Planning, Scheduling and Time Management of Six Lanes Road Construction Work at V.O.C Port Trust using Primavera P6 Software

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Abstract

Effective time planning is very important in determining a success of any project. Thus, without proper time controlling will cause project delay and consequently budgeted cost overrun. In this project, VOC port trust of Tuticorin is considered. It had only four lanes which were not sufficient to tolerate the traffic. For this purpose an alternate arrangement of a six lanes is constructed. The work carried out was not done by proper planning, scheduling and resource allocation. So, that the resources were wasted and the time was extended. For reducing this wastage in time. It can be done by using the primavera p6 software. In this project, the planning, scheduling, resource allocation, cost and time management were done by using primavera P6 software. This software improves the quality of construction with stipulated cost and time. Finally implementation of sequence can be done by using minimum time, cost and resources.

Keywords: Critical Path, Planning, Primavera P6, Scheduling, Six Lanes Road Work, Time Management

I. INTRODUCTION

Construction projects or industries are time bound and all project activities are directed towards the achievement of project objectives with respect to scope, time and quality. In a complex project where large number of activities are performed at different places and different agencies and sub organizations, with each having its own scheduled targets, a small delay in the critical activity can affect many schedules. Many issues are being faced by construction industry that must be taken care of. They include time and cost overruns due to inadequate project formulation, poor planning for implementation, lack of proper contract planning and time management during execution. Delays can alter the planned level of resources and their mobilization. Time overrun increases overheads, reduce planned revenue from sales and create fund inflow problems. Delays in contracted projects or construction projected can results in penalties and adversely affect the reputation of the company.

A. Planning and Scheduling:

Planning is the process of developing project plan and scheduling is the process of developing a schedule. Usually it is used with a moderator. Project planning and scheduling aims at timely execution of work according to the project planned schedule and can apply corrective measures in case of any time deviations. In a broader sense, time management implies the control of the entire planning system, as time is directly or indirectly related with project activities and project functions.

B. Time and Cost Control:

Time control aims at to complete the project with contract duration. Time control hinges on time performances and the sequences of execution of activities. The basis of measuring activity time progress is the project master schedule of work. Time control monitoring starts with measuring of time status of completed in-progress and nonstarter balance activities. It uses time plan updating techniques to depict progress pictorially.

Project cost control aims at controlling changes to the project budgeted cost in contract document. It provides management with cost and time related information for making decision with a view to complete the project with specified on time, quality and within budgeted cost. This information is extracted from performance data and other sources, is used to minimize waste, update current cost budget estimates forecast cost trends and make decision about the future. Close and periodical monitoring has to be done on the ‘Assigned time’ versus ‘Achieved time’ of various activities which would have an effect on the overall period or total project time.
C. Primavera Software:

Primavera’s software packages include P5, Porsited, and Contract Manager, Cost Manager, and Pert master, Sure Track, Evolve and Inspire. The newest addition to the suite project management solution is Primavera P6, which is an integrated PPM solution that provides a real-time view of portfolio performance. P6 offers what-if scenario modelling and tabular scorecards and capacity analysis.

The software tools Primavera P6 Project Planner is used for planning, scheduling, and project time management. The construction project activities require to minimum completion period of the building structure was identified and was fed as an input to Primavera P6 along with their durations. The critical activities and the project duration which is represented by the summation of critical path durations are obtained from the primavera schedule.

D. Scope of the Project Work:

1) To present an ideal schedule for 6 lanes road work construction process.
2) To prepare an alternative plan for the ever running process.
3) To minimize the time with optimum quality and reduces the other types of resources.

E. Objective of the Study:

The main objective of this study is to implement how effectively primavera software can be used for planning, scheduling, monitoring and time controlling the construction project particularly for the project considered in case study. The objective of the project includes the following,

1) To identify construction sequence for a widening and resurfacing of road work at V.O.C Port Trust Tuticorin.
2) To prepare a detail activities plan and schedule based on construction sequence.
3) To work out the practical duration for each construction activities.
4) To identify scheduling technique used by the organization.
5) To develop scheduling and determine the critical path using primavera project planner’s software.
6) To optimize the time required for construction. The optimization of time directly reduces cost and other resources.

II. METHODOLOGY

The detailed description of the methodology is given below

![Flowchart for project methodology]

A. Steps Involved in Monitoring and Control

1) Creating Schedule

To create an ideal schedule for any project, first step is to collect data available for the project. The following steps can be followed in Primavera P6 software.
2) **Enterprise Project Structure (EPS)**
Create the complete structure of the company with its branches, which is executing the project using primavera P6. This is known as Enterprise project structure (EPS). Each Category/Program is called an independent EPS Node and is Training; Each Node is further divided into sub-nodes that classify projects based on location.

3) **Organizational Breakdown Structure (OBS)**
This structure represents the management responsible for the project in a hierarchy. The OBS usually reflect the management structure from top level personnel down through the various levels constituting the project. The OBS should be addressed with the idea that each task in the WBS must be assigned to a committee or person. The OBS mirror the structure of the WBS.

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

5) **Work Breakdown Structure (WBS)**
WBS elements have defined and organize the project elements. It helps to clearly identify the deliverables, report and summarize project schedule and estimated cost data at different levels of detail. WBS is a hierarchy of any project work that must be accomplished to complete a construction project. Each project has its own project WBS hierarchy structure with top level WBS element being equal to that of each EPS node of the project. Each WBS element contains more detailed WBS levels, activities, or both resources constrains.

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

7) **Relationships Between Activities**
To form a network, scheduling the activities should be connected to each other, which is done by assigning succeeding, preceding activities with significant relationship to the overall project activities.

- Finish to start (FS) relationship
- Start to start (SS) relationship
- Finish to finish (FF) relationship
- Start to finish (SF) relationship

8) **Activity Duration**
When planning the work, the project duration is entered in the original duration field. The actual duration can only be entered for the project activities, which are completed.

9) **Activity Dates**
The following types of project activity dates available in the primavera; actual start, planned start, actual finish, planned finish.

10) **Activity Cost**
The project activity cost is the sum of all the cost incurred to complete the activity.

11) **Creating Baselines**
A simple baseline plan is a complete copy of the original schedule which provides a target against which a project’s performance is tracked.

12) **Earned Value**
Earned value is a technique for measuring estimated and actual project performance according to both project cost and schedule of project activities. The technique compares the budgeted cost of the work to the actual cost.

13) **Project Thresholds**
Project thresholds consist of important parameters assigned to WBS elements; and they are used to monitor projects and generate issued.

### III. PROJECT DATA

#### A. **Major Components of Work:**

1) **Work ‘A’**
1) Building for accommodation of CSIF/Customs & Port Office at each Entry & Exit.  
2) Approach Road Developed with Heavy duty Paver Block.  
3) The Roof will be supported by Piles & Columns.  
4) The Roof Covered with sheet on top and metal ceiling on bottom.

2) **Work ‘B’**
1) The proposed “Approach Road.”  
2) RCC Drains with Base preparation of PCC, RCC Raft slab, RCC Retaining wall & RCC Cover slab.  
3) RCC Electrical Cable ducts with Base preparation of PCC, RCC Raft slab, RCC Retaining wall & RCC Cover slab.
IV. RESULTS

The results revealed that the contractors and subcontractors plays vital role in completion of project as scheduled. Major of the reasons are related with the contractors performance such as lack of manpower, site management, equipment management and lack of supervision during execution. The activities that are used for the completion of the work and the step by step procedure for the work to be done are also scheduled in the correct manner using primavera P6 software. The project completed in contract period within 9 months. The primavera results and Gant chart are given below.

4) Formation of Rubble bund in sea reclamation area.

B. Contract Document:

The following project Data are furnished from the contract agreement, project report and tender documents.

1) Name of the Project:

De-Congestion Phase – I widening and resurfacing of 4lanes to 6lanes road work construction at V.O. Chidambaranar Port trust, Tuticorin.

- Contract period : 9 months
- Construction start date : 21/2/2014
- Construction end date : 21/8/2015
- Contract value : Rs. 14.80 crores
- Nature of contract : item rate contract
- Client : V.O.C PORT TRUST

Fig. 2: Lanes Road Work and Port Entrance at V.O.C Port
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Fig. 3: Project Scheduling Activity Results
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**Fig. 4: Project Scheduling Activity Results**

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Original Duration</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1004</td>
<td>Damming of flexible pavement</td>
<td>3</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1005</td>
<td>Subgrade preparation</td>
<td>3</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1006</td>
<td>Laying 3rd layer of 200mm</td>
<td>5</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1007</td>
<td>Draining the dam</td>
<td>5</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1008</td>
<td>Construction by the boc</td>
<td>4</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1009</td>
<td>Watering (after compaction)</td>
<td>1</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1010</td>
<td>Compaction and curing</td>
<td>1</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1011</td>
<td>Cushioning and filling (after comp)</td>
<td>2</td>
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<td>28-Jun-10</td>
</tr>
<tr>
<td>A1012</td>
<td>Compaction</td>
<td>5</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1013</td>
<td>Laying 1st layer of 220mm</td>
<td>10</td>
<td>28-Jun-10</td>
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</tr>
<tr>
<td>A1014</td>
<td>Laying 2nd layer of 150mm</td>
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<td>28-Jun-10</td>
</tr>
<tr>
<td>A1015</td>
<td>Laying 3rd layer of 100mm</td>
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<td>28-Jun-10</td>
</tr>
<tr>
<td>A1016</td>
<td>Laying 4th layer of 50mm</td>
<td>5</td>
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<td>28-Jun-10</td>
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<tr>
<td>A1017</td>
<td>Laying 5th layer of 20mm</td>
<td>5</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1018</td>
<td>Laying 6th layer of 10mm</td>
<td>5</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
<tr>
<td>A1019</td>
<td>Laying 7th layer of 5mm</td>
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<td>28-Jun-10</td>
</tr>
<tr>
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</tr>
<tr>
<td>A1021</td>
<td>Laying 9th layer of 1mm</td>
<td>5</td>
<td>28-Jun-10</td>
<td>28-Jun-10</td>
</tr>
</tbody>
</table>

**Fig. 5: Project Scheduling Activity Results**

- **Fig. 4**: Project Scheduling Activity Results
- **Fig. 5**: Project Scheduling Activity Results
Fig. 6: Project Scheduling Activity Results

Fig. 7: WBS activity result and Gantt chart
V. CONCLUSION

Finally, time management system is considered to perform a key role in organization, which is responsible to complete the project in a specific time, budget cost within a certain period of time. Poor time and cost performance are major problems faced by today’s construction industry. The main objective of this project is to prepare the proper planning and scheduling for the 6 lanes road work construction at VOC PORT TRUST, Tuticorin. Time management and time control are done by primavera P6 software. The main advantage of project was timely execution and completion of the project using primavera P6 software. The road construction project has completed prior to the contract duration.

REFERENCES


