



Scheduling of Residential Building Using MS Project

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Abstract: In the last ten years, India's construction industry has grown rapidly. Construction is a challenging endeavor that calls for careful resource management and planning. Projects today tend to be more intricate. The necessity to concentrate on quality and workmanship has emerged as a result of the industry's growing competition and safety concerns. Any project's success depends on the effective management of time, quality, and cost. After gaining practical management experience, it has been concluded that the most crucial aspect of project management is resource scheduling. This paper focuses on the scheduling of the project by understanding the activities involved in the project. A reduction in time, resources, and cost were observed by meticulous scheduling of the project using Microsoft Project.

IndexTerms - MSP Software, Gantt chart, Cost, Materials, Quantity, and Management

I. INTRODUCTION

"Project is a unique process consisting of a series of coordinated and controlled operations with start and conclusion dates performed to attain a purpose conforming to particular requirements, including limits of time, cost, and resources." The discipline of project management entails initiating, planning, executing, controlling, and concluding the work of a team to achieve certain objectives and satisfy specific success criteria. To achieve project requirements, project management is the application of knowledge, skills, and techniques to project activities. It is a strategic ability to accomplish goals for businesses, allowing them to better compete in their marketplaces by connecting project outcomes to organizational goals. It can also be described as the activity and process of organizing resources, following protocols, and being inspired by others to reach predetermined objectives in solving scientific or everyday issues.

II. IMPORTANCE OF MS PROJECT

- Organizing Chaos
- Managing Risk
- Managing Quality
- Managing Integration
- Managing Change
- Clearing Issues
- Retaining and Using Knowledge

III. PURPOSE OF SCHEDULING

- Scheduling is the reflection of the plan.
- It is a strong and formal decision taken to allocate optimum time, cost, and resources for the project.
- The entire project is divided/ broken down into small individual activities and the activities are to be scheduled in such a way that they are completed in a particular time frame using the allocated resources.
- The process of scheduling reveals the flaws in the plan, leading to easy rewriting/redoing of the plan.

IV. ABOUT MICROSOFT PROJECT

Designed and marketed by Microsoft, Microsoft Project is a project management software programme. It is intended to help a project manager create a strategy, allocate resources to tasks, monitor progress, control costs, and analyze workloads. MS Project can be used as a stand-alone tool for monitoring project progress or for monitoring complex projects that are dispersed across many different geographies and are managed by numerous project managers. A project manager can use Microsoft Project to help with;

- Developing a plan,
- Assigning resources to tasks,
- Tracking progress
- Managing budget

- Analyzing workloads

V. OBJECTIVES ABOUT THE MICROSOFT PROJECT

In essence, this paper will conduct an exploratory study on how project software is implemented in every aspect of a project, which includes the Planning and Scheduling stage, followed by the Monitoring and Controlling stage. This paper discusses construction management in terms of writing for the objectives listed below:

- To prepare a realistic schedule and set a baseline.
- To reduce the total duration than the actual executed project's duration.
- To ease of work for Labour.
- To reduce the cost by proper allocation of resources.
- To study Microsoft Project (MSP) software and to use the same software for the execution of the ongoing project.
- To complete the task on time and within budgeted cost.

VI. SCOPE OF WORK

The phase of project planning known as project scope entails identifying and recording a list of precise project objectives, deliverables, tasks, costs, and deadlines. The requirements for a project are the basis of these deliverables. Delay in construction is the amount of time that elapses past the deadline set by the parties for project completion.

VII. METHODOLOGY

A multi-storied residential building, which has been executed using conventional methods, has been considered in the present study. The study focuses on the cost, duration, and resource management that have been employed for the execution of the project. The extract of data obtained from the building site is titled Plan A - Conventional execution approach. An analysis of planning and scheduling was again carried out for the same multi-storied building by applying project management skills and techniques with help of M. S. Project software. This was carried out to obtain a comparison with plan A - Conventional execution approach. The resulting analysis was titled Plan B- Project Management approach.

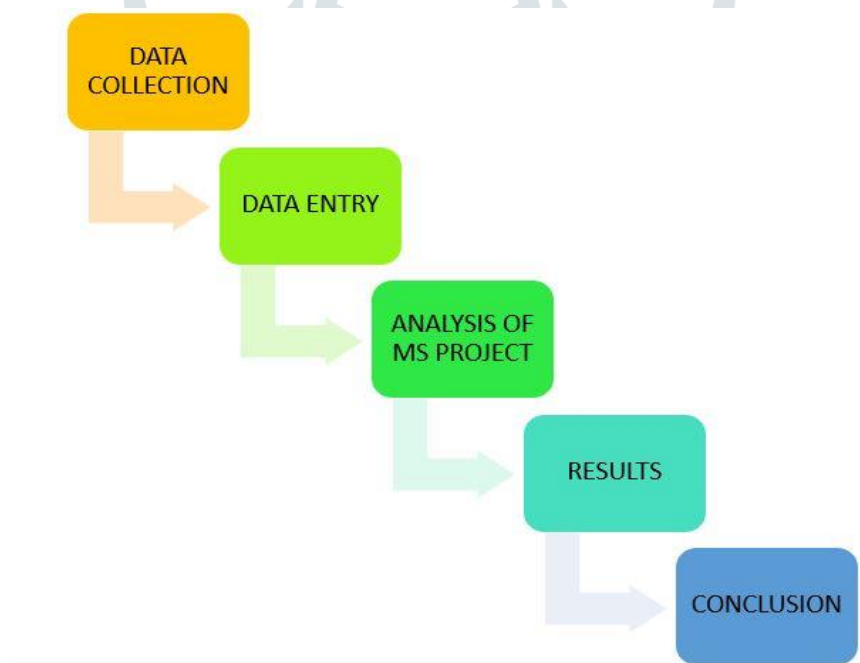


Figure 7.1 Flowchart of Methodology

VIII. PROBLEM STATEMENT

In India today, delays are a concern in practically every sector of the building business. The issue arises for a number of causes, the majority of which are related to the construction activity that was carried out improperly due to inefficient planning and scheduling made before to the project's actual execution. According to reports, the contractor will need more time to complete the project.

The contractor will be granted an extension of time for problems that were not brought on by a lack of diligence (carelessness, unawareness), an error, or a mistake on their part. Instead, these problems are typically delayed by powerful forces like difficulty obtaining construction materials and variation orders (VOs) from customers due to natural disasters like the rainy season. Construction project management is the art and science of overseeing all aspects of a project in order to meet its mission objectives, a specific timeline, a set budget, and predetermined quality specifications. It also involves working effectively in a project environment that is constantly changing while taking into account the safety and health of the construction workers. The task of building a facility or providing services with established performance goals is defined in terms of quality requirements, completion time, completion cost, and other stated restrictions.

IX. CASE STUDY

The case study for the project involves the planning and scheduling of a residential building. For this case residential building, located at Shenoli, Karad which is Mr. Sohan Kanase's residential building at Shenoli Maharashtra, India was selected. The site details, plans, and drawings, etc. were utilized to achieve the goals of the project. Type of Structure -Reinforced Cement Concrete Structure (RCC) Residential Building.

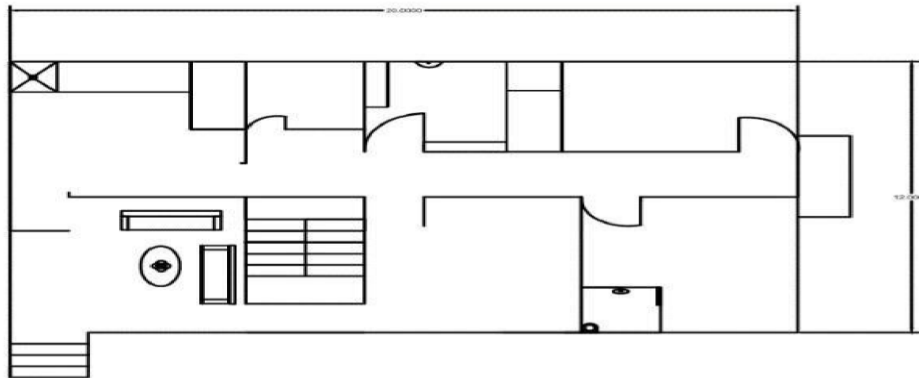


Figure 9.1 Plan view of the Residential Building

In essence, the project calendar is utilized to determine the days and hours the project will run. It aids in setting up and allocating work to specific days. Additionally, it aids in allocating resources to certain activities on the appropriate days. Therefore, it is clear from the project calendar which days the organization or construction firm will be working on its project and which days there will be no work being done. There are essentially three fundamental calendars in MS Project 2010. Therefore, any of the three base calendars chosen by MSP 2010 can be used to set a base calendar for any project, or a custom base calendar can be made. A base calendar is a calendar that can be used for a group of resources, a group of tasks, or the entire project.

9.1 Following are the three base calendars that are defined by the MS Project 2010:

- **Standard base calendar:** According to this base calendar, working days are from Monday to Friday, and the time followed is 9 am to 6 pm. According to this calendar, lunch timing will be from 12 noon to 1 pm. This is the default base calendar used for the project, the task, and the resources.
- **Night shift base calendar:** According to this calendar, working days will be from Monday to Friday and working timing will be from 11:00 pm to 8 pm with one hour off from 3 am to 4 am. It is basically used to work for the projects that will be carried on at night shifts.
- **24 hours base calendar:** According to this calendar, one has to work from midnight to midnight for seven days a week. This base calendar is usually practiced by manufacturing companies. Any of the three above-mentioned base calendars can be used as a resource calendar or project calendar or task calendar or all three calendars can be used at a time.

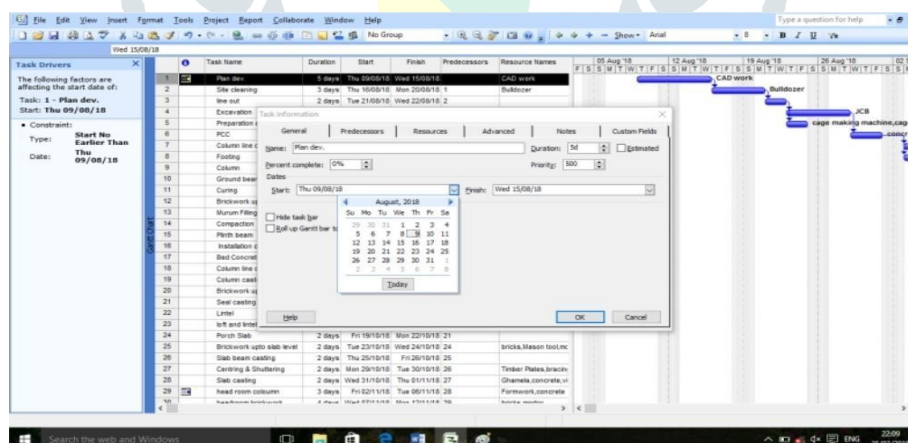


Fig.9.2. Calendar

9.2 Scheduling with Gantt Charts and WBS

A unique kind of view that is often utilized in project management is the Gantt chart. The Gantt chart in MSP has a sheet view on the left and a bar graph with a timeline on the right. In MSP, the Gantt chart is created based on the duration entered for each work and the effectiveness with which task relationships are established. Project 2010 calculates the schedule to reflect those controls automatically scheduled tasks are marked with the Gantt bar icon in the task as we adjust the durations, link tasks, and maybe include date constraints or allocate resources.

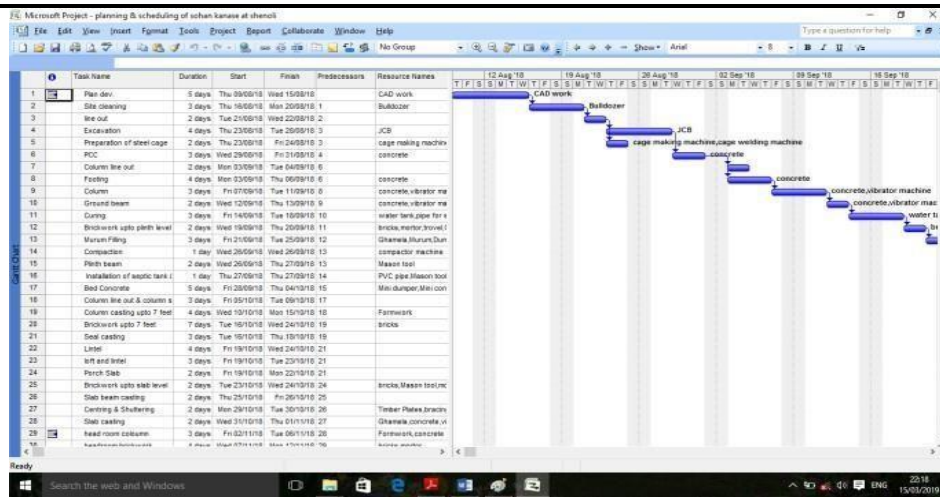


Fig.9.3. Scheduling

A timetable in conjunction with the project after the lead task set was completed. If the project's completion time is later than expected or arrives earlier than expected, or if certain crucial time nodes have changed, the project schedule must be adjusted. Two adjustment techniques could be distinguished: One is to change the deadline, i.e., shorten or lengthen the main construction project's timeline to adhere to the deadline. The lead job and time delay adjustments are the other. According to the principle of task reasonable cohesiveness, the original plan used the complete-begin type, carrying out project B after finishing project A, but it can be adjusted to begin-begin in accordance with the actual needs. To assure the implementation of the project's progress, project B started at the same time as project A. The project is tracked in terms of gathering, entering, and analyzing data to determine the job and actual duration of work. In project management, tracking is the second crucial step. The main focus of project planning at the outset of actual work should be on conveying and developing the project plan's specifics.

X. RESOURCE ALLOCATION

The project will determine the resource demand curve for the entire project based on how many resources are used for each task, the amount of time, money, and effort required to complete each task, as well as how the resources are allocated among each specific work unit. Thus, it is simple to calculate the purpose and the subtask flow working strength, alter the time scale in the "resources usage scenario," and configure the workforce and budget separately.

Resources are the supplies, labor, or other labor-intensive inputs used to execute the project's assigned duties. These also specify the amount that will be spent on or charged for the project's materials. Resources can help in the ways listed below:

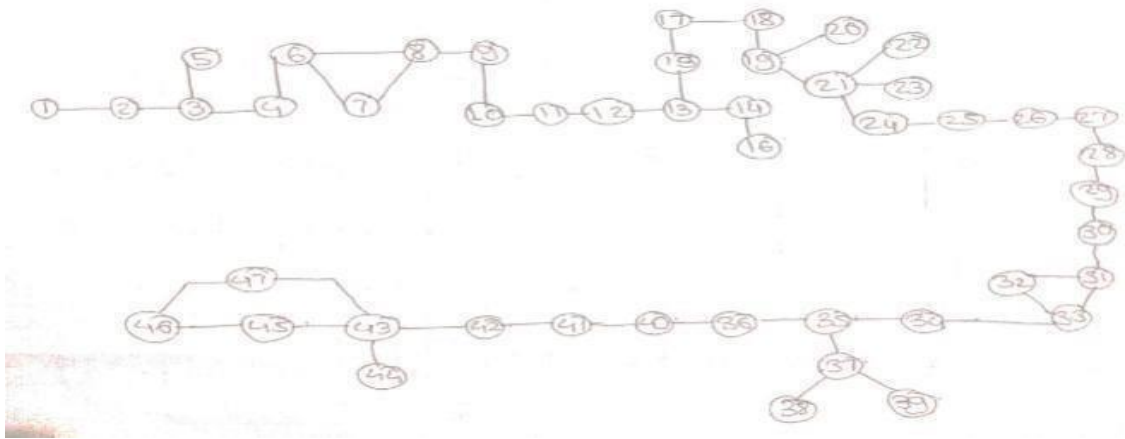
- It aids in improving a project's accuracy. If "Automatic Scheduling" is chosen, MSP 2010 will consider the project calendar, task dependencies, and duration before creating a precise project model. After allocating resources to the project, MSP 2010 updates the projected schedule to include working time and resource availability.
- Additionally, it assists in identifying any overuse of resources early on in the project as well as any jobs that are not given enough attention. Information about task progress can be generated later, as work progresses, and the need for any new under- or over-allocation of resources can be determined.
- Additionally, it can be useful for monitoring the project's development in light of resource usage. It can also indicate how much time has already been spent by a resource or how much time it will need, which is useful for determining whether any adjustments are required to ensure that the project continues to go forward. It will be useful for gathering actual progress data that can be used as background knowledge for upcoming projects.
- It assists in keeping track of costs, material consumption, and project-related material utilization. This will help with both accurate budget performance monitoring and anticipating the need for record-keeping materials.
- It helps track some of the largest expenses in the project such as labor cost, material cost, equipment cost, transportation cost, etc.
- It will assure that proper resource allocation is followed and nothing is slipped through the cracks.
- The following types of resources can be assigned to the tasks:

- 1) Work Resources: this includes equipment or people.
- 2) Material Resources: these include consumable materials.
- 3) Cost Resources: these include the cost of the items or consumables incurred in performing a task.

XI. CRITICAL PATH AND CRITICAL TASKS

For the project plan to be optimized, critical path determination is crucial. It is common knowledge that any modifications to the critical route might result in a change in the project's completion date, which impacts the project's resources, budget, and scope.

Therefore, it becomes crucial to identify the vital path and important activities for each project using acceptable and correct methodologies. Here, CPM and PERT methodologies were utilized to determine the critical path in this work.



Sr. No	Activity	To	Duration in Days (Tp)	Tm	Te	Sd= (Tp-To)/6	Variance
1	Document review & plan formation	4	5	6	5	0.1667	0.0277
2	Site cleaning	2	3	4	3	0.1667	0.0277
3	Line out	1	2	3	2	0.1667	0.0277
4	Excavation	4	4	5	4	0.1667	0.0277
5	Preparation of steel cage	2	2	3	2	0.1667	
6	PCC	2	3	4	3	0.1667	0.0277
7	Column line out	1	2	3	2	0.1667	
8	Footing	3	4	5	4	0.1667	0.0277
9	Column	2	3	4	3	0.1667	0.0277
10	Ground beam	1	2	3	2	0.1667	0.0277
11	Curing	2	3	4	3	0.1667	0.0277
12	Brick work up to plinth level	1	2	3	2	0.1667	0.0277
13	Murum filling	2	3	4	3	0.1667	0.0277
14	Compaction	0	1	2	1	0.1667	0.0277
15	Plinth beam	1	2	3	2	0.1667	0.0277
16	Installation of septic tank and plumbing pipe	0	1	2	1	0.1667	0.0277
17	Bed concrete	4	5	6	5	0.1667	0.0277
18	Column line out and column starter	2	3	4	3	0.1667	0.0277
19	Column casting up to 7 feet	3	4	5	4	0.1667	0.0277
20	Brick work up to 7 feet	6	7	8	7	0.1667	
21	Seal casting	2	3	4	3	0.1667	
22	Lintel	3	4	5	4	0.1667	
23	Loft and lintel	2	3	4	3	0.1667	
24	Porch slab	1	2	3	2	0.1667	0.0277
25	Brick level up to slab level	1	2	3	2	0.1667	0.0277
26	Slab beam casting	1	2	3	2	0.1667	0.0277
27	Centring and shuttering	1	2	3	2	0.1667	0.0277
28	Slab casting	1	2	3	2	0.1667	0.0277
29	Head room column	2	3	4	3	0.1667	0.0277
30	Head room brick work	3	4	5	4	0.1667	0.0277
31	Head room lintel	2	3	4	3	0.1667	0.0277
32	Head room slab	3	4	5	4	0.1667	
33	Head room slab level	4	5	6	5	0.1667	

	brick work						
3	External plastering	9	10	11	10	0.1667	0.0277
4							
35	Internal plastering	9	10	11	10	0.1667	0.0277
36	Plumbing	6	7	8	7	0.1667	0.0277
37	Electrification work	6	7	8	7	0.1667	
38	MS Work	3	4	5	4	0.1667	
39	Steel railing	4	5	6	5	0.1667	
40	Water proofing	3	4	5	4	0.1667	0.0277
41	Flooring	19	20	21	20	0.1667	0.0277
42	POP	1	2	3	2	0.1667	0.0277
43	Wall putty	2	3	4	3	0.1667	0.0277
44	Sliding window fixing	9	10	11	10	0.1667	0.0277
45	Door fixing	6	7	8	7	0.1667	
46	Colour	17	18	19	18	0.1667	0.0277
47	Glass work	9	10	11	10	0.1667	
	Total	226	255	264			0.9418

XII. CALCULATIONS

$$X = \sqrt{\text{variance}} = 0.970,$$

Expected days = 226 days

$$Z = (te - tp) / x = (226 - 255) / 0.970 = -29.89$$

Probability = 0.3%

Y = Probability of completion of project in 264 days

$$Z = (te - tp) / x = (264 - 226) / 0.970 = 39.17$$

Probability = 98.3%

Z = If probability is 90%, what is the project duration

$$Z = (te - tp) / x,$$

$$1.5 = (te - tp) / 0.970 = 384.12 \approx 385 \text{ days}$$

XIII. CONCLUSION

During the scheduling of the project, it was observed that experience played a pivotal part in the scheduling process. The detailed knowledge about the activities which were going to be carried out and their interdependencies on each other were very essential to be taken into consideration.

However, the MS project served as a very important tool in scheduling the activities. An experienced engineer with the knowledge of using the MS project as a tool would envisage the problems and the challenges way before they would occur. The software served as a great tool for planning critical activities and prioritizing the tasks which needed attention.

The critical activities were easy to track and monitor. The amount of time for scheduling which would normally be lost using traditional scheduling methods was reduced by almost 25% by the use of MS Project.

A systematic allocation of the resources was observed by using MS Project. Labors were efficiently utilized and the output was approximately improved by 12%.

The cost parameters were yet to be envisaged but the project duration was reduced to 12 months and 8 days from 18 months using MS Project thus reducing the project time by almost 33%.

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