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Primavera Based - Approach To Project Management And Financial Integration In Residential Building

Case study on the residential building

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Abstract: This research discusses the application of Primavera software in financial integration and project management in the construction of residential buildings. The study puts more emphasis on how the sophisticated scheduling, resource allocation, and financial monitoring capabilities of Primavera may enhance project efficiency and cost control. The case study demonstrates how improved teamwork, real-time tracking of progress, and efficient budgeting procedures may reduce delays and cost overruns. This approach emphasizes the importance of including it integrates technology into construction management and gives guidelines for improving project results. Potential that Primavera holds to be a comprehensive solution in accurately and efficiently managing complex residence building projects is reflected upon.

Index Terms – Primavera, Project management, Resource allocation, financial integration.

I. INTRODUCTION

The use of project management tools like Primavera P6 in financial integration for a residential building of 2065 SQF area. The project which has been completed in 84 days was analyzed for the current study. Allocation of the resources which would increase the efficiency and reduction in the construction time of the project. Management tools help in preparation of strategies and scheduling of the project with proper financial aspect. The delay in the project works can be optimized and more projects can be scheduled by the organization for a year.

Estimation of cost is a key factor in construction industry these days because of schedule delay and increase in construction cost at the completion of the project. The success and quality of the project is mainly depending on the project accurate estimation and schedule. Estimation and scheduling help to plan and organize the construction process accurately throughout the time. The estimate is the best source of information about deciding on a price for a project. Cost estimation can be done manually or by using software and manual cost estimation method is depends upon the expertise and also it includes an expert who is familiar with this type of projects.[1]

The cost estimation is an important task in the management of construction projects. The success and quality of the project depends on the accurate estimation of the construction cost. The cost estimation models which are in the early stage, improved cost estimation models which are available to managers will facilitate more effective control of time and cost of the project. There are many problems in construction industry which are caused by improper scheduling caused by man-made. So, all barriers can be controlled of planning stage using scheduling through primavera.[1]

II. LITERATURE REVIEW

Planning and Scheduling Construction Project Using Primavera Software: A Case Study by Nidhi Raghuvanshi et.al [2]. Planning and Scheduling are very essential in the large infrastructure projects like road and bridge construction. These projects have numerous stakeholders and large amount of money, resources are invested. Improper planning and scheduling leads to loss of resources, increase in project cost and unpleasant delays. But with computer and software evolution, it is now possible to plan these projects using software like Primavera P6 and Microsoft office project.

A Study on Optimization of Resources for Multiple Projects by using Primavera by B.S. K. Reddy et.al [3]. Resources play vital role in construction projects. The performance of construction industry depends chiefly on how best the resources are managed. Optimization play pivotal role in resource management, but task is highly haphazard and chaotic under the influence of complexities and vastness. Management always looks for optimum utility of resources available with them. Hence, the project management has got important place especially in resource allocation and smooth functioning with allocated budget.

Financial and Work Management Analysis for Residential Construction: A Case Study by Sanjeet Kumar et.al [1] The study discusses the pros and cons of the analysis of the above results. This study relieved that the primavera helps in optimization the construction project in scheduling and improves the productivity. The results will project the earned value graph which show the cost performance index and scheduled performance index of resources.

III. METHODOLOGY

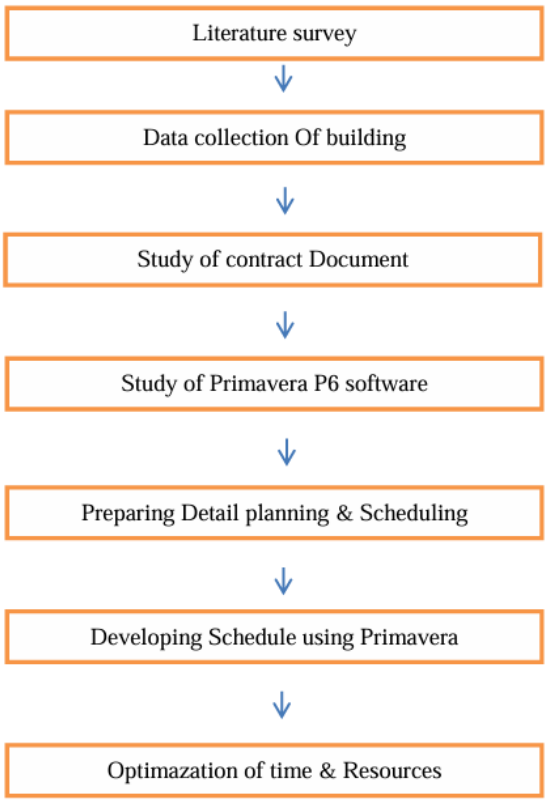

Fig no 1 Methodology flowchart

Steps involved in Primavera project planning

1. Creating EPS: 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. 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).

2. Creating new project: The project constitutes a plan for creating a product or service contains a set of different activities and associated information. The project is governed under respective divisions in EPS. That can be given planned start and finish dates. Global, resource or project calendar is assigned by the project.

3. Work breakdown structure 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.

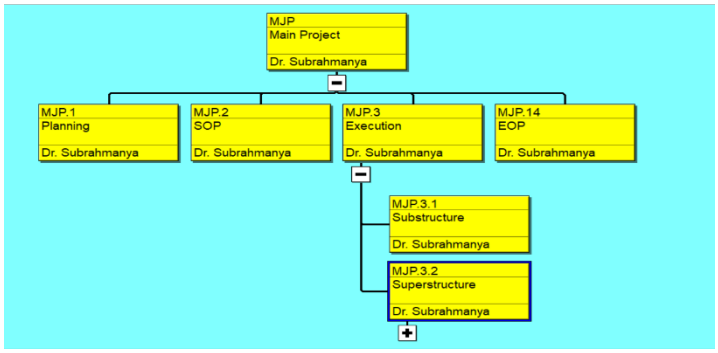

Fig no 2 Work break down structure

4. Defining activity: The smallest subdivision of a project activities are the fundamental and key work elements of a project and form the top to lowest level of a WBS. The characteristics Activity like ID, activity name, start and finish dates, activity calendar, activity codes, activity type, constraints, expenses, predecessor and successor relationships, resources, roles etc.

5. Relationship between activity: By assigning succeeding, preceding activities with significant relationship to the overall project activities, form a network, scheduling the activities should be connected to each other. Finish to start (FS) relationship , Start to start (SS) relationship, Finish to finish (FF) relationship , Start to finish (SF) relationship [4]

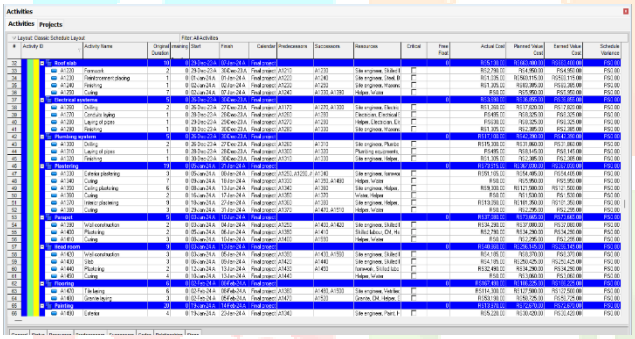

Fig no 3 Activity table

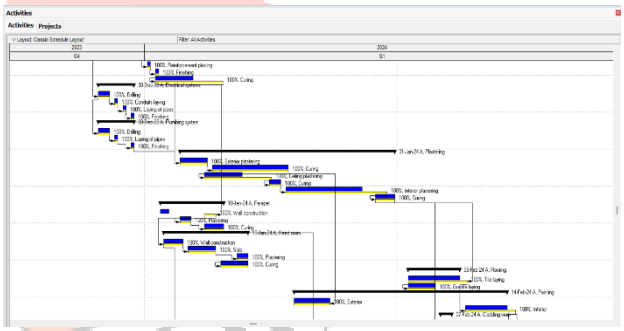

Fig no 4 Relationship and Gantt chart

IV. EARNED VALUE ANALYSIS

1. Planned Value (PV): The authorized budget assigned to scheduled work at a given point in time.
   PV=Total Planned Cost × Percentage of Work Planned to be Completed
2. Earned Value (EV): The value of work actually performed, measured in terms of the budget allocated for that work.
   EV=Total Planned Cost × Percentage of Work Completed
3. Actual Cost (AC): The actual cost incurred for the work completed up to a specific point.
4. Schedule Variance (SV): Indicates if the project is ahead or behind schedule.
   Positive: Ahead of schedule. Negative: Behind schedule.
5. Cost Variance (CV): Shows whether the project is over or under budget.
   Positive: Under budget. Negative: Over budget.
6. Schedule Performance Index (SPI): Measures schedule efficiency
   Greater than 1: Ahead of schedule. Less than 1: Behind schedule.
7. Cost Performance Index (CPI): Measures cost efficiency.
   Greater than 1: Cost-efficient. Less than 1: Not cost-efficient.

Actual Cost	Planned Value Cost	Earned Value Cost	Schedule Variance	Cost Variance	Schedule Performance Index	Cost Performance Index
RS7,331,135.00	RS6,969,855.00	RS6,969,855.00	RS0.00	(RS361,280.00)	1.00	0.95
RS0.00	RS5,700.00	RS5,700.00	RS0.00	RS5,700.00	1.00	0.00
RS0.00	RS0.00	RS0.00	RS0.00	RS0.00	0.00	0.00
RS0.00	RS3,000.00	RS3,000.00	RS0.00	RS3,000.00	1.00	0.00
RS0.00	RS2,700.00	RS2,700.00	RS0.00	RS2,700.00	1.00	0.00
RS0.00	RS2,700.00	RS2,700.00	RS0.00	RS2,700.00	1.00	0.00
RS0.00	RS1,350.00	RS1,350.00	RS0.00	RS1,350.00	1.00	0.00
RS0.00	RS1,350.00	RS1,350.00	RS0.00	RS1,350.00	1.00	0.00
RS7,331,135.00	RS6,961,455.00	RS6,961,455.00	RS0.00	(RS369,680.00)	1.00	0.95
RS0.00	RS6,480.00	RS6,480.00	RS0.00	RS6,480.00	1.00	0.00
RS810.00	RS1,890.00	RS1,890.00	RS0.00	RS1,080.00	1.00	2.33
RS6,724,005.00	RS219,765.00	RS219,765.00	RS0.00	RS6,504,240.00)	1.00	0.03
RS6,600,000.00	RS6,480.00	RS6,480.00	RS0.00	RS6,593,520.00)	1.00	0.00
RS1,305.00	RS83,385.00	RS83,385.00	RS0.00	RS82,080.00	1.00	63.90
RS122,700.00	RS129,900.00	RS129,900.00	RS0.00	RS7,200.00	1.00	1.06
RS606,320.00	RS6,733,320.00	RS6,733,320.00	RS0.00	RS6,127,000.00	1.00	11.11
RS5,220.00	RS72,540.00	RS72,540.00	RS0.00	RS67,320.00	1.00	13.90
RS990.00	RS2,610.00	RS2,610.00	RS0.00	RS1,620.00	1.00	2.64
RS1,395.00	RS83,475.00	RS83,475.00	RS0.00	RS82,080.00	1.00	59.84
RS116,265.00	RS508,295.00	RS508,295.00	RS0.00	RS392,030.00	1.00	4.37
RS12,600.00	RS143,500.00	RS143,500.00	RS0.00	RS130,900.00	1.00	11.39
RS0.00	RS2,550.00	RS2,550.00	RS0.00	RS2,550.00	1.00	0.00
RS3,915.00	RS250,155.00	RS250,155.00	RS0.00	RS246,240.00	1.00	63.90
RS0.00	RS2,295.00	RS2,295.00	RS0.00	RS2,295.00	1.00	0.00
RS99,750.00	RS107,500.00	RS107,500.00	RS0.00	RS7,750.00	1.00	1.08
RS0.00	RS2,295.00	RS2,295.00	RS0.00	RS2,295.00	1.00	0.00
RS4,455.00	RS661,645.00	RS661,645.00	RS0.00	RS657,190.00	1.00	148.52
RS1,305.00	RS2,385.00	RS2,385.00	RS0.00	RS1,080.00	1.00	1.83
RS1,845.00	RS569,925.00	RS569,925.00	RS0.00	RS568,080.00	1.00	308.90
RS1,305.00	RS83,385.00	RS83,385.00	RS0.00	RS82,080.00	1.00	63.90
RS0.00	RS5,950.00	RS5,950.00	RS0.00	RS5,950.00	1.00	0.00
RS5,130.00	RS663,400.00	RS663,400.00	RS0.00	RS658,270.00	1.00	129.32
RS2,790.00	RS4,950.00	RS4,950.00	RS0.00	RS2,160.00	1.00	1.77

Fig no 5 Earned value analysis

V. WORK FORCE ALLOCATED FOR THE PROJECT

Sl. no	Description	Quantity	Units	Manpower/day *	No of days*
1	Excavation	2951	CFT	8	7
2	PCC at foundation	253	CFT	7	1
3	Random rubble masonry	2533	CFT	8	8
4	Earth filling	1576	CFT	9	9
5	RCC lintel	2061	CFT	8	5
6	Total plastering	6897	SFT	9	5
7	Slab	596	CFT	7	5
8	Painting	934	SFT	8	4
9	Flooring	1047	SFT	6	4
10	Electrical fixtures	-	-	4	2
11	Plumbing fixtures	-	-	4	3
12	Doors	162	SFT	4	2
13	Windows	184	SFT	5	4

*Details collected from local practicing consulting engineers.

Fig no 6 Work output of labor

VI. BUILDING PLAN

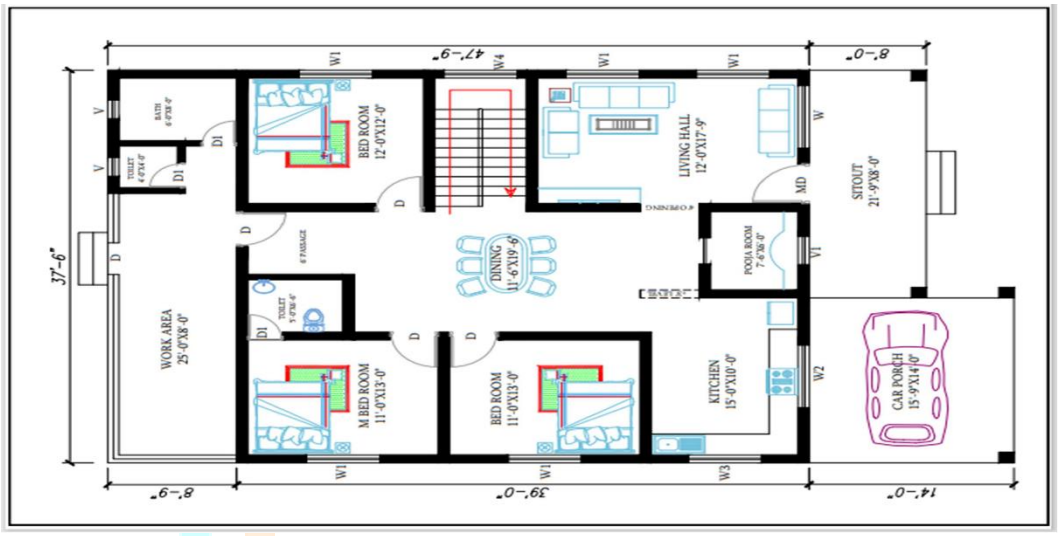

Fig no 7 Plan of the building

VII. RESULTS AND DISCUSSIONS

8.1 Sequential approach-

Sequential approach to the project Implementing a sequential approach to project management through Primavera demonstrated significant improvements in the organization and execution of residential construction tasks. Key results include:

1. Enhanced Scheduling Accuracy: Primavera's detailed scheduling ensured logical task sequencing, minimizing overlaps and dependencies, leading to efficient resource utilization.
2. Improved Resource Management: The allocation of labor, materials, and equipment was optimized, reducing idle time and resource wastage.
3. Effective Financial Monitoring: Real-time cost tracking and budget forecasts enabled early identification of variances, ensuring financial control.
4. Streamlined Communication: Integrated collaboration tools enhanced stakeholder communication, fostering timely decision-making and reducing delays.

This approach resulted in better adherence to project timelines and budgets, showcasing Primavera's effectiveness in managing complex construction projects.

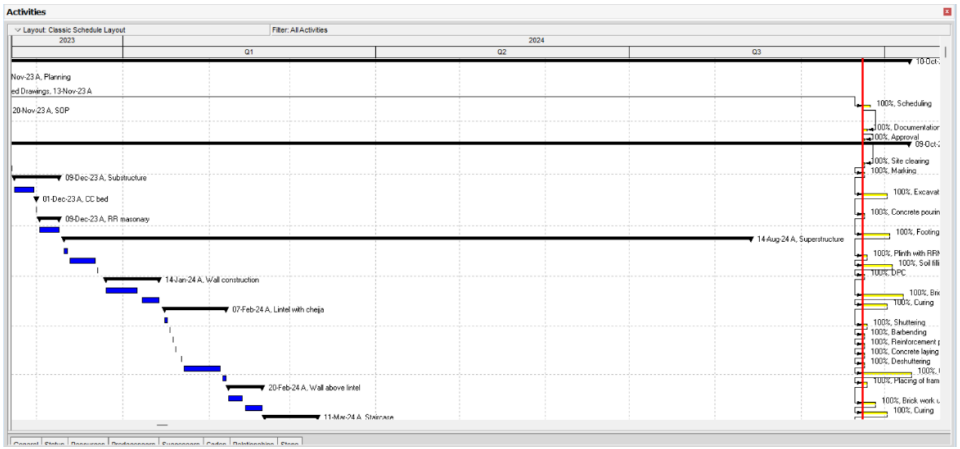

Fig no 8 Sequential approach

8.2 Parallel approach-

Using a parallel approach in project management through Primavera resulted in notable efficiencies in overlapping tasks and resource utilization. Key outcomes include:

1. Reduced Project Duration: Simultaneously executing interdependent tasks, as enabled by Primavera's scheduling features, shortened overall project timelines without compromising quality.
2. Optimized Resource Allocation: Parallel task execution required careful resource management, which Primavera facilitated through its real-time tracking and allocation capabilities.
3. Enhanced Risk Management: Primavera's monitoring tools effectively identified and mitigated potential conflicts arising from concurrent activities, ensuring smooth workflow continuity.
4. Cost Savings: Overlapping tasks and minimizing downtime led to reduced labor and equipment costs, improving overall financial performance.

This approach demonstrated Primavera's potential to balance efficiency and risk in managing concurrent construction activities.

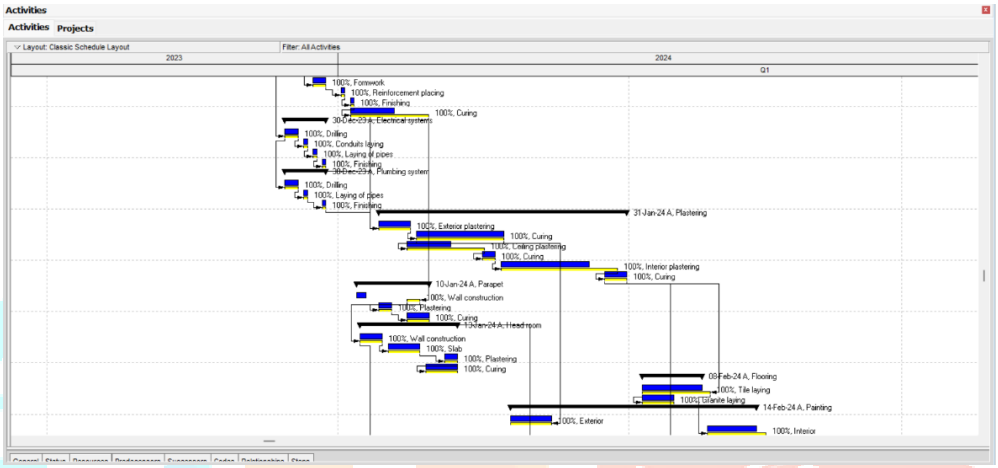

Fig no 9 Parallel approach

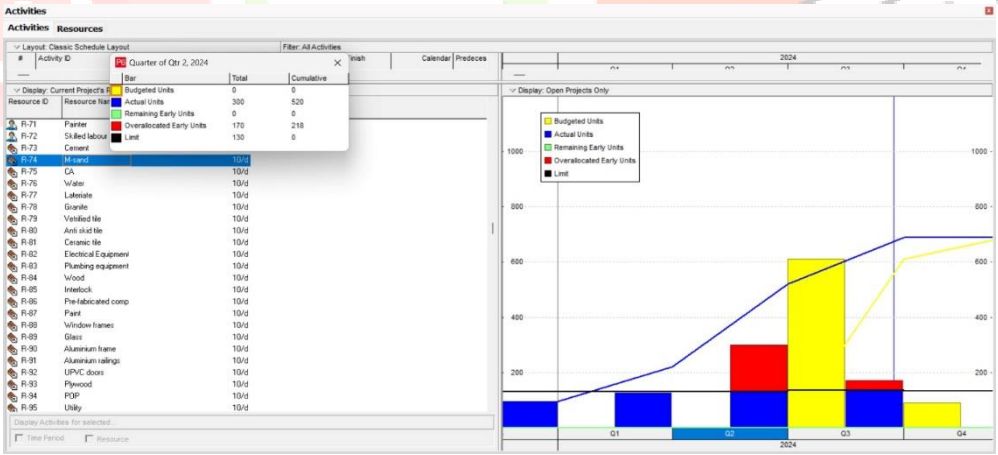

Fig no 10 Overallocated resource units

VIII. COMPARISON BETWEEN SEQUENTIAL AND PARALLEL APPROACH

Table no 1 Comparison of different approaches with cost and duration

Type of approach	Actual project duration(Days)	Actual project cost (Rs)	%Variation	
			Project duration	Project cost
Sequential approach	262	71,65,050	63.31	-1.35
Parallel approach	73	73,31,135	112.83	2.3

Table no 2 Comparison of different approaches

ASPECT	SEQUENTIAL WORK	PARALLEL WORK
Definition	Tasks are performed one after another, in a set order.	Multiple tasks are performed simultaneously.
Speed of Completion	Slower, as each task depends on the previous one.	Faster, as tasks are executed concurrently
Resource Utilization	Resources may remain idle during task transitions.	Optimizes resource use by engaging multiple teams.
Coordination Complexity	Simple to coordinate with fewer overlapping activities.	More complex due to multiple concurrent tasks.
Risk of Delays	High, as one delay can stall the entire sequence.	Lower, as delays in one task may not halt others.
Quality Control	Easier to maintain, as focus is on one task at a time.	Challenging, with quality checks required for all tasks.
Flexibility	Inflexible, as changes affect the entire sequence.	More flexible, as tasks are less interdependent.
Safety	Safer, with fewer teams working simultaneously.	Riskier, with overlapping activities increasing hazards.
Applicability	Suitable for smaller or specialized projects.	Ideal for large-scale, resource-rich projects.
Cost Implications	Potentially higher due to extended timelines.	Can reduce costs with shorter project durations but may increase management costs.

IX. CONCLUSION

1. Integrating Primavera-based project management with financial tracking in residential building construction significantly enhances project efficiency.
2. The case study highlights that how effective monitoring and use of project management techniques, coupled with Primavera, optimize project timelines and costs. (Reduced project duration from 262 days to 73 days with a bare minimum increase in the cost of about 2.3%)
3. The duration in sequence approach takes up to 262 days excluding the nonwork days whereas in parallel approach the duration is 73 days including nonwork days.
4. In any project it's better to go with parallel activity approach rather than that the sequential activity approach which significantly reduces the project duration.
5. Approaches like use of chemicals for curing activities, material performance enhancing chemicals in residential buildings will provide major routes for the planner to reduce the project duration
6. By streamlining project execution and improving financial integration, this approach ensures better control over resources and expenses, ultimately leading to successful project delivery.

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