International Journal of Civil
Engineering (IJCE)
ISSN (P): 2278-9987; ISSN (E): 2278-9995
Vol. 6, Issue 4, Jun– Jul 2017; 21-32
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International Academy of Science,
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PLANNING AND SCHEDULING OF A APPARTMENT BUILDING BY COMPARISON OF MS PROJECT AND PRIMAVERA

S. RAGAVI[1] & R. N. UMA[2]

[1]Research Scholar, Department of Civil Engineering, Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India

[2]Head, Department of Civil Engineering, Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India

ABSTRACT

Planning and scheduling are important task in construction projects. In this project comparison of two commonly used programs, i.e., Primavera software and Microsoft (MS) Project, was undertaken. For planning and scheduling work huge amount of paperwork is required, which makes the management very burdensome These problems can be solved using a project management software which helps to give a planned approach to planning. This analysis was done because of their comparable technical features and to evaluate on the basis of the function to manage the project.Each software had many benefits, however Primavera scored better than MS Project on the overall rating. MS Project also scored best in terms of easy to use. In this study, a case of an apartment building has been taken to display how proper planning and scheduling is done using primavera and MS project.

KEYWORDS: CPM, EPS, MS PROJECT, Basics of CPM Scheduling, Gantt Chart, PRIMAVERA P6

INTRODUCTION

Project management is a knowledge area which entails estimation techniques, sequencing of task items, resource assignment, training and cost management. The project is expected to get completed within the specified and agreed upon time frame and budget. There are numerous softwares available in the market for project management. MS project and Primavera are widely used for planning and scheduling. Planning of huge projects requires huge amount of paperwork, which can be reduced with the help of primavera and MS project software. Each software has got its own merits and demerits. These tools help us for the optimal and resourceful organization of activities which helps to give the dream to complete the project in planning duration and within the budget.

OBJECTIVES

The objectives of this project are:

- To find the construction sequence for an apartment building construction.
- To calculate the practical durations required to carry out the activities.
- To identify the scheduling technique.
- To develop scheduling using Primavera project software and MS Project

ABOUT THE SOFTWARES

Ms Project Software

MS Project is a project management software product, developed and sold by Microsoft. It is designed to help project managers in creating a project plan, assigning resources to task items, tracking their progress, managing the budget, and analyzing workloads. Microsoft Project is part of the Microsoft Office family, but has never been included in any of the Office suites. It is available currently in two editions viz., Standard and Professional.

Primavera Software

Before implementing Primavera and MS Project to schedule projects, team members and other project participants should understand the processes involved in project management and the associated recommendations that help smooth implementation and supports corporate mission.

Project management follows the same methodology and purpose to achieve each project's goals. It is an important and vital tool to help companies stay on target and accomplish its goals.

To put it in a nutshell, project management is the process of achieving predefined target within the constraints of time, budget, and resourcing limitations. It allows to get the most available resources. Resources include

- People
- Information
- Money Materials
- Equipment
- Roles

Project management factors in all of these variables across multiple projects, enabling project managers and company executives to see an accurate picture of how each project's resource use affects other projects.

The process of project management is guided by three key principles:

- Planning
- Controlling
- Managing

Primavera software is available in enterprise and stand alone versions which make it versatile for use by single or multiple users. Primavera uses Dynamic Data Exchange and Object Linking and allow users to insert data, graphs, tables, and figures from other applications. It will also allow users to create project templates, which can be stored and used for future projects.

METHODOLOGY

The methodology of the study started with the collection of data from the site where the project is completed. Before executing in the software the list of activities, the duration for each activity, the resources required and organization workflow was entered in the software.

By using MS Project and Primavera software scheduling of the activities will be done. From the results obtained software's efficiency will be compared.

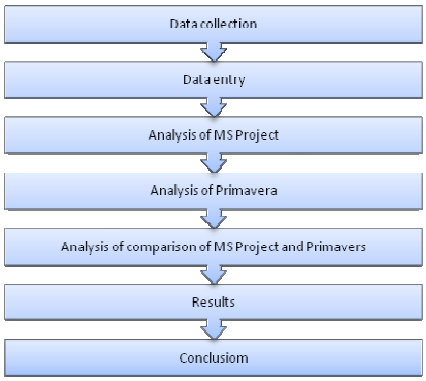

Figure 1: Research Methodoloy Chart

ANALYSIS OF MS PROJECT SOFTWARE

Defining Project Calendar

A working calendar is defined in which the working days in a week and the working hours are specified. In this study, the name given to the project calendar and the timings are 9:00 AM to 6:00 PM with a lunch break of one hour between 1:00 PM to 2:00 PM. The calendar is 8 hours working per day, 7 working days in a week (i.e. 56 hours in a week), and 30 working days in a month.

Selection of Task Mode

The Task mode gives the option whether a task is scheduled manually or automatically.

Manual Schedule Mode

The manually scheduled task placed anywhere in the schedule. This new feature gives greater flexibility and control over planning and managing schedule.

Auto Schedule Mode

Automatic scheduling provides a highly planned, systematic means of managing the project schedule. Project calculates the earliest and latest dates for tasks for the optimal schedule.

Entering Task

The task is individually entered in auto schedule mode in the Microsoft Project software. The tasks are normally entered in the order that they occur. The task duration is entered in terms of days only. Information about milestones in the project is also entered.

Creating Work Breakdown Structure

After the complete planning of a project, the next step is to create a work breakdown structure (WBS) to define and organize the project elements at different levels. At the first level of work breakdown structure, a project with name Mahadev Parisar is created. Inside this, Block B is created.

Then inside this Block B, project breaks down structure like excavation and earthwork, substructure, superstructure, brick work, including door frame, lintel work, internal plaster, waterproofing work, external plaster, finishing work and service work are created.

Scheduling the Project

After all the tasks are entered along with their respective duration, the information about task dependencies is specified by specifying predecessor of each of the tasks. The information is entered using a predecessor column of the software. The four types of task relationships or inter dependency are FS, SS, FF and SF

Assigning Manpower

A man power can be defined as the number of people that is required to complete the task and is assigned to an activity. It is suggested to create and allocate the minimum number of resources to activities. When the project schedule is completed with the activities, duration, start and finish dates for each activity and for the whole project, next step is to define and assign resources to the activities then to find the estimated cost of the activities for the whole project

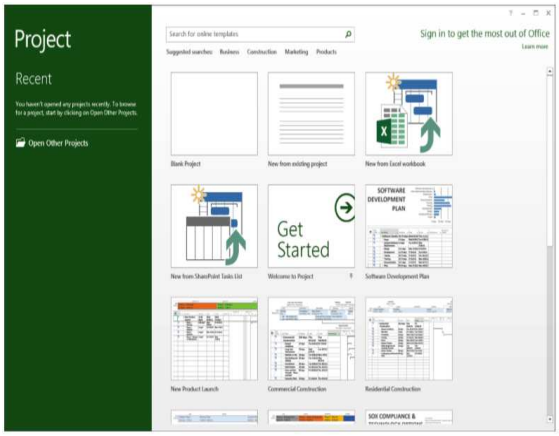

Figure 2: Start Project

	Task Name	Duration	Start	Finish
1	RESIDENTIAL APARTMENT	602.5 days	Wed 15-03-17	Mon 11-03-19
2	PRELIMINARY	33 days	Wed 15-03-17	Sat 22-04-17
3	DRAWING PREPARATION	30 days	Wed 15-03-17	Wed 19-04-17
4	SITE PREPARATION	15 days	Sat 01-04-17	Wed 19-04-17
5	MATERIAL DUMPING	3 days	Thu 20-04-17	Sat 22-04-17
6	FOUNDATION	94.5 days	Mon 24-04-17	Sat 12-08-17
7	EARTHWORK EXCAVATION	10 days	Mon 24-04-17	Fri 05-05-17
8	SAND FILLING	10 days	Wed 26-04-17	Tue 09-05-17
9	COLUMN & FOOTING RFT ERECTION	15 days	Sat 29-04-17	Thu 18-05-17
10	PCC WORKS	15 days	Thu 27-04-17	Tue 16-05-17
11	FOOTING CONCRETE WORKS	20 days	Tue 02-05-17	Thu 25-05-17
12	PEDESTAL UPTO GROUND	20 days	Fri 05-05-17	Mon 29-05-17
13	RAISING OF COLUMN UPTO BASEMENT	5 days	Wed 31-05-17	Tue 06-06-17
14	PLINTH BEAM WORK	20 days	Sat 17-06-17	Tue 11-07-17

Figure 3: Assigning Activity

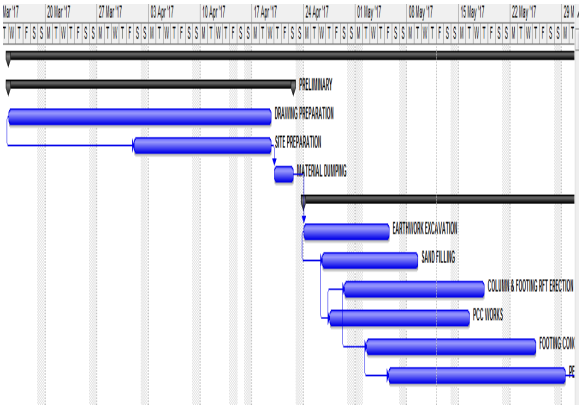

Figure 4: Gantt Chart

	Task Name	Duration	Start	Finish
1	RESIDENTIAL APARTMENT	602.5 days	Wed 15-03-17	Mon 11-03-19
2	PRELIMINARY	33 days	Wed 15-03-17	Sat 22-04-17
3	DRAWING PREPARATION	30 days	Wed 15-03-17	Wed 19-04-17
4	SITE PREPARATION	15 days	Sat 01-04-17	Wed 19-04-17
5	MATERIAL DUMPING	3 days	Thu 20-04-17	Sat 22-04-17
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12	PEDESTAL UPTO GROUND	20 days	Fri 05-05-17	Mon 29-05-17
13	RAISING OF COLUMN UPTO BASEMENT	5 days	Wed 31-05-17	Tue 06-06-17
14	PLINTH BEAM WORK	20 days	Sat 17-06-17	Tue 11-07-17
15	BRICKWORK UPTO BASEMENT	5 days	Tue 11-07-17	Mon 17-07-17

Figure 5: Assigning Resources

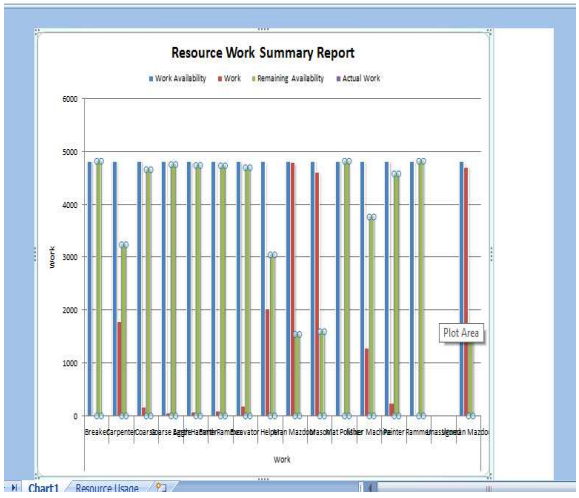


Figure 6: Resources Work Summary Report

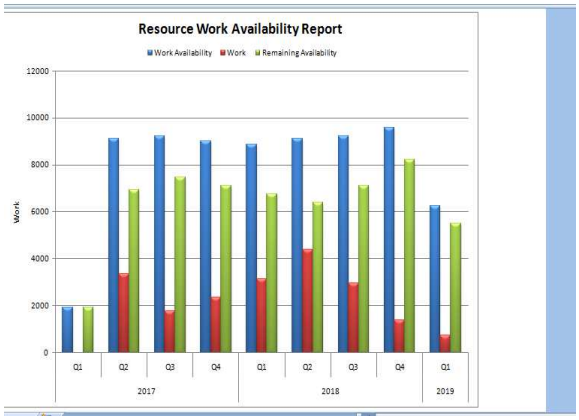


Figure 7: Resources Work Availability Report

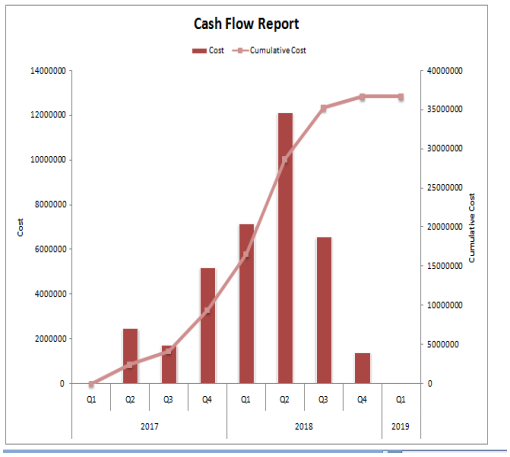


Figure 8: Cash Flow Report for a Project

ANALYSIS OF PRIMAVERA SOFTWARE

Primavera has a number of features which allow it to track costs, schedules, and resources. The software can be used to compare the completed work to the original schedule, and can identify when resources are stretched beyond availability. Primavera is capable of applying different work calendars to activities within the same project. This helps account for activities which may have different work schedules and days off. Primavera supports the use of three types of calendars: global, project, and resource. The global calendar is applied to all projects. The project calendar is applied to the specific 37 project and the resource calendar applies only for the resource. The calendar feature is especially useful for converting working days into calendar days.

Primavera features the ability to manage earned value through user input on the percent complete for specific projects.

Figure 9: Start Project

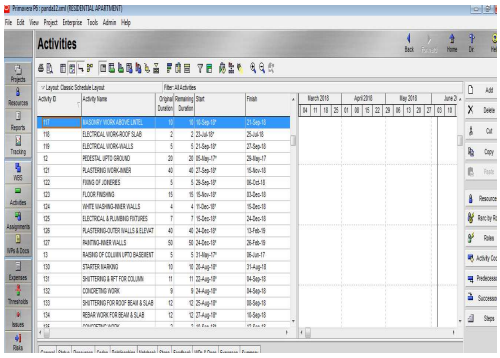


Figure 10: Assigning Activity for a Project

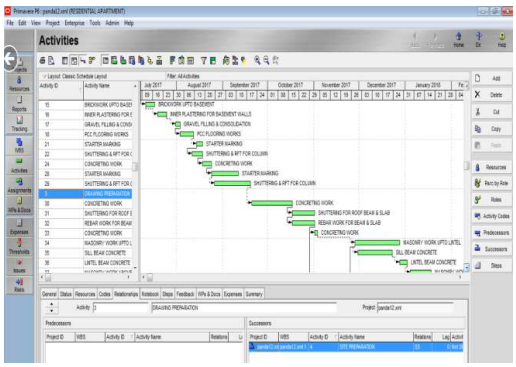


Figure 11: Gantt Chart with Activity Table

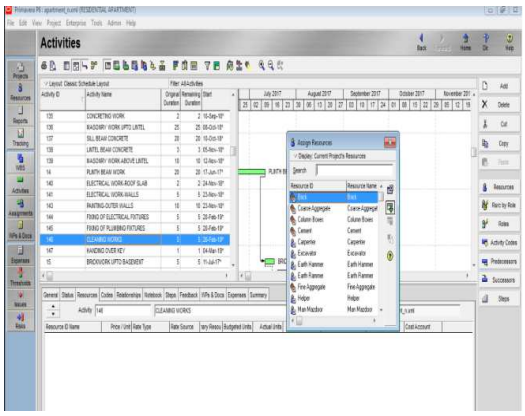
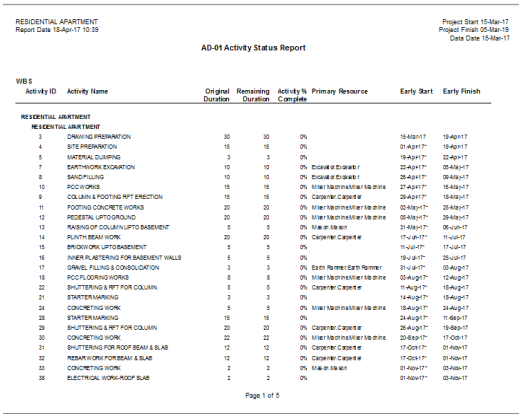


Figure 12: Adding Resources for Each Activity



RESIDENTIAL APARTMENT
Report Date 18-Apr-17 10:39

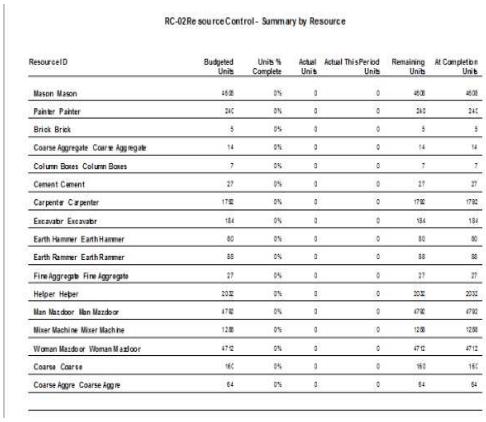
Project Start 15-Mar-17
Project Finish 05-Mar-19
Data Date 15-Mar-17

AD-01 Activity Status Report

WBS Activity ID	Activity Name	Original Duration	Remaining Duration	Activity % Complete	Primary Resource	Early Start	Early Finish
RESIDENTIAL AIRTMENT							
RESIDENTIAL AIRTMENT							
3	DRAWING PREPARATION	30	30	0%		15-Mar-17	19-Apr-17
4	SITE PREPARATION	15	15	0%		01-Apr-17*	19-Apr-17
5	MATERIAL DUMPING	3	3	0%		19-Apr-17*	22-Apr-17
7	EARTHWORK EXCAVATION	10	10	0%	Excavator Excavator	22-Apr-17*	05-May-17
8	SAND FILLING	10	10	0%	Excavator Excavator	25-Apr-17*	09-May-17
10	PCC WORKS	15	15	0%	Mixer Machine Mixer Machine	27-Apr-17*	16-May-17
9	COLUMN & FOOTING RFT ERECTION	15	15	0%	Carpenter Carpenter	29-Apr-17*	18-May-17
11	FOOTING CONCRETE WORKS	20	20	0%	Mixer Machine Mixer Machine	02-May-17*	25-May-17
12	PEDESTAL UPTO GROUND	20	20	0%	Mixer Machine Mixer Machine	05-May-17*	29-May-17
13	RAISING OF COLUMN UPTO BASEMENT	5	5	0%	Mason Mason	31-May-17*	06-Jun-17
14	PLINTH BEAM WORK	20	20	0%	Carpenter Carpenter	17-Jun-17*	11-Jul-17
15	BRICK WORK UPTO BASEMENT	5	5	0%		11-Jul-17*	17-Jul-17
16	INNER PLASTERING FOR BASEMENT WALLS	5	5	0%		19-Jul-17*	25-Jul-17
17	GRAVEL FILLING & CONSOLIDATION	3	3	0%	Earth Rammer Earth Rammer	31-Jul-17*	03-Aug-17
18	PCC FLOORING WORKS	8	8	0%	Mixer Machine Mixer Machine	03-Aug-17*	12-Aug-17
22	SHUTTERING & RFT FOR COLUMN	5	5	0%	Carpenter Carpenter	11-Aug-17*	18-Aug-17
21	STARTER MARKING	3	3	0%		14-Aug-17*	16-Aug-17
24	CONCRETING WORK	5	5	0%	Mixer Machine Mixer Machine	18-Aug-17*	24-Aug-17
28	STARTER MARKING	15	15	0%		24-Aug-17*	11-Sep-17
29	SHUTTERING & RFT FOR COLUMN	20	20	0%	Carpenter Carpenter	26-Aug-17*	19-Sep-17
30	CONCRETING WORK	22	22	0%	Mixer Machine Mixer Machine	20-Sep-17*	17-Oct-17
31	SHUTTERING FOR ROOF BEAM & SLAB	12	12	0%	Carpenter Carpenter	17-Oct-17*	01-Nov-17
32	REBAR WORK FOR BEAM & SLAB	12	12	0%	Carpenter Carpenter	17-Oct-17*	01-Nov-17
33	CONCRETING WORK	2	2	0%	Mason Mason	01-Nov-17*	03-Nov-17
36	ELECTRICAL WORK-ROOF SLAB	2	2	0%		01-Nov-17*	03-Nov-17

Page 1 of 5

Figure 13: Activity Status Report



RC-02 Resource Control - Summary by Resource

Resource ID	Budgeted Units	Units % Complete	Actual Units	Actual This Period Units	Remaining Units	At Complete Units
Mason Mason	4608	0%	0	0	4608	4608
Painter Painter	240	0%	0	0	240	240
Brick Brick	5	0%	0	0	5	5
Coarse Aggregate Coarse Aggregate	14	0%	0	0	14	14
Column Boxes Column Boxes	7	0%	0	0	7	7
Cement Cement	27	0%	0	0	27	27
Carpenter Carpenter	1792	0%	0	0	1792	1792
Excavator Excavator	184	0%	0	0	184	184
Earth Hammer Earth Hammer	80	0%	0	0	80	80
Earth Rammer Earth Rammer	88	0%	0	0	88	88
Fine Aggregate Fine Aggregate	27	0%	0	0	27	27
Helper Helper	2032	0%	0	0	2032	2032
Man Mazdoor Man Mazdoor	4792	0%	0	0	4792	4792
Mixer Machine Mixer Machine	1288	0%	0	0	1288	1288
Woman Mazdoor Woman Mazdoor	4712	0%	0	0	4712	4712
Coarse Coarse	160	0%	0	0	160	160
Coarse Aggre Coarse Aggre	64	0%	0	0	64	64

Figure 14: Resources Summary Report

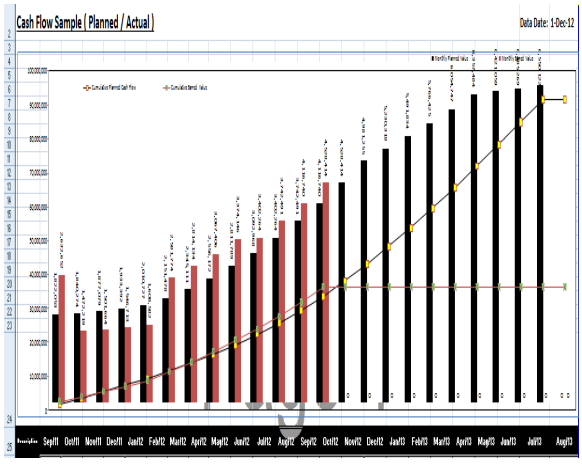


Figure 15: Cash Flow Report

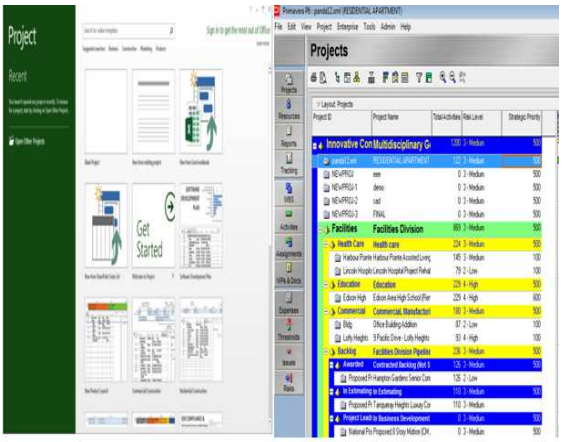
ANALYSIS OF COMPARISON OF MS PROJECT AND PRIMAVERA

MS PROJECT and PRIMAVERA both are said to reputed software that mostly in project planning. Their work is to make reporting, tracking and updating every step of progress. Both of the software works world wide and they have renowned benefits. Primavera enables the organisation to manage time , tasks, costs , resources, contracts change and risks to consistently execute profitable projects.

In MS Project only 11 Baselines can be created for a Project. In Primavera unlimited baselines can be created and also can be assigned at any time to a schedule. MS Project does not allow multiple user to work a single project at the same time, But in Primavera we can specify what features of primavera a particular user is permitted to use multi users.

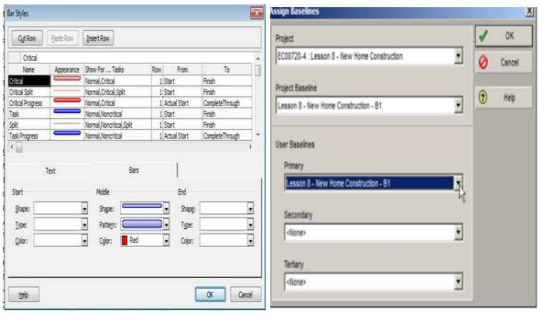
The difference comes in the working format like in MS Project, user has to use complex formulas for setting their functions and have to add additional values to use it properly; whereas in Primavera user have a blank custom field and don't have any kind of formulae there, so the user has to enter values manually and have to enter in each row and column. Primavera includes so many useful columns, approximately it comes with more than 200 columns installed and each column will give you unique information. Each column has different names like EVM, cost, risk and Budgeting. On the contrary, MS project only has 40 columns.

In Primavera, multiple types of relationship can be formed between the two activities of the same project, for e.g. if two different activities running at the same time, we can have SS and also FF in these two activities simultaneously. On the contrary, in MS Project one relationship is allowed in between of two different activities. In Primavera, we can create and view multiple projects. These can also be done in MS Project. As this Software is not more efficient for creating multiple project so people are switching their daily working towards Primavera, because it is very efficient in WBS comparison, any kind of calculations and investigation of any issue. Most of the workers still like to work with MS project



MS Project **Primavera**

Figure 16: Multiple User Access



MS Project **Primavera**

Figure 17: Baseline for a Bar Chart

In MS Project only 11 Baselines can be created for a Project. In Primavera unlimited baselines can be created and also can be assigned at any time to a schedule.

EX-01 Activity Expenses

Project Activity Name Expense Item		Expense Category	Cost Account	Vendor	Budgeted Cost	Actual Cost	Remaining Cost
apartment_n.xml	RESIDENTIAL APARTMENT						
7	EARTHWORK EXCAVATION				₹s1,640,790.48	Rs0.00	Rs1,640,790.48
EARTHWORK EXCAVATION - (cost)					₹s1,640,790.48	Rs0.00	Rs1,640,790.48
8	SAND FILLING				₹s1,622,163.62	Rs0.00	Rs1,622,163.62
SAND FILLING - (cost)					₹s1,622,163.62	Rs0.00	Rs1,622,163.62
9	COLUMN & FOOTING RFT ERECTION				₹s4,473,700.00	Rs0.00	Rs4,473,700.00
COLUMN & FOOTING RFT ERECTION - (cost)					₹s4,473,700.00	Rs0.00	Rs4,473,700.00
10	PCC WORKS				s46,521,598.60	Rs0.00	ls46,521,598.60
PCC WORKS - (cost)					s46,521,598.60	Rs0.00	ls46,521,598.60
11	FOOTING CONCRETE WORKS				s15,382,410.75	Rs0.00	ls15,382,410.75
FOOTING CONCRETE WORKS - (cost)					s15,382,410.75	Rs0.00	ls15,382,410.75
12	PEDESTAL UPTO GROUND				s17,813,460.00	Rs0.00	ls17,813,460.00
PEDESTAL UPTO GROUND - (cost)					s17,813,460.00	Rs0.00	ls17,813,460.00
13	RAISING OF COLUMN UPTO BASEMENT				₹s2,162,627.25	Rs0.00	Rs2,162,627.25
RAISING OF COLUMN UPTO BASEMENT - (cost)					₹s2,162,627.25	Rs0.00	Rs2,162,627.25
14	PLINTH BEAM WORK				s17,250,587.20	Rs0.00	ls17,250,587.20
PLINTH BEAM WORK - (cost)					s17,250,587.20	Rs0.00	ls17,250,587.20

Figure 18: Activity Expenses Report

In addition to resource costs, primavera allows to plan, remaining and activity expenses to enter at the activity level. Microsoft project does not have this capability

CONCLUSIONS

The apartment building schedule was made by proper planning and scheduling details as per the project by comparing two Project management Softwares like Primavera and MS Project. On comparison Primavera is superior to MS Project on various aspects. From those results Primavera is better than MS Project by some of the operational characteristics, functionality and technical features. Primavera also provides better security tools for accessing project files and Baseline plans.

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