

Planning and Scheduling for a Multi-Storied Building using MS-Project

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Abstract - The object of the present work is to study the scheduling methods and construction system of work for multistorey buildings and to achieve the application of Microsoft project software in planning and scheduling of a multistorey RCC building construction and cost of conformance for the project. To complete the above objectives a hypothetical RCC residential G+7 building is considered. The complete planning and scheduling of this building is studied by traditional technique used by Architects, Engineers and contractors and is compared by modern software technique. For this approach Microsoft project software is used for planning and scheduling the RCC building. Observation shows that Microsoft project software serves as an effective tool for generating Gantt chart for the schedule of a construction project and offers the minimum duration of construction time by schedule crunching and project crashing methods in software. Present work presents good information about the application of Microsoft project software for the planning and scheduling of building construction.

Key Words: Project, Time, Cost, Scheduling, Resource Allocation, construction, Critical Path Method (CPM)

1. INTRODUCTION

The Building professional as an integral component of a nation's structure and plays an important role in financial growth through multiple effects on other sectors of economy. Companies are always looking for developments in utilities features, communication tools, effective management methods, and harnessing human resources. There are many issues being faced by the civil engineering and most of them are time and cost related, due to inadequate project planning and incorrect management during completing. Many project planners say that the cost of the project goes above the planned cost by 30% and it is due to improper planning and scheduling. Large scale works become more difficult so the opportunity of exchanging information on papers with establishments at regular intervals becomes nearly difficult. The casual project management system cannot reach the demands of today's projects, as huge amount of data and evidence of a project are always changeable. Project managers in the civil engineering say that the amount of time spent on communication is 70-80% and project certification is 70% paper prone. A warning mechanism must be fulfilled which can alarm the association about its projects achievement and failures in the meantime. Projects with better planning, sufficient flow of resources and adequate machines cannot

achieve good results on its own. There has to be some alerting mechanism, which can alarm the association about its success and failures, on and off.

In India, due to an increasingly local and international competition, construction companies are always motivated for maximum productivity and a economical operational benefit. Companies are always looking for developments in equipment features, communication tools, efficient management methods, and training human resources. They are also narrowing their focus to study in certain projects instead of taking up all forms of it. This specialization requires a very streamlined method for monitoring techniques and extremely good planning for the best services. The profits of operative planning, scheduling and control of building projects are: reduced construction time, decreases cost overruns.

1.1 Project

The projects are the temporary striving which has undertaken to create the unique products, results and services.

Each and every Project will have an unmistakable start date and moreover an end date. The projects are termed finished just when the reason proposed has been accomplished or when it has been chosen that the reason can't be accomplished. For instance, if the venture is to create software design and it is wound up by building up the same, it has said to be reason accomplished. The primary vital element that decides a project is "Temporary". The important point to be noted for that the word temporary need not means short. A task can keep going for 6 months, or 1 year, or even up till 10 years, yet the length of there has a positive start and an end date for the task, it would be called as a Project.

Also, project are "Unique" in nature, i.e. no two tasks can have hundred percent closeness between them. In order to explain a task is a project, the unique feature of the task should be prominent, the minimum bring one feature at least. The individuality may not be obtainable in all parts of the project. There can be recurrences in the project activities and deliverables, but the objective attempted for differs. For occurrence, the exchange reasonable being directed each year in any of the month has another project being done each year, as it expects to undertake an alternate target a apparently endless amount of time. The developing activities don't require exhausting planning since that will be gone to,

all the live long day. Be that as it may, as projects are one of the unique kind we need to plan it in point of importance to decrease the variabilities.

The key components of any task would be as per the following:

- Project has described start and end date.
- End results are particular and responsible.
- Projects are logically expounded.
- The result of the project might be unique.

1.2 Microsoft Project

Microsoft Project is a project management software product, established and sold by Microsoft. It is planned to assist a project manager in increasing a plan, assigning resources to tasks, tracking progress, managing the inexpensive, and analysing 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 achieved by a number of project managers. Microsoft project is planned to assist a project manager in;

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

1.3 Objective of Study

The main objective of this study is

- 1) To develop effective schedule by defining the various activities and arranging these activities in an appropriate sequential order.
- 2) To identify the resources required for all activities, allocating and managing the same with efficiency.
- 3) Estimate duration required to complete the individual activity with the available resources
- 4) To estimate the resources of the project according to the quantities calculated.
- 5) Using Parametric and analogous estimation calculations of duration and resources.
- 6) Developing Critical Path Method to calculate total duration of the project and its critical task.

7) Optimization of scheduling using fast tracking, crashing of the duration and Bottom Up Estimation.

8) To identify the cost of quality of the Budget as per the scope. Namely

- Cost of conformance
- Cost of non-conformance.

2. LITERATURE REVIEW

Shruti Singh, Shweta Istape, Amruta Surve, Sahil Pandey, Avinash Singh, Sangram More (2018) In this study the Planning and Scheduling has been done and the site where located near Karjat, Mumbai, India. According to the estimation they got 20 months to complete this building as per their planning. For this building they have done CPM and PERT analysis for Planning. After MSP work the project time was completed in 18 months by proper allocation. Hence they concluded that the MSP method of planning and scheduling is more scientific.

Monish Kumar K, Maheshwar S Maregoudru, Sparsha B.P (2017) In this study they taken a Apartment for a project work. The methodology has been done in two phases in first phase collection of data and also structural drawings, soil test report, are collected and in second phase actual scheduling process starts by using MS Project. After obtaining results they concluded that Using MSP as a construction project management tool, project planning is done accurately, Budget cost of the project is easily obtained.

Pooja Tripathi, Vinay Kumar Singh, Pravin Singh Tomar, J. P. Gupta (2018) By using Microsoft they made a study on RCC building Project, and the objective of the project scope is to study the scheduling technique and construction sequence for a multi-storey building. To achieve the above objectives a hypothetical RCC residential G+4 building is considered. The traditional software which is used by the contractor is compared with Microsoft Project. After obtaining the result the MSP software works on Gantt chart concept. This gives the easy considerate of the development of the work. It says that the MS Project is more economical than traditional one.

3. METHODOLOGY

The Microsoft Project is used in this project. A proper start and end time must be a project have. Within the obtainable funds and resources the project must be completed and within the assigned time the task must be managed by achieving this a project can be complete in a defined period. The procedure of the work in this process can be carried out in the following way. The flow diagram of the process is obtainable below.



Fig -1: Flow Chart of Methodology

In the Microsoft Project the planning of the construction, the programming and the optimization of the resources are done. The methodology used for this project were the activity was defined first, to prepare a programming report the several activities were used with the different logical relations and durations. Then, collecting a availability of resources and assigning were this can be obtained by the critical path, the levelling and analysis will be carried out and the results will be concluded. In the below MSP the activity were completely described in the following steps.

1. Planning
 - Data Collections
 - Quantity Surveying
2. Scheduling
3. Resource Optimization
 - Resource Allocation
 - Resource Levelling
4. Cost Benefit Analysis

Cost Benefit Analysis: It relates the cost of the quality with the benefit derived from meeting the quality. The primary advantage of achieving quality necessities are:

- Stakeholder’s satisfaction
- Costs are lower
- Productivity is higher
- Less rework

4. INVESTIGATION AND ANALYSIS

4.1 Estimation of the Project

The estimated data of the project where collected from office where the project were studied. The given format is in the form of excel and the calculated quantities of earthwork Excavated, steel reinforcement required, concrete quantity etc were given. This were calculated and was summarized in a excel sheet.

4.2 Planning, Scheduling and Budgeting In MSP

After Collecting the Building Estimation, the resource are calculated and for each activity will be allocated with duration in the sequence of the activity will be done further in MSP the work Breakdown structure will be created by using Intending and Out ending the activities. The activities will be linked later with one another by giving the predecessors.

The Resources like Manpower, Material and Machinery are used for the allocating the resource for the specified activity for the budgeting purpose. The rate per unity should be given by the resources where allocated so that the number of resource required to allocate for the specified activity so that the software automatically computes the total price for that activity later the total budget of the project, and total cost of all activity will be given.

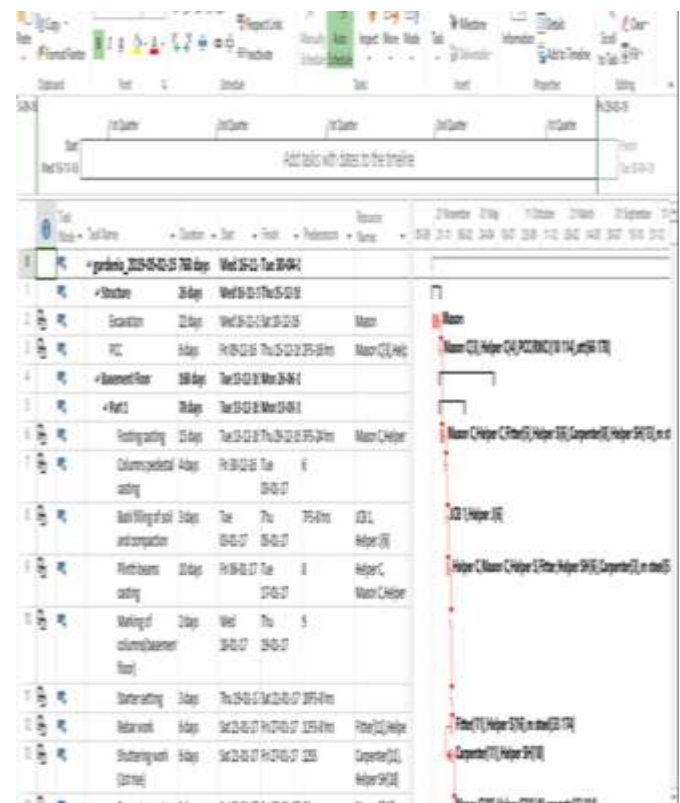


Fig -2: Planning of Project in MSP

4.3 Resource Calculation

The labour productivity sheet where given by the company, the required quantity of work were calculated depending on which the labour required to complete the required quantity. Depending on the duration of the activity the same was implemented to planning, the number of labours required per day can be changed. If again any changes required in the number of labours.

4.4 Identifying the Critical path

Every task is essential, but only some of them are critical. The critical path is a chain of linked tasks that directly affects the project finish date. If any task on the critical path is late, the complete project is late.

The critical path is a series of tasks that controls the planned start or finish date of the project. The tasks that make up the critical path are typically interrelated by task needs. There are likely to be many such networks of task throughout your project plan. When the last task in the critical path is finished, the project is also complete.



Fig -3: Critical Path of the Project

4.5 Cost Benefit Analysis

According to the cost of conformance the supervisor are assigning to the each activity and Quality Control and Quality Assurance is assigned for steel and concrete works this has been done to reduce the over run of the cost after completion of the project. Before spending 1% to 2% of total estimated cost we will be able to control the project over run.

granite work material	Material	363	granite (New works Resource)	Rs30,000.00	Rs0.00/Pr	Prated		357	
plastering material	Material	363	plastering (New works Resource)	Rs20,000.00	Rs0.00/Pr	Prated		358	
Helper C	Work		concrete-1 Mason C	26	Rs120.00/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	359
Helper S	Work		steel-1 Fitter	67	Rs29.50/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	360
Helper SH	Work		Shuttering Carpenter	43	Rs17.50/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	361
Helper B	Work		BlockWork Mason B	16	Rs41.75/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	362
Helper P	Work		Plastering Mason P	61	Rs68.75/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	363
Helper D	Work		Dadoing-1 Mason D	11	Rs69.00/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	364
Helper G	Work		Granite-1 Mason G	19	Rs65.00/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	365
Helper Ca	Work		Door Fram Mason Ca	23	Rs55.00/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	366
Helper W	Work		Waterpro Mason W	18	Rs69.00/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	367
JCB L	Work		JCB Mason	1	Rs4333.25/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	368
semi skilled electrician	Work		electrical-skilled electricia	14	Rs61.50/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gardelia	369
helper	Work		plumbing-plumber	11	Rs61.50/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	370
4" Block	Material	363	4" Block	Rs5,129.00	Rs0.00/Pr	Prated		371	
Helper J	Work		job-1 JCB L	6	Rs61.50/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	372
ESC Resources	Work		ESC Resou.	1	Rs0.00/Pr	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	373
Residential Villa	Work		R/R	11	Rs0.00/Pr	Rs0.00/Pr	Rs0.00 Prated	ABC	374
Mason	Work		R ESC Resou	18	Rs17.50/Pr	Rs45.00/Pr	Rs0.00 Prated	ABC	375
PCC(BMC)	Material	114	PCC Resident	Rs1,500.00	Rs0.00/Pr	Prated		376	
Supervisor	Work		S	1	Rs300.00/day	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	377
QA / QC	Work		Q	1	Rs800.00/day	Rs0.00/Pr	Rs0.00 Prated	Eminence/Gai	378

Fig -4: Supervisor and QA/QC resource sheet



Fig -5: Resource allocation for supervisor and QA/QC

5. RESULTS AND DISCUSSION

In this project using Microsoft Project the Project duration is optimized. By creating the WBS (Work Break down Structure) and allocating the resources the total duration of the project is calculated by planning and scheduling the project. And also the cost benefit analysis has been done the total cost of the project has been increased by 1% to 3% for allocating supervisors and Quality Assurance and Quality

Control for the activities, the cost conformance can be achieved.

5.1 Time Optimization

Efficiently scheduling the project for 768 days using CPM.

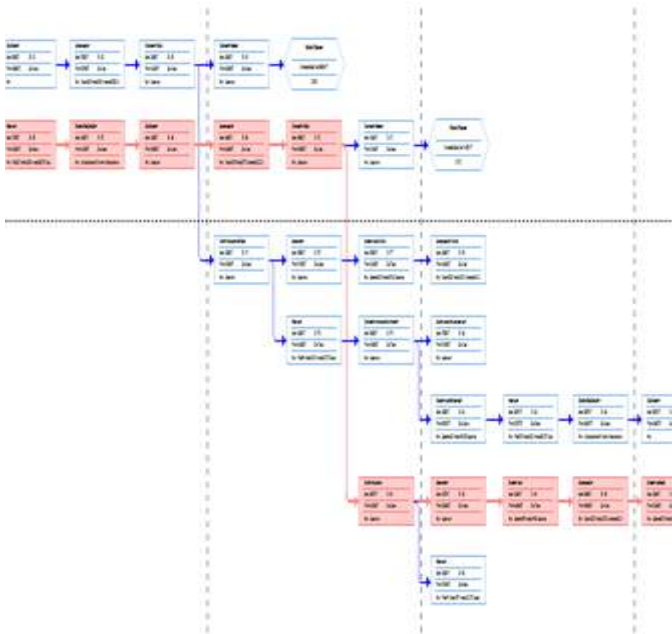


Fig-6: Critical path Method in MSP

5.2 Resource Calculation

According to the quantity of the project surveyed the resource are calculated according to the productivity sheet where given by the company the required quantity of work were calculated depending on which the labour required to complete required quantity.

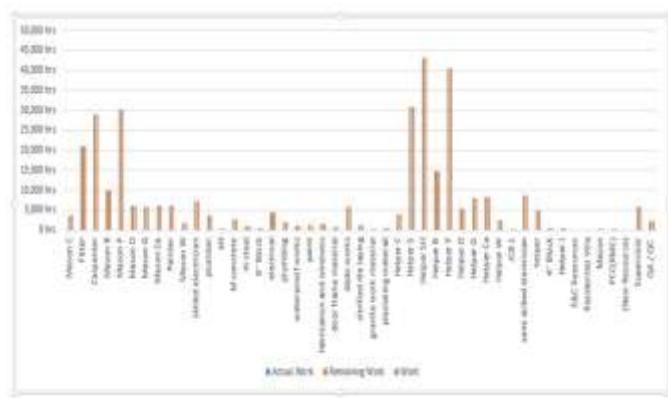


Chart -1: Total duration for workers

5.3 Fast Tracking

The duration of the project was found to be 768 days after fast tracking. The start to start predecessor were used for the fast tracking process.

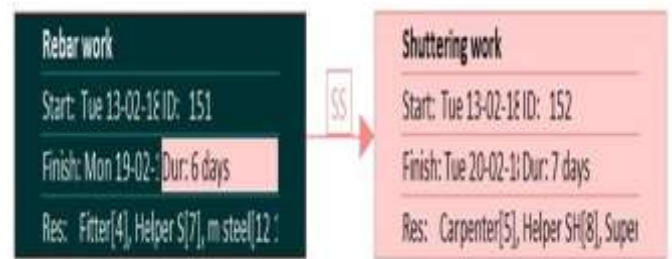


Fig -7: Fast tracking

5.4 Cost of conformance

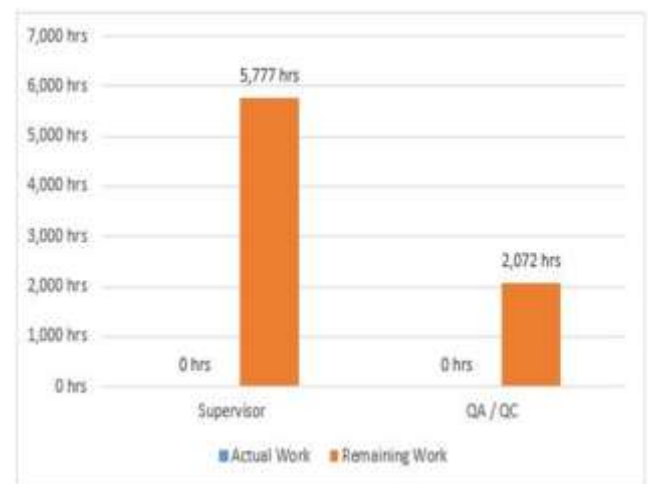


Chart -2: Total duration for supervisor and QA/QC

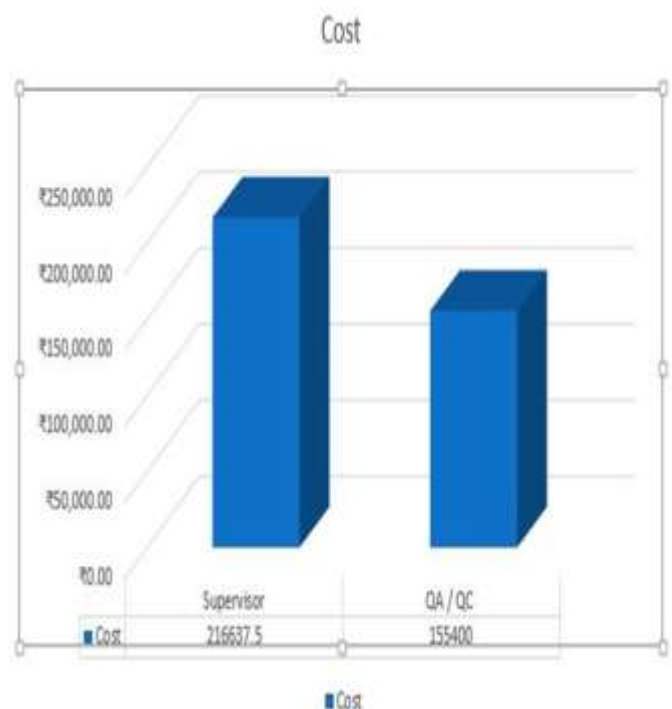


Chart -3: Total cost for supervisor and QA/QC

$$\begin{aligned}\text{Total cost of Conformance} &= \text{Supervisor} + \text{QA/QC} \\ &= 216637.5 + 155400 \\ &= 372037 \text{ Rupees}\end{aligned}$$

6. CONCLUSIONS

Following conclusion can be made from the result obtained from the project.

- Features like Critical Path Method in Microsoft Project for Planning and Scheduling is proved to be very effective then doing manual Planning and Scheduling
- Optimization of the Duration was carried out by Fast tracking, Crashing and bottom of estimation to decrease the duration of the project to 768 Days.
- After carrying out the duration Optimization it helped to define the resource and its quantities.
- Microsoft Project helps to understand the under allocation and over allocation of the Project and allows it to level the resources timely.
- As we have estimated the activity duration using parametric and analogous Estimation we could achieve to get the accurate duration of the task.
- With the seven Basic Quality tools Project was executed with zero defects.
- Adding on Extra resource in terms of supervisors and Quality Assurance\Quality Control on to the tasks to ensure the Quality in controlled and Monitored throughout the duration of the Project therefore Cost of Conformance = 3,72,037Rs
- According to the survey of KPMG, it says that after the completion of the project, the overall cost of the project 10% to 30% of the cost will over run. The above cost of conformance Graph it proves that spending approximately 1% to 3% of total estimated cost we will be able to control the project over run.

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BIOGRAPHIES



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