

STUDY ON EFFECTIVE SCHEDULING AND COST MANAGEMENT OF A PROJECT

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Abstract — Schedule and finance plays very important role in construction projects. Lag in projects may affect the project completion and cost. To avoid such problems proper scheduling is important. It is a great challenge that the activity would be completed within the targeted duration. Scheduling is a simply a calendar with project activities, a network showing the sequence and timing of events required for a construction project. The techniques adopted for this project scheduling are namely Bar chart, Milestone chart and CPM. For the multi-storey buildings the scheduling may complex. To overcome such problems computer based scheduling software may be adopted. In this study, a real apartment building is taken as a case study. For that, scheduling is done with help of Primavera (P3) software. It is a tool for investigate the current practice of CPM scheduling. Proper monitoring of activities is another aspect that directly contributes to improve the productivity. Delays may easily identify so that necessary steps may be taken to complete the activity within duration. The scheduled duration with Primavera may compared with actual duration of the apartment building and knows how completion time may differ with or without scheduling may identified.

Keywords — Finance, CPM, Schedule, Activity, Lag.

I. INTRODUCTION

Large scale improvement and prohibitive land cost in India have resulted in a vast expansion in the building is becoming essential and inevitable (i.e.) multi-storey building. Multi-storey buildings aim to increase the building area without increasing the land area. This also ensures better lighting and greater airflow as well as freedom from street noise. Unnecessary cost and delays may occur because of poor coordination and communication among the specialists. We can focus our attention on the complete process of the project management with the constructed facilities. However, it is through the understanding of the entire process of project management and in improving the productivity and quality of their work. Planning involves the listing of jobs or activities that have to be done to complete the project. The requirements of men, material, equipment, estimate of costs as also the duration of each of the activities are part of planning. Scheduling on the other hand deals with the time order in which these activities are to take place and also the manpower, materials etc., required at every stage of production. Most construction projects are schedule based on some sort of CPM technique. The project management software packages like primavera, MS project are developed to achieve an efficient Scheduling. The schedule is developed based on this idea and the resource capacity and material requirements are input for the project simulation. The importance is on project duration shortage and resource leveling. The CPM networks are generally used for repetitive type of projects, where fairly precise estimates of time can be made for the activities of the project.

II. SCHEDULING

The “schedule” means a choice of things depending on its intended use. The schedule is a management tool used to predict completion time and thereby guarantee timely completion by adjusting resources applied to the work.

A. Steps to develop a schedule

The primary steps to developing a schedule are

- Estimating the duration required for each activity
- Calculating the time required for project completion
- Defining time intervals in which each activity must start and finish
- Identifying the activities that may be critical that affects timely completion of the project [Clough et al. 2000]

The critical path method (CPM) of scheduling follows the deterministic approach of single time estimate with the fair degree of accuracy for each activity in the network. In CPM, the project duration is so fixed that the cost is minimum. CPM calculations critical activities are defined and to establish the early and late start and finish times for each activity.

B. Need for Scheduling

In general, scheduling answers who and when, determining the sequence and timing of construction operations. The following are some of the needs for scheduling,

- Helps to estimate the project completion date
- To act as an effective project control tool
- To avoid LD (liquidated damages)
- To provides the coordinate among the subcontractors and co-worker
- To predict resource demand and improve resource allocation
- To serve as an effective communication tool

C. Objectives of the study

- To effectively monitor the time and financial management of the project.

D. Methodology

The following "Figure 1. Methodology" for time and cost management of the project.

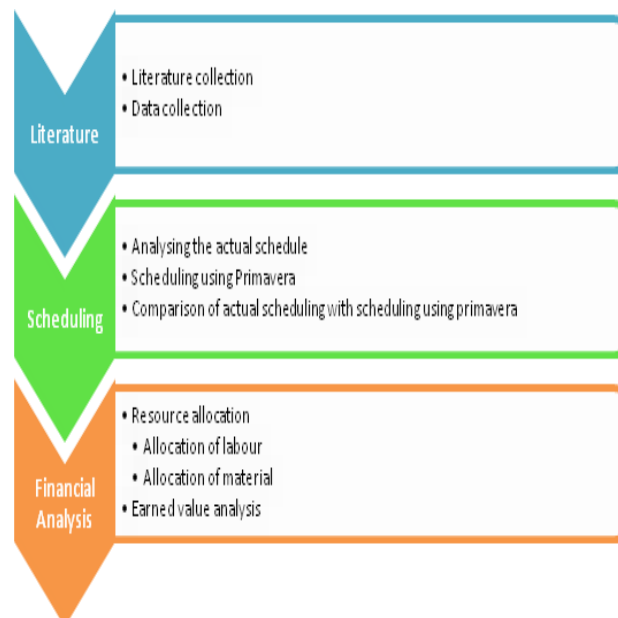


Figure 1. Methodology of the project

III. SCHEDULE FOR THE CASE STUDY

In this work, a Multi storey Building is taken as a case study. For the case study, scheduling is done with help of Primavera and that may compared with the actual schedule. So that we can simply know how an appropriate scheduling helps to finish the project within the duration.

A. Project Details

Table 1. Project Details

Building type	Multi storey building
Purpose	Residential
Total Area	9,600 sq.ft
Built up Area	18,000 sq.ft
No. of floors	4
No. of houses	14
Start Date	7/7/2014
Finish Date	25-10-2015

B. Software Introduction

Primavera is a project, Cost and resource management software that enables organization to make informed decisions and to improve their ability time deliver programs and projects on time and on budget through the confine and use again of best practices. Primavera creates a collaborative environment through its set of integrated components with easy-to-use.

C. WBS of the project

The Work Break down Structure (WBS) is a task-oriented breakdown of activities for dividing a project into manageable sections using a hierarchical structure. The WBS of the apartment is shown in the "Figure 2."

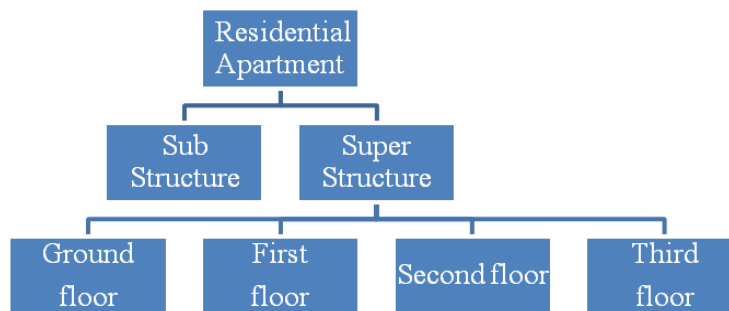


Figure 2. WBS of the Apartment

D. Project Scheduling using Primavera

In the below table Activity ID, Name, Duration and their start and finish time are listed.

" Table 2. Activites with thier start and finish time"

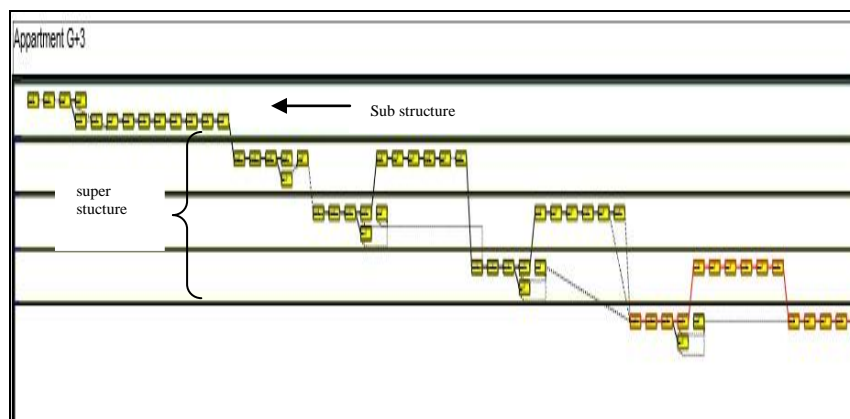
Activity ID	Activity Name	Original Duration	Start Date	Finish Date
<i>Sub structure</i>		48	07-07-2014	30-08-2014
A	Site cleaning and leveling	1	07-07-2014	07-07-2014
B	Earthwork excavation and sizing	3	08-07-2014	10-07-2014
C	Footing PCC concrete	2	11-07-2014	12-07-2014
D	Column position marking	2	14-07-2014	15-07-2014
E	Column fabrication	4	14-07-2014	17-07-2014
F	Column erection in footing	2	16-07-2014	17-07-2014
G	Footing concrete	2	18-07-2014	19-07-2014
H	Column starter marking	2	21-07-2014	22-07-2014
J	PCC leveling course	2	04-08-2014	05-08-2014
K	Brickwork single layer	2	06-08-2014	07-08-2014
L	Grade beam fabrication	10	08-08-2014	19-08-2014

M	Brickwork up to basement level	5	20-08-2014	25-08-2014
N	Brickwork inner plastering	5	26-09-2014	30-09-2014
Super structure		281	01-09-2014	24-07-2015
Ground Floor		122	01-09-2014	20-01-2015
O	Superstructure brickwork up to lintel level	7	01-09-2014	08-09-2014
P	Lintel beam fabrication and concrete	8	09-09-2014	17-09-2014
Q	Brickwork above lintel up to roof level	5	18-09-2014	23-09-2014
R	Centering	10	24-09-2014	04-10-2014
S	Bar bending and fabrication	10	24-09-2014	04-10-2014
T	Ceiling Plastering	7	06-10-2014	14-10-2014
U	Electrical pipe erection	5	15-12-2014	19-12-2014
V	Wall plastering	5	20-12-2014	25-12-2014
W	Flooring work	5	26-12-2014	31-12-2014
X	Electrical item fittings works	5	01-01-2015	06-01-2015
Y	Painting work	5	7-01-2015	12-01-2015
Z	Door and windows fixing work	5	15-01-2015	20-01-2015
First Floor		122	10-11-2014	31-03-2015
O1	Superstructure brickwork up to lintel level	7	10-11-2014	17-11-2014
P1	Lintel beam fabrication and concrete	8	18-11-2014	26-11-2014
Q1	Brickwork above lintel up to roof level	5	27-11-2014	02-12-2014
R1	Centering	10	03-12-2014	13-12-2014
S1	Bar bending and fabrication	10	03-12-2014	13-12-2014
T1	Ceiling Plastering	7	15-12-2014	22-12-2014
U1	Electrical pipe erection	5	25-02-2015	02-03-2015
V1	Wall plastering	5	04-03-2015	08-03-2015
W1	Flooring work	5	09-03-2015	13-03-2015
X1	Electrical item fittings works	5	14-03-2015	19-03-2015
Y1	Painting work	5	20-03-2015	25-03-2015
Z1	Door and windows fixing work	5	26-03-2015	31-03-2015
Second Floor		122	21-01-2015	11-06-2015
O2	Superstructure brickwork up to lintel level	7	21-01-2015	28-01-2015
P2	Lintel beam fabrication and concrete	8	29-01-2015	06-02-2015
Q2	Brickwork above lintel up to roof level	5	07-02-2015	12-02-2015
R2	Centering	10	13-02-2015	24-02-2015
S2	Bar bending and fabrication	10	13-02-2015	24-02-2015
T2	Ceiling Plastering	7	25-02-2015	03-03-2015
U2	Electrical pipe erection	5	08-05-2015	13-05-2015
V2	Wall plastering	5	14-05-2015	19-05-2015
W2	Flooring work	5	20-05-2015	25-05-2015
X2	Electrical item fittings works	5	26-05-2015	30-05-2015
Y2	Painting work	5	01-06-2015	05-06-2015
Z2	Door and windows fixing work	5	06-06-2015	11-06-2015
Third Floor		122	03-04-2015	24-07-2015
O3	Superstructure brickwork up to lintel level	7	03-04-2015	10-04-2015
P3	Lintel beam fabrication and concrete	8	11-04-2015	20-04-2015

Q3	Brickwork above lintel up to roof level	5	21-04-2015	25-04-2015
R3	Centering	10	27-04-2015	07-05-2015
S3	Bar bending and fabrication	10	27-04-2015	07-05-2015
T3	Ceiling Plastering	7	08-05-2015	17-05-2015
U3	Electrical pipe erection	5	12-06-2015	17-06-2015
V3	Wall plastering	5	18-06-2015	23-06-2015
W3	Flooring work	5	24-06-2015	29-06-2015
X3	Electrical item fittings works	5	30-06-2015	04-07-2015
Y3	Painting work	5	06-07-2015	16-07-2015
Z3	Door and windows fixing work	5	17-07-2015	24-07-2015

E .Scheduling network using primavera

The following "Fig. 3," shows the scheduling network for the Apartment building. In this network diagram each activity and their interrelationship are shown. The critical activities are indicated in the red border box so some special care should be done while carry out this activity.



"Figure 3.Scheduling Network for the Apartment"

IV. COMPARISON OF ACTUAL SCHEDULE WITH SCHEDULE USING PRIMAVERA

The Sub Structure starts on 7th July 2014 and completed at 5th September but as per schedule done using primavera they complete on 30th August 2014. The super Structure also start on 5th September 2015 and finish on 25th October 2015 but they completed so earlier in Primavera Schedule (i.e.,) 24th July 2015. There is one month difference in each sub projects and overall 2 month and 29 days (i.e.) three month difference between the actual and the scheduled duration using primavera.

V. CONCLUSIONS

In this project work, Time is managed effectively with help of scheduling using primavera and critical activities are found. By finding the critical activities, special concern should be given so that lag may be avoided and the project may be complete as per the duration. The project can be easily cross checked if it goes as per schedule or not. The results obtained from the comparison are about 3 months difference in duration from the actual and the scheduled duration using primavera. Before the start of a particular activity, the resources (i.e. man, material and machinery) are allocated and their availability is verified so the delays due to in availability of material may be reduced. The allocation of labour is done. The allocation of materials and cost analysis using EVA (Earned Value Analysis) will be done in my future studies for estimating its completion date, final cost and analyzing variances in the schedule & budget as the project proceeds so that cost may be managed effectively.

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