

# Planning & Scheduling of Residential Building Using MS Project

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**Abstract:** *Every one of us is a manager of projects of our own life. From a house wife to an employee to money expert, from banker to doctor, from engineer to manager from a teacher to a student, we all work on different tasks with deadlines. (without any concern about / having nothing to do with ) our occupation, normal behaviors , or location in an organization, we all work on tasks that are mixed and involve people who do not usually work together. The project may have a simple goals that does not require many people or a great deal of money or it may be quite complex, calling for (many different kind of people or thing) skills and huge amount of useful thing's/valuable supplies. But the bottom line is that every one of us manages projects. Because of this the purpose of dealing with the project should not be only execution but effective and (producing a lot of waste ) execution of project is extremely important. Which is needed to be highlighted? Construction Firms in India, Construct the Projects in a Traditional ways, this sometimes proves Expensive & tiring & Boring too. Traditional way also proves to be Time Using/ Eating/ Drinking, and Confusing. The presented work will provide them an Opportunity to clearly watch/ notice/ celebrate/ obey the difference between the Microsoft Project (MSP) and the Traditional Planning ways of doing thing, which speeds up Construction and also make the Project Cost Effective with Proper Planning with the help of the case study on the single wing of project executed in Pune, Maharashtra, India. For finding out different aspects that proves (producing a very little waste) planning & execution of the project, very different ways of doing things ) adopted and to find out (education that fix something) measures, international journal papers were referred. Ways of doing thing. adopted includes defining of problem statement, hinting about something bad the goals from the data collected in two part that is first ( or most important ) data and Secondary , carefully studying the data and finally coming to the end/end result.*

**Keywords:** Microsoft Project, Project Management, Planning, Construction Organization, Activities

## 1. Introduction

Project Management is the Application of knowledge, skills and Ways of doing thing to project activities to meet project needed things. It is a (related to a plan to reach a goal) ability to do something successfully for organizations, enabling them to patch the project results to Organizational goals and so, better Compete in their markets. It can be also defined as the process and activity of planning, organizing very interesting intelligent, and controlling useful things/ valuable supplies procedures and rules of conduct to (accomplish or gain with effort) particular goals in scientific or daily problems.

A project is an (only lasting for short time ) aim designed to produce a special product, service or result with a defined starting and end (usually time-held back ) and often by held back money/giving money (to) or things that can be to meet weird goals and goals usually to bring about help full change or added value. The only lasting short time nature of projects stands in contrast with business as usual (or operations), which are repeating, permanent, or semi-permanent functional activities to produce products or services. In putting in to use, the management of these two systems is often quite clear/ separate, and as such needs/ demands the development of (different branching out into different abilities to do particular job related task) and management (success plan / ways of reaching goals) it has always been practiced (showing little corner in relaxed way) but began to change (and get better) as a prime job /line of work in the mid – 20th century

## 2. Importance of Project Management

Project gets started at the right way but as it go ahead/move forwards further, gets off the track. Because of this its important to manage the activities in the right way, this way project management plays a very important role in arranging the critical activities of the project which is called as job to function in the appropriate way. Project Management aid the project in better (wasting very little while working or producing something) to deliver services.

## 3. Purpose of Scheduling

- A Schedule is the reflection of the plan
- It is the strong desire/formal decision about something of time and sequence of operation in the project and their (group of people/ device made up of smaller parts) to give the overall completion time.
- The process of scheduling uncovers flaws in the plan, leading to easy rewriting/redoing of the plan.

## 4. Microsoft Project Basic Information

Microsoft Project is a project management software product, developed and sold by Microsoft. It is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analyzing workloads. MS project can be used as a standalone tool for tracking project progress or it can be used for tracking complex project distributed in many geographical areas and managed by a number of project managers. Microsoft project is designed to assist a project manager in;

- 1) Developing a plan,
- 2) Assigning resources to tasks,
- 3) Tracking progress,
- 4) Managing budget and
- 5) Analyzing workloads.

## 5. Objectives

Basically this thesis will conduct an exploratory study on implementation of Microsoft Project in every aspect of a project which comprise of Planning and Scheduling stage followed by the Monitoring and Controlling stage. In this regards, in term of construction management, this dissertation is written for the objectives listed below:

- 1) To study the scheduling technique using network models (CPM).
- 2) To reduce the total duration then the actual executed project's duration (Case Study).
- 3) To ease of work for the Labor.
- 4) To reduce the cost by proper allocation of resources

## 6. Brief Overview of Literature

**Young Hoon Kwak & Frank T. Anbari (2008)** observed that the ranking of occurrences of the eight allied project management disciplines from most to the least appeared subjects over the last 50 years are:

- Strategy/Portfolio Management;
- Operations Research/Decision Sciences;
- Organizational Behavior/ Human Resources Management;
- Information Technology/Information Systems;
- Technology Applications/Innovation;
- Performance Management/Earned Value Management;
- Engineering and Construction; and
- Quality Management/Six Sigma.

They also concluded that project management shouldn't only be studied in academics but we should deal it in every domain of life in practical ways – both reflection on action and reflection in action.

**Vittal Anantamula (2010)** found out that Similar to a traditional project, managing an academic degree is related to the triple constraints of time, cost, and scope. It is concluded that by applying project management concepts, tools, and techniques, undergraduate degree program advising and planning can be improved after comparing the planning aspects of a conventional business project with the planning of an academic degree. Author also helps to explain the application of project planning techniques to manage the multiple constraints and the complexity associated with academic advising and planning.

**R. Prabhakar and G. Ravichandran (2014)** analyzed that; Construction planning is an important part of the overall management process. The planning and management includes organizing the work, executing the work, correlating plan and progress information and controlling the work, the three inter-related factors of time, money and

quality need to be managed in a proper way. Completion of many of the projects nowadays is not in estimated duration. This will direct to an increase in overheads as well as various other factors. It will not only reduce the expected revenues but also will affect the reputation of the contractor. Scheduling is one of the vital functions in construction project to determine the sequence of activities necessary to complete a project.

**Hoang, Nhat Minh Shrestha, Swastik (2014)** hinted that the main function of a software is to offer help, and enhance the quality of output with less effort than manual ways. A project has disparate requirements and the aim of the adopted software is to fulfill those requirements effectively in terms of time and cost. In addition, the issues of scheduling, tracking and physical element must be considered while adopting the project management software.

**Aftab Hameed Memon and Ismail Abdul Rahman (2014)** suggested that time is the biggest element that every contractor has to deal with while practicing the construction activities. Variety of approaches and tools has been introduced over the past decades to cherish the management of the projects. Author identified commonly used techniques and software of time management together with their effectiveness level in large construction projects. Data was collected from the construction organization that deals with huge projects. Relative Importance Index calculation was employed to assess the level of effectiveness for time management techniques and software packages adopted in the construction project. The results depicts that most common and effective time management technique and software Package are CPM and Microsoft Project respectively. Although this technique is brought into practice but practitioners did not accomplish the goals of respective organization.

**Rhuta Joshi and Prof. V.Z. Patil** analyzed the project management technique by scheduling various construction activities, allocation of resources and resource leveling using Microsoft Project 2013 for residential building. The study was carried out in two phases. In first phase data was collected from site and quantities were calculated as per drawing and required manpower was calculated. In second phase of construction activities was defined in MSP 2013. The result was as resource decreases duration increased by 10.38% and cost by 0.94%.

**Nikhil R. Mahajan and M. V. Bhogone (2017)** The methodology adapted by them was to compare Microsoft Project and Traditional Method. Schedule was prepared for both conventional and prefabrication method. A residential building was taken for comparison. The software used was MSP, the duration required for completion of project was collected from respective company. The comparison was made by comparing the total time required for completion by using critical path method with MSP project. The result shows that the total duration for both the conventional and prefabrication method and prefab construction for individual house and double story the required cost is 13% more than conventional but it reduces the project duration by 63 days.

**Wallance Agyei** The study was aimed at finding the difference between the cost and minimum expected time that will be required to complete the project. Both CPM and PERT techniques were used for analysis and from the result it was concluded that schedule proposed by bus provides much shorter completion time as compared to the actual time taken by the process.

**Rashmi J.V. and Amey A. Kelkar (2017)** They analyzed the planning and scheduling of multistoried building in two phase by conventional execution approach & again analysis of same building was carried out by applying MSP to compare the result for justification. For their study they considered G+3 with basement and the type of RCC frame structure, to estimate the overall cost and time required to execute a multistoried residential building. The result of their study showed that proper manage of project management skills and technique reduces the time by 23.2% and cost by 3.14%.

**E. Suresh kumar and S. Krishnamoorthi (2015)** In their study they focused on the scheduling using MSP and earns value analysis for an apartment building. Thereby time required for the process of cost overrun is avoided. Project schedule is considered as core of the project plan, and the purpose of the project schedule is to show the organization how the work will be performed to uncover the mistakes. After completion of project it has been observed that there is more difference between budget cost and actual cost, cost increases as the material price increases. Earned value analysis is carried out in order to find the variance cost of the project.

## 7. Problem Statement

Nowadays, almost every construction industry in India is experiencing delay problem. The problem occurs from various reasons; the extensive sources are caused by the construction activity which has been executed not according to planning and scheduling efficiently decided before actual execution of the project. Apparently, contractor will require time extension to accomplish the project.

The Extension of time will be given to the delay in problem not caused due to lack of proper care (incautious, unaware) and mistake by the contractor, but it's normally caused by major forces such as inconvenience in supplying construction materials, variation order (VO) by customer owing to the nature disaster such as rainy season.

Construction project management is the art and science of managing all aspects of the project to achieve the project mission objectives, the specific time, budget cost and predefined quality specifications; working efficiently and effectively in the changing project environment with due regards to construction worker's safety and health. Mission of creating a construction facility or services, with predetermined performance objectives define in terms of quality specifications, completion time, budget cost and other specified constraints.

## 8. Scope of Work

Project scope is the part of project planning that involves determining and documenting a list of specific project goals, deliverable, tasks, costs and deadlines. These deliverables are derived from a project's requirements. In construction, delay could be defined as the time over run either beyond completion. Date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project.

## 9. 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 as 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 comparison with plan A - Conventional execution approach. The resulting analysis was titled as Plan B- Project Management approach.

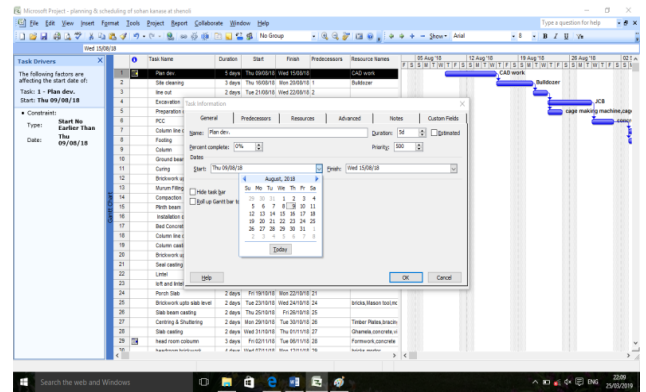
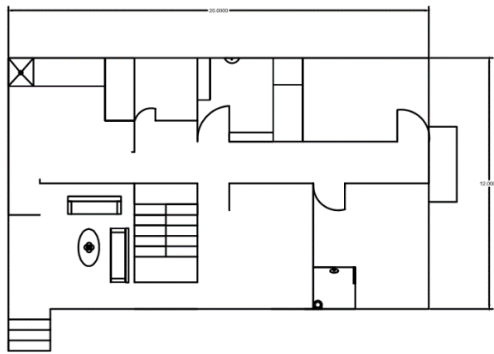


## 10. Case Study

The case study for the project involves the planning and scheduling of a residential building. For this case G+ 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) G + Residential Building.



10.1 Plan



10.2 Calendar

The Project calendar is basically used to establish the days and time for which the project will run. It also helps in establishing and assigning tasks to particular days. It also helps in assigning in resources to particular tasks for the respective days. So, by looking at the project calendar, one can clearly tell that on which days the organization or the construction company will be working on its project and on which day no work will be going on. MS Project 2010 has basically three base calendars. So for setting a base calendar for any project, any of the three base calendar decided by MSP 2010 can be chosen or own base calendar can also be created. A base calendar can be defined as a calendar template that can be applied to a set of resources, a set of tasks, or the project as a whole.

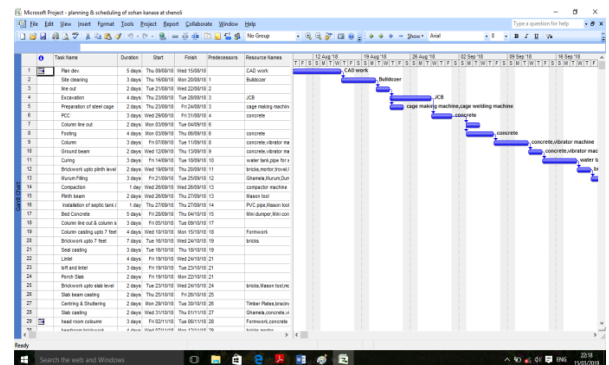
Following are the three base calendars that are defined by the MS Project 2010:

- 1) **Standard base calendar:** According to this base calendar, working days are from Monday to Friday and timing 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, for task, and for resources.
- 2) **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.
- 3) **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 resource calendar or project calendar or task calendar or all the three calendars can be used at a time.

10.3 Scheduling

Scheduling with Gantt Charts and WBS

Gantt charts are a special type of view that are used extensively in project management. In MSP, the left side of the Gantt chart contains a sheet view, and the right side contains a bar graph along a timescale. In msp, the Gantt chart is developed depending upon the duration we enter for respective task and how to efficiently establish task dependencies. As we refine the durations, link tasks, and possibly enter date constraints or assign recourses, Project 2010 calculate schedule to reflect those controls automatically scheduled task are marked with the Gantt bar icon in the task



After the completion of lead task, we make the schedule combined with Project. the project schedule begins from the start of the scheduled date, completion time latter or earlier than specified schedule, or some key time nodes have changes, need to adjust to the project plan. The adjustment methods could be divided into two: One is to adjust the time limit, that is, through shorten or extend the main construction project of time to meet the time limit. The other is to adjust the lead task and time delay. the original plan use type of complete-began, conducting project B after completing project A, under the premise of task reasonable cohesion, it can be changed into began-began according to the actual needs. That is project B began at the same time when project A started, to ensure the implementation of the project progress. A project performance value that is task and actual duration of work is done by tracking the project in terms of collecting, entering and analyzing. Second important phase is tracking in project management. At start of actual work, main thing to highlight in project planning is communicating and developing the details of project plan. When actual work

has been started, the next phase of project management is tracking progress.

### 11. Resource Allocation

Project will calculate the whole project resources demand curve according to the resource usage for each task, take up proportion being undertaken schedule, cost and effort, the resources of the table by each specific work units, conduct automatic balance resources. And thus easy compute out the purpose and the sub task flow working strength, adjusting time scale in “resources use situation”, configuring personnel and cost according to the mission independently.

Resources are the materials or consumables or labors that are used to complete the tasks allocated to the project. These also define the expenditure or cost that will be incurred for the materials used in the project. Resources can help in following way:

- It helps in increasing the accuracy of a project. In case of ‘Automatic Scheduling’ selected, MSP 2010 will take into account the project calendar, task dependencies and duration and an accurate model of the project will be ready. After assigning resources to the project, MSP 2010 adds working time and availability of resources to the scheduled planned.
- It also helps in letting us to know, well ahead of time, the overloading of the resources at any stage of the project as well if there are any tasks that are under allocated. Later, at the time of work progress, information regarding task progress can be generated and the requirement of any new under allocation or over allocation can be identified.
- It can also help in tracking progress of the project according to resource work. It can also indicate how much time have been spent by a resource or how much time will be needed by it, this will be helpful in making any necessary adjustments so that the project can keep moving in the right direction. It will also be helpful in capturing actual progress data that can be used as historical information for the future projects.
- It helps in recording the cost, amount of materials consumed and also their use in the project. This will be beneficial for the well monitoring of the budget performance and also about the requirement of the record supplies well in advance.
- It is helpful in tracking some of the largest expenses in project such as labour 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 cost of the items or consumables incurred in performing a task.

### 12. Critical Path and Critical Tasks

Determination of critical path is very important for the optimization of the project plan. It is well known that any kind of adjustments to the critical path can lead to the change of project’s finish date resulting in changes in the resources, budget and scope of the project. So it becomes very important to determine the critical path as well as the critical tasks of every project using appropriate and proper methods. Here, in this project we have used CPM and PERT methods for the determination of critical path.

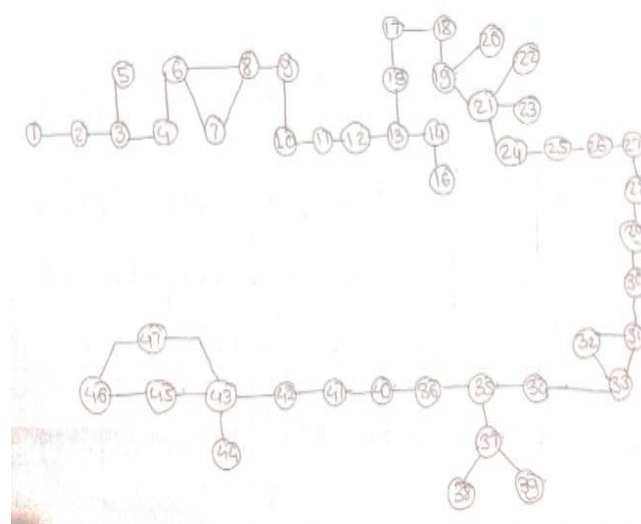


Table 6: CPM Chart

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

31	Head room lintel	3
32	Head room slab	4
33	Head room slab level brick work	5
34	External plastering	10
35	Internal plastering	10
36	Plumbing	7
37	Electrification work	7
38	MS Work	4
39	Steel railing	5
40	Water proofing	4
41	Flooring	20
42	POP	2
43	Wall putti	3
44	Sliding window fixing	10
45	Door fixing	7
46	Colour	18
47	Glass work	10

	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	22	255	26	4		0.9418

Table 7: PERT Chart

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	

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  
 $Z = (te - tp) / x$ ,  
 $1.5 = (te - tp) / 0.970 = 384.12 \approx 385$  days

13. Conclusion and Result

Experience is very important in project management, but it is only part of the resource requirements. Large-scale scientific research projects often have lots of senate grinds unit, time is special tight. To work out the plan and repeated calculation only by personal experience will often spend a lot of time and usually isn't easy to achieve objectives. Use the project management technology can do comprehensive management when managing a project. And it has characteristics of timely, rapid, accurate and convenient etc. Whatever, manual work only can't match it at all. For this reason, Depending on its significant role in project management, and its characteristics of simple operation, easy to tracking and adjust, Project must will be widely used.

We had used MS software for planning and scheduling of material as well as labour, which gives us brief information about the activities in construction project, showing their start and finish time, and material and labour requirement as well as project duration.

We have done CPM and PERT analysis for Planning. The result obtained by our planning shows that the estimated time of completion of this project is 12 months and 8 days approximately; highlighting the critical activities and critical path duration required for completion for some activities are more than software result.

Which indicate that some activities are delayed by 4 months. We have done resource allocation for those labour, material

and activities which are delaying the project, then we calculated the time required for completing the project using software. Then the comparison between the result obtained by the software and on actual site was done.

Hence, it was concluded that time required for completing the project as per our planning and scheduling is 4 months prior to their planning and scheduling. That's why we completed our project in 8 months and 8 days. Hence our method of planning and scheduling is more scientific

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