# Analysis of Planning and Scheduling Using Traditional and Primavera Approach

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**ABSTRACT:** Extend observing and control is the way toward gathering, recording, and revealing data concerning venture execution. Extend controlling utilizations the information from screen action to convey real execution to arranged execution. The present review manages the venture observing procedure of a ten storeyed (G+9) building whose development is in advance at Tathawde, Pune. A correlation between the arranged advance of development work and real advance is performed in this review utilizing venture administration programming Primavera P6. Regardless of entrenched standards and approaches of venture observing the procedure itself may not be productively expert in a venture, due to those down to earth issues existing or emerging in the projectSuch an endeavor in understanding the handy issues in execution of venture checking and control will add to appropriate acknowledgment of the issue ranges and setting up the control procedure to amend the deviations.

**KEYWORDS:** Planning, Scheduling, Project Planning Software, Primavera.

## I. INTRODUCTION

Development industry is an essential part of a country's foundation and mechanical growth.Even however development industry is the second biggest industry in India, the development of this industry has been differential the country over. The country locales require apparatuses for monetary improvement, arrive utilize and condition wanting to adapt to the status of advancement in urban ranges. The time accessible to accomplish this objective is contracting. Here emerges the requirement for viable venture management.Many issues are being confronted by development industry that must be dealt with. Theyinclude time and cost overwhelms because of insufficient venture detailing, lack of common sense for usage, absence of legitimate contract arranging and administration and absence of appropriate administration amid execution. It has been assessed by experts that normal cost of a venture goes up by 30 rate contrasted with the planned cost. Perceptions demonstrate that legitimate skillful administration is basic for the auspicious fruition of the venture inside assessed spending plan and with assigned assets. Ventures with great arranging, satisfactory hierarchical apparatus and adequate stream of assets can't naturally accomplish the coveted outcome. There must be some notice instrument, which can caution the association about its conceivable achievement and disappointments, now and again. Extend observing is the way toward gathering, recording, and revealing data concerning venture execution that venture supervisor and others wish to know. Observing includes watching the advance of the venture against time, assets and execution plan amid execution of the venture and recognizing slacking ranges requiring convenient consideration and activity though extend controlling utilizations information from screen movement to convey genuine execution to arranged execution.

## TABLE I. CASE STUDY DETAILS

Name of the Building: Sai Apartment

Description: Building
Address: Tathawade Pune. 411033
MH, INDIA.
Society Name: SaiApartment

Main steps involved in factory construction work apart from initial planning are
1. Mobilisation
2. Piling
3. Column& beam concreting
4. Slab & stair concreting
5. Post concreting works
6. Masonry work
7. Plastering
8. Flooring, dado
9. External wall plastering
10. Finishing

## II. METHODOLOGY OF MONITORING THE PROJECT WITH PRIMAVERA

The construction projects have become so vast and complex that the application of information technology has become inevitable. Companies started developing softwares for project management such as Primavera P6, P3, Suretrack, MS project, etc.

This study involves monitoring and controlling the project using Primavera P6. The progress at site must be incorporated in the Primavera schedule and updated. These updates needs to be thoroughly monitored using Primavera. Tools and techniques involved in this process are:

- Earned value management (EVM)

Earned value management is a commonly used method ofperformance measurement. It integrates scope, cost, and schedule measures to help the project management team assess and measure project performance and progress. This technique requires the formation of an integrated baseline against which performance is measured for the duration of the project. This can be effectively done in Primavera.The project performance baseline is used to measure, monitor, and control overall cost performance on the project.

- Work performance measurements

The calculated cost variance, schedule variance, CPI, values for WBS components, in particular the work packages and control accounts, needs to be documented and communicated to stakeholders.

Steps involved in monitoring and control of this project are
1) Creating an ideal schedule

To create a schedule for any project, first step is to collect data available for the project. Subsequently the following steps can be followed in Primavera.

2) Enterprise project structure (EPS)

Create the structure of the company with its branches, which is executing the project. This is known as Enterprise project structure (EPS).

3) Organizational breakdown structure (OBS)

After the EPS, OBS is created which is a hierarchy that reflects the persons responsible for theprojects in the enterprise.

4) Creating new projects

A project is a set of activities and associated information that constitutes a plan for creating a product or service. The project is created under the respective divisions in EPS and assigned the person in charge from OBS to it. The project can be given planned start and must finish dates. The project is assigned a calendar which can be global, resource or project calendar.

5) Work breakdown structure (WBS)

WBS is a hierarchy of work that must be accomplished to complete a project. Each project has its own WBS hierarchy with top level WBS element being equal to that of each EPS node or project. Each WBS element may contain more detailed WBS levels, activities, or both.

6) Defining activities

Activities are the fundamental work elements of a project and form the lowest level of a WBS and, are the smallest subdivision of a project. An activity has the following characteristics like activity ID, name, start and finish dates, activity calendar, activity type, activity codes, constraints, expenses, predecessor and successor relationships, resources, roles etc.

7) Relationship between activities

To from a network, the activities should be connected to each other, which is done by assigning preceding and succeeding activities with significant relationship to the activities.

8) Determining activity duration

When planning the work, the duration is entered in the original duration field. The actual duration can only be entered for the activities, which are completed.

9) Activity dates

The following are the types of activity dates available in the primavera; actual start, actual finish, planned start, planned finish.

10) Activity cost

The activity cost is the sum of all the cost incurred to complete the activity.

11) Creating baselines

A simple baseline plan is a complete copyof the original schedule which provides a target against which a project's performance is tracked.

12) Updating schedule
- If the project is progressing exactly as planned, then only needed to estimate progress.
- If the project is not progressing as planned many activities are starting out-of-sequence, actual resource use is exceeding planned use, and then update should be done for activities and resources individually.
- Most projects contain some activities that progress as planned and some which do not. In this case, the best method is to combine the two updating methods.

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### 13) Tracking

Tracking window is used for monitoring a project's progress using different types of layoutssuch as labour costs, project cost, resource forecasting, resource allocation unit wise and cost wise.

### 14) Earned value

Earned value is a technique for measuring project performance according to both project cost and schedule. The technique compares the budgeted cost of the work to the actual cost.

### 15) Claim digger

The claim digger is a schedule analysis tool that enables a company to generate a report that compares selected data fields in a revised project and a corresponding baseline.

### 16) Project thresholds

Project thresholds consist of parameters assigned to WBS elements; they are used to monitor projectsand generate issues.

### 17) Project issues

Project issues are the problems within a schedule that must be addressed before the project can be completed. They can either be created by thresholds or manually.

*Preliminary steps to be done in updating*

Choose *project. Maintain baseline.* Then add and save a copy of current project as a new baseline B1. Then choose projectbaseline as B1 and assign primary baseline as B1.

Daily updates to be made:

a) Start date and end date

Choose the activity to be updated. Then in the activity details window, select *status* tab. Then tick mark *started* if the activity has been started and select the date. Tick mark *finished* if the activity has been finished and select the finish date.

b) Resource

In activity details window, select *resource* tab. Then select the resources which are to be added to the particular activity

c) Code

In activity details window, select *code* tab. Then select the activity code for each resource.

d) Notebook

In activity details window, select *notebook* tab. Select the topic which we want to note and write the details in notebook topic.

e) Steps

In activity details window, select *steps* tab. Then if the activity has any steps update the activity in percentage complete and put a tick mark if the activity has been completed.

f) Feedback

In activity details window, select *feedback* tab. Then the details for the resources have to bementioned in feedback.

g) Work products and documents (WPs & Docs)

In activity details window, select the *WPs & Docs* tab. Then the drawings, documents, specifications have to be uploaded here.

Weekly updates to be made:

    a)    Threshold

In directory bar choose *threshold* tab. Then 3 variances are to be monitored regularly; finished date variance, start date variance and cost variance.

    b)    Issues

In directory bar choose *project issues.* The values which fall outside the threshold values are indicated in the issues. Contractor also has to add issues if there are any.

    c)    Reports

Choose *tools*. Then choose the data date which we want to update the progress. All the activities done in that week has to be selected. Then select *update progress.*

*Schedule analysis and forecasting*

Schedule variance (SV)

It determines whether a project is behind or ahead of the schedule. It is calculated by subtracting planned value from the earned value.

Schedule variance = Earned value (EV) -Planned value (PV)

The Schedule Variance can be expressed as a percentage by dividing the schedule variance (SV) by the planned value (PV):

SV% = SV / PV

Schedule performance index (SPI)
It indicates efficiency with which the project team is using its time.
$$\text{Schedule performance index} = \text{Earned value} / \text{Planned value}$$

Time estimate at completion {EAC(t)}
We can generate a rough estimate of when project will be completed
$$\text{Estimate at complete \{EAC(t)\}} = (BAC/SPI)/ (BAC/months)$$

BAC = Budget at completion

*Cost analysis and forecasting*

Cost variance (CV)
It shows whether a project is under or over budget.
$$\text{Cost variance (CV)} = \text{Earned value (EV)} - \text{Actual cost (AC)}$$

This number can be expressed as a percentage by dividing the cost variance (CV) by the earned value (EV). CV% = CV / EV

Cost performance index (CPI)
It is one of the clearest indicators of the cumulative cost efficiency of the project.

$$\text{Cost performance index (CPI)} = \text{Earned value (EV)} / \text{Actual cost (AC)}$$

### III. RESULTS AND DISCUSSIONS

*Ideal baseline for Project*

An ideal baseline B1 was created in Primavera for the this case study. The work breakdown structure, activities and steps for activities are being discussed here. The structure for the baseline is presented from the WBS levels. In WBS a level may be again sub divided. Activities come under the WBS.

*Gantt chart*
1. The time scale of the Gantt chart should be weekly basis.
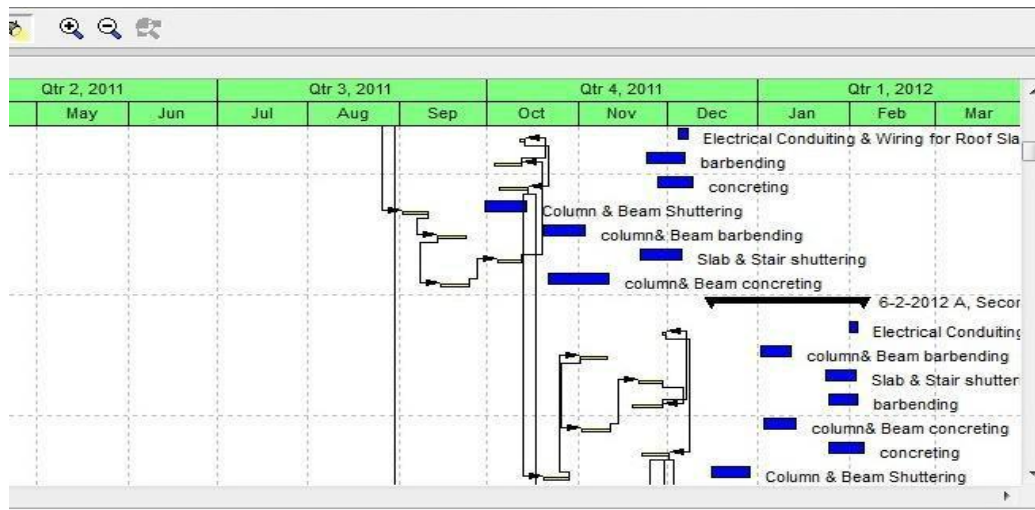2. All relationships should be clearly given in the Gantt chart.



Fig.1 Gantt chart window(Source: Google)

*Calendar*
The work is carried out in 6 days per week. So the standard 6 day workweek calendar is made with necessary holidays in it. A break of one hour is given in the afternoon.

*Activity usage spreadsheet and resource usage spreadsheet*
These two spreadsheets reflect the usage of resources and progress of activities at any stage of the construction project. This is based on classic WBS layout

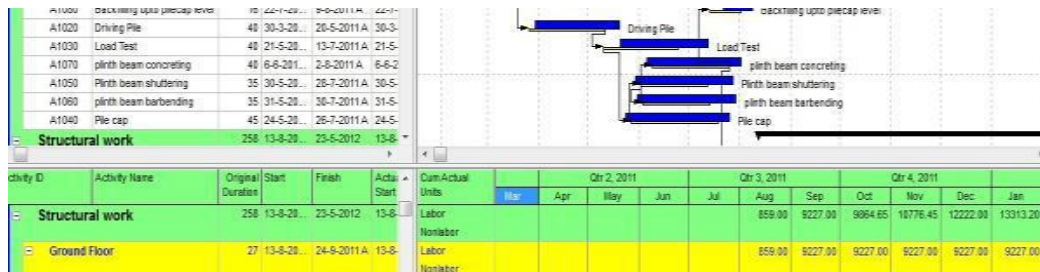Fig. 2 Activity usage spreadsheet window(Source: Primavera)



Fig. 3 Resource usage spreadsheet window(Source: Primavera)

*Activity usage profile and resource usage profile*

These show graphical representation of cumulative values activity usage and resource usage at any stage of the construction project. This is based on classic WBS layout.
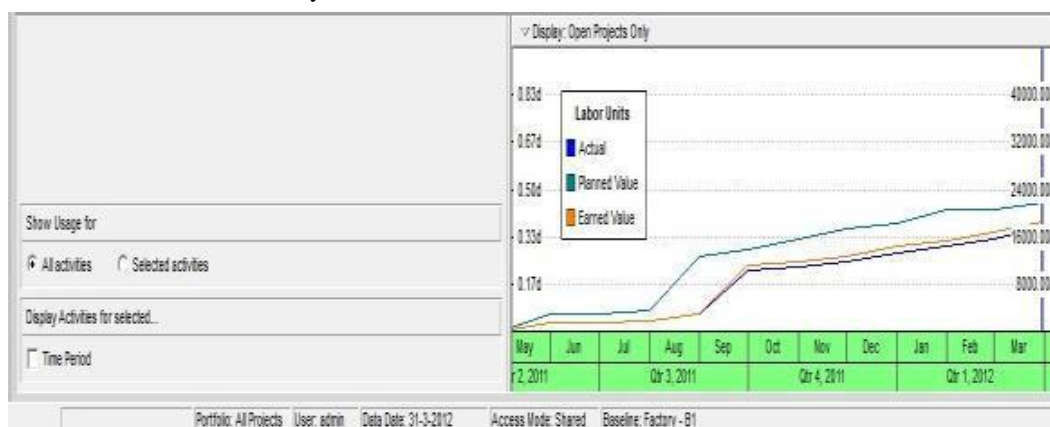


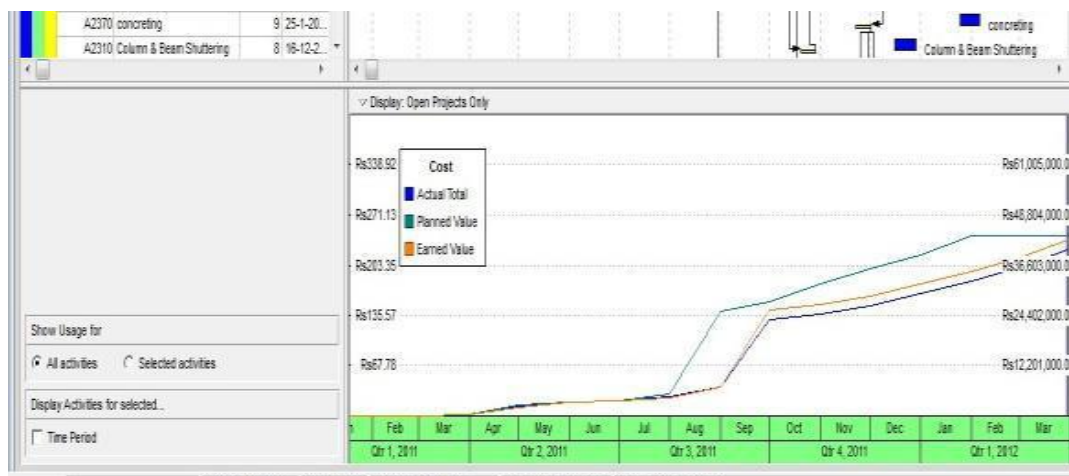Fig.4 Activity usage profile window(Source: Primavera)

Fig. 5 Resource usage profile window(Source: Primavera)

Based on the guidelines from literature review and methodology described, it was possible to monitor the progress of this construction project. Till now we have gone through step by step procedure followed in monitoring the project using Primavera P6. The numerical results obtained after following the previously mentioned methodology is discussed in the following sections.

*Master schedule with key dates*

A schedule is being created using the key dates of the activities. The baseline project start date is on 9th March 2016 and baseline project finish date is on 12th July 2018. The actual start of project was on 15th March 2016. It shows that the actual start of project was as per baseline schedule. After knowing the dates of all key activities, all the constituent activities are arranged sequentially and logically to form a schedule. This schedule shows a slow and ever increasing gap between baseline schedule and actual work progress. The actual progress started shifting from planned schedule, from the second activity mobilisation of resources itself.

*Resource assignments and usage*

The resource assignment window shows all the resource assignments, grouped by resource for the project. An approximate rate analysis was done to arrive at rates of individual resource groups, considering the various component resources. Most of the resources are taken as *material*. Machines are taken as *non–labour* and human involvement is listed as *labour*.

The resource usage profile obtained using Primavera P6 shows that there has been a slight variation in the quantity of each resource used during the project life cycle.

*Tracking of the Project*

Tracking a project is very important in mega projects. While updating the schedule time to time, it was reviewed and the revised allocation of resources and the budgeted cost is estimated. All the associated resources of a project are tracked and kept record.

*Threshold calculation*

The parameter which is checked in the threshold is *start day variance* and *finish day variance* for the started activities. Threshold calculation of the factory project shows that 88 activities show start date variance and 88 activities show finish date variance. All these thresholds which fall outside are reported as issues. Hence 88 issues are identified for finish date variance and 88 issues are identified for start date variance.

*Delay analysis*

The following reasons were observed during this thesis work, which can be held responsible for delays;

- Lack of knowledge about advanced tracking methods and softwares.
- Insufficiently skilled staff.
- Lack of proper fund flow throughout the project progress
- A major portion of labour force was from West Bengal and Orissa. Regional festivals in these areas cause sudden delays in work progress.
- Even though delay due to monsoon rain was already accounted in the baseline schedule, unexpected extension of monsoon caused further delay in project progress.
- Sand unavailability due to legal restrictions.
- Late delivery of resources.

*Comparison of revised project schedule with baseline using claim digger*

The revised project is compared with the baseline of the project. The output of Claim digger shows that 43 WBS have been added to and 45 WBS have been deleted from the project.

*Earned value analysis*

The earned value of the work has been calculated after including the actual cost of each activity inclusive of expenditures. The following details were obtained from calculations using data obtained from Primavera P6

TABLE II. RESULTS OBTAINED FROM PRIMAVERA

| | |
|---|---|
| Project budget (BAC) | Rs. 6,07,81,495 |
| Planned value (PV) | Rs. 4,79,17,756 |
| Earned value (EV) | Rs. 4,26,24,087 |
| Actual cost (AC) | Rs. 4,05,63,038 |
| Schedule variance (SV) = EV-PV | Rs. 52,93,669 |
| SV % = SV/ PV | - 11.05 % |
| Schedule performance index (SPI) = EV/ PV | 0.89 |
| Total duration | 21 months |
| Estimate at Complete {EAC(t)}= (BAC/SPI)/(BAC/months) | 23.6 months |
| Cost variance (CV) = EV- AC | 20,61,048 |
| CV % = CV/ EV | 4.84 % |
| Cost performance index (CPI) = EV/AC | 1.05 |
| Estimate to complete | Rs.1.82 crores |

*S Curve*

It is graphical representation of financial cash flow of a project. It is derived from activity usage profile, and it shows an "S" like shape, flatter at the beginning and end and steeper in the middle. This shows that costs involved in the project is low in the beginning as well as in the end, whereas it increases at a rapid rate when the project is in its middle stage.
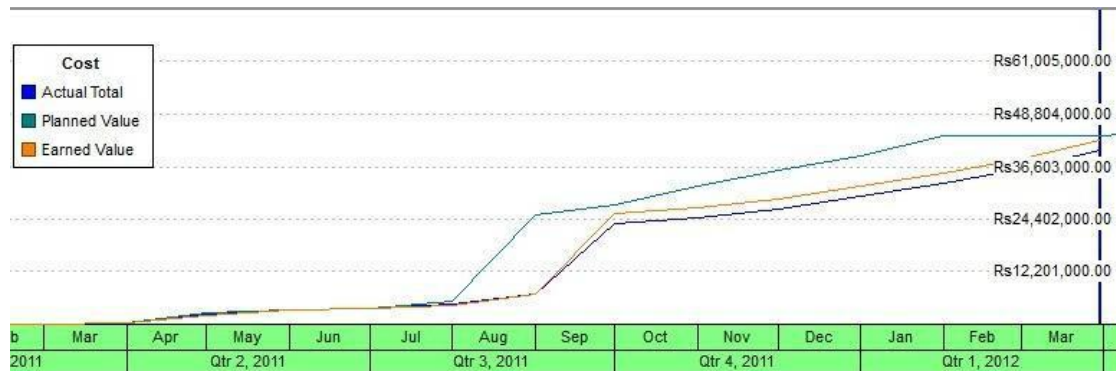
Fig.6 S-curve of this project(Source: Primavera)

**Financial Calculation of Traditional and Proposed System-**

| SR | PARTICULAR OF ITEM | QUANTITY DONE PER DAY BY ONE PERSON (LABOUR) | | |
|---|---|---|---|---|
| | | $M^2$ | $M^3$ | |
| | | | | |
| 1 | Brick work in lime or cement mortar in foundation & plinth | | 1.25 | |
| 2 | Brick work in lime or cement mortar in super structure | | 1 | |
| 3 | Coursed rubble stone masonry including dressing | | 0.8 | |
| 4 | Cement concrete 1:2:4 | | 5 | |
| 5 | R.C.C work | | 3 | |
| 6 | 12mm cement plaster | 8 | | |
| 7 | White washing or color washing | 200 | | |
| 8 | Painting or varnishing doors and windows (1 coat) | 25 | | |
| 9 | Painting large surface 1 coat | 35 | | |
| 10 | Distempering 1 coat | 35 | | |
| 11 | 2.5 cm Thick Cement Concrete Flooring | 7.5 | | |

| 12 | Timber framing Sal of teak wood | | 0.07 | |
| 13 | Door and window shutter panel or glazed | 0.7 | | |
| 14 | Single Allahabad tilling | 6 | | |
| 15 | Double Allahabad tilling | 4 | | |
| 16 | Ashlar stone dressing | | 0.7 | |
| 17 | Flag stone dressing | 1.5 | | |
| 18 | Earthwork in--- | | | |
| | ordinary soil | | 3 | |
| | hard soil | | 2 | |
| | rock | | 1 | |
| 19 | Number of brick laid by mason in brick work up to a height of 10" | | | 600 |
| 20 | Amount of work done by helper per day | | | |
| | 1) mix | | | 3 m3 of mortar |
| | 2) Deliver bricks | | | 4000 no's at distance of 15 m |
| | 3) Deliver mortar | | | 5.5 m3 per day |

## IV.CONCLUSIONS

The fundamental target of this review was to comprehend the part of observing and control in the advance and opportune consummation of a development extend. This goal was accomplished through update of writings and techniques required in checking and control. The contextual analysis turned out to be a rule in understanding the advance of this development work and furthermore to distinguish the particular issues emerging amid the procedure. Consequences of this review demonstrate the disadvantages of the present venture administration framework in this venture and the significance productive arranging, observing and controlling, and additionally the need and adequacy of venture administration programming like Primavera P6 in a development extend.

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