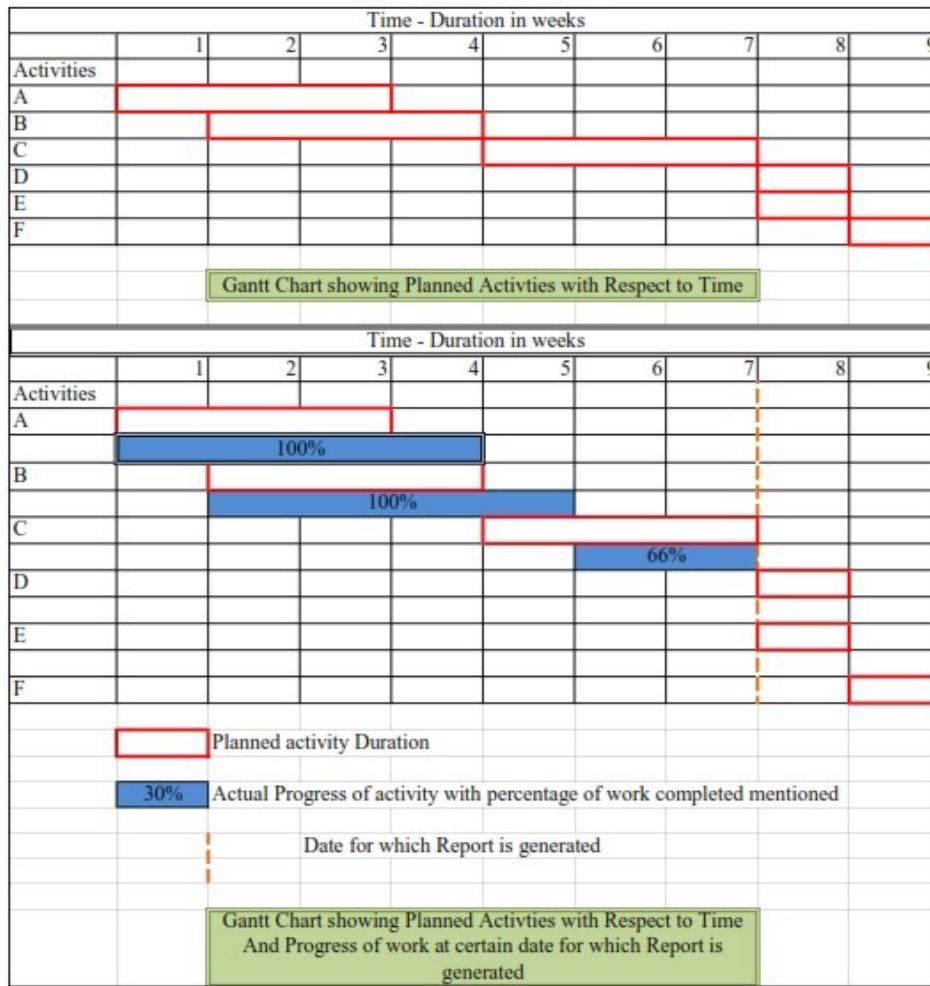


Fig. 1 Project progress monitoring using Bar/ Gantt Charts

Time - Duration in Days										
Activities	1	2	3	4	5	6	7	8	9	10
A										
B										
C										
D										
Planned Cost of Work in thousands	1	3	3	2	1	1.4	1.4	1.4	0.4	0.4
Cumulative cost in Thousands	1	4	7	9	10	11.4	12.8	14.2	14.6	15
Percentage	6.67	26.67	46.67	60.00	66.67	76.00	85.33	94.67	97.33	100.00

Adding Resources in Gantt Chart, Gantt Chart - Planned Cost Data

Fig. 2 Adding Resources in Bar/ Gantt chart

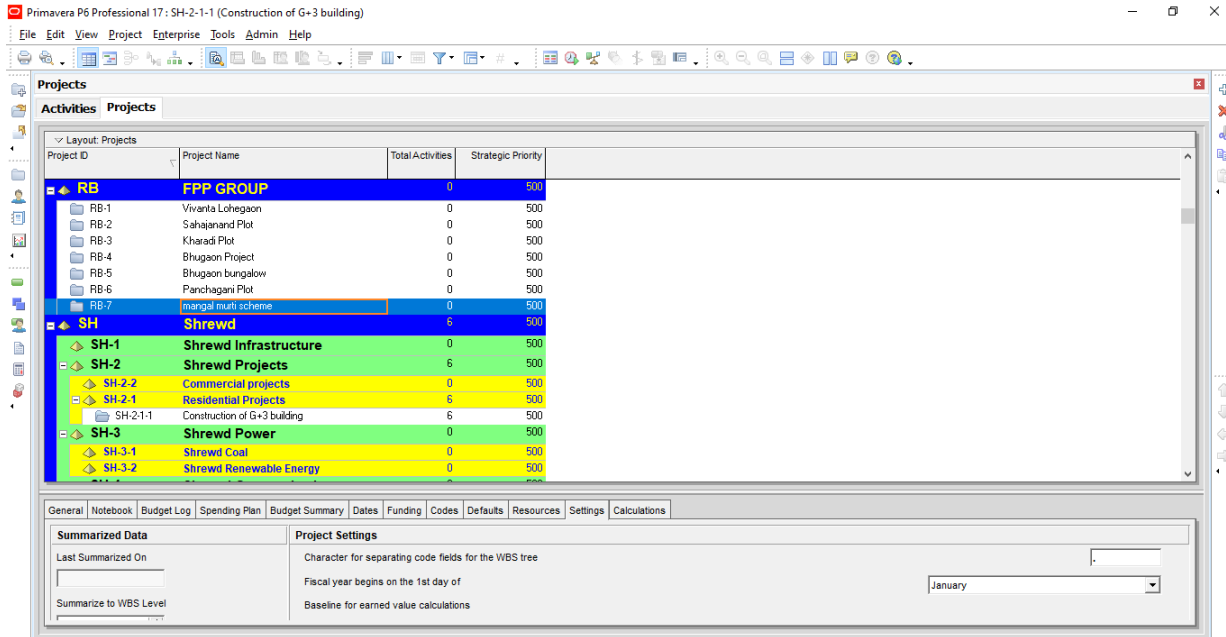


Fig. 3 Projects window in Primavera

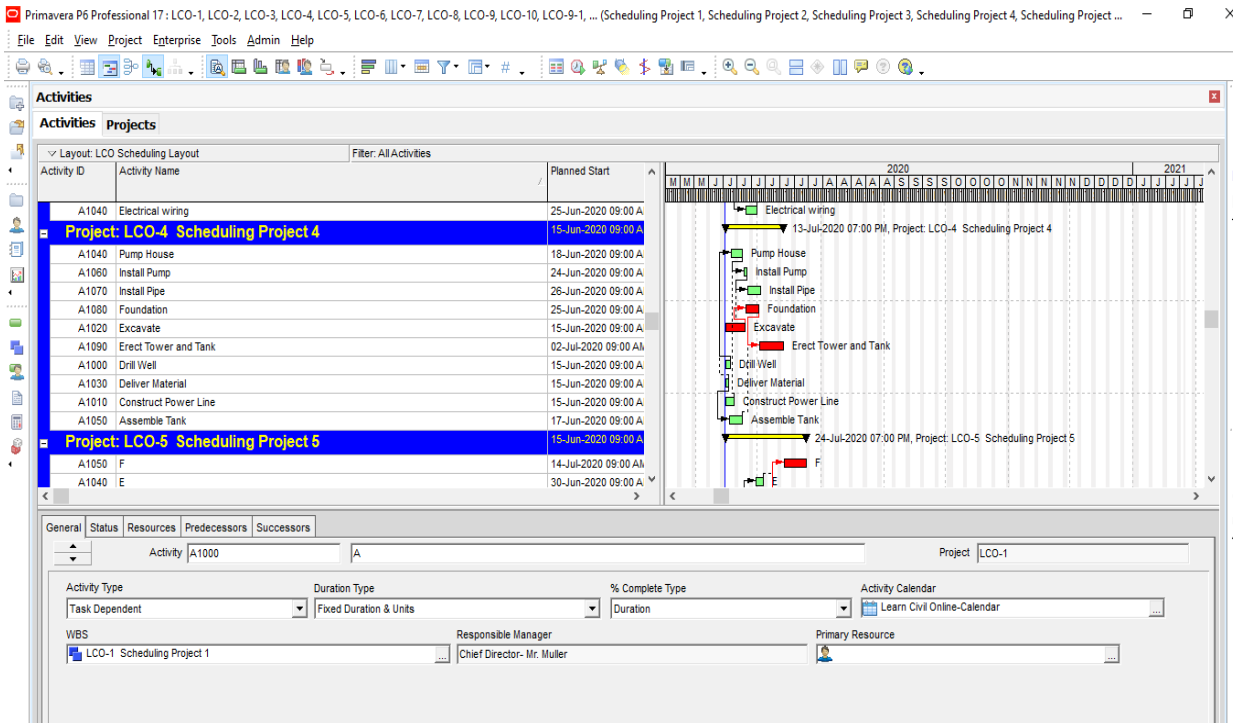


Fig. 4 Activity window with Gantt chart in Primavera

#### 4. Conclusions

Bar/ Gantt Charts are unable to determine critical path but can represent it after determining it with help of network diagram S-curve is useful in comparing actual expenditure on project with planned expenditure on project in terms of currency but not useful for other functions.

CPM and PERT take in account only finish to start kind of relationship

PDM deals with all possible types of relationship

Computer assisted Scheduling tools save time of managers by using computing abilities of modern computers

Project monitoring with Periodical report generation with Computer Assisted Scheduling tools of project is easy and time saving than manual methods

It requires separate training to use Computer Assisted Scheduling Tools

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#### References

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