

Application of MS Project for Optimizing the Delay in Construction of Multistoried Building Caused Due to Uncertainties

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Abstract - Construction Industry is a field that involves construction, modification, renovation and rehabilitation of various structures. Success of every project is depend on time and cost. The goal of project management is to complete the project within specified time and estimated budget. Delay in completion of project leads to overrunning of cost the project. This article deals with uncertainties like heavy rain and pandemic covid - 19 encountered during the execution of multi-storied building. With the application of project management tool as Microsoft Project is employed for planning and scheduling of the building. For the convenience of the execution of this work is divided into four stages, in each stage the planning and scheduling of building is done with the application of project managing tool. In first stage only project duration is considered without any effect of delay, second stage considered with the effect of heavy rain, third stage considered with the effect of Pandemic covid -19 and in the fourth stage planning and scheduling is made by considering both the delays to minimize the total delay by applying Advanced project management techniques.

We made an attempt to minimize the delay with the help of MS Project tool by applying some techniques like resources enhancement, project crashing, reducing dependencies and effective tracking the critical path

Key Words: Project Management, Microsoft Project(MSP).

1. INTRODUCTION

Civil Engineering is one of the mother branches of engineering which has its roots from ancient times. Caves were the oldest form of shelters and the wooden logs laid across the banks of a river formed a bridge. Further with time and growth in modern science and technology this stream widened its scope and is known as “Construction Industry” in today’s world. Construction Industry is a field that involves construction, modification, renovation and rehabilitation of various structures. It has become one of the leading employment sectors in our country. With the growth in infrastructure needs to fulfill the humans needs this industry grew in three dimensions and has equipped itself to take up any challenge of the modern world. Introduction of modern machinery has also aided in the growth of construction sector.

Further the introduction of the concepts like “Time Value of Money”, the Civil Engineer understood the need of projection

completion in the shortest possible time. This paved the way for a new field in Civil Engineering branch which is known as Construction Project Management”. As a great demand for construction with new technology in the short time, the need for Fast-track construction has become increasingly common in the current scenario and Fast-track construction is used for most building projects. With the application of this technology the duration and cost of the overall construction can be reduced. The average time required to build multifamily housing varies with the total number of units in the building. But the lag in the construction or execution of project will contribute extra delay in the completion of work which needs to be actually calculated. Most of the construction projects face serious problems in overrunning of cost and time. Cost and Calendar are the most important elements for the success of any Project as the total project costs are very high. Resource Management is also considered as an important parameter for the project success. The resources have influence on the project form beginning till the end of project and hence should be properly managed. All the issues related to the resources which can be in case of estimation, procurement, storage, supply, transportation etc should be addressed in time to prevent a Delay in Construction.

1.1 Construction Delay

Delay in the Construction is considered as time lag in the completion of work with respect to a specified time mentioned at the start of the work. It directly affects the project cost and thus impact the success rate of the project. It becomes the responsibility of the engineer to prevent the delays in construction. If in case the delays are invincible than the engineer should develop an alternate plan to minimize the delay in construction.

1.2 Causes of delay in Construction

The delay may be caused due to many reasons which are as follows:

- a. Inefficient management
- b. Construction implementation failure
- c. Design issues
- d. Scope increase
- e. Failure in coordination
- f. Economy failure
- g. Natural calamities.

h. Epidemics/Pandemics

1.3 Microsoft Project Software

Microsoft Project Software is a software product developed by Microsoft for the project management. This helps project managers monitor the project through the creation of a schedule, assigning resources to the activities, managing the budget and evaluating the workload. The MS Project will develop budgets based on allocation of work and resource levels.

Since the amount of resources allocated to tasks and assignment work is estimated, the cost is determined by software that is proportional to the rate of work hours, rolling up to the level of task to every overview task and finally to the level of the project. Asset consists of people, equipment and resources and each asset will have a calendar of its own with individual levels indicating which days and shifts.

Each resource may be allocated in multiple plans to individual or multiple tasks, and the application schedule function based on the resource availability.

The MS Project establishes timeline and critical chain for critical route. Schedules may be resource graded, and in a Gantt map vital chains are visualized.

1.4 Some of the important views in MS Project

a. Gantt Chart View: This is a default view which gives information about tasks, duration of each task, starting and finishing dates and resources allocated to that specific task.

b. Resource Sheet view: This elaborates all available resources allocated to a project in a sheet format. It doesn't tell which tasks are assigned to which resource.

c. Resource Usage view: This groups the tasks against each resource.

d. Task Usage view: It shows details about each task that which task is assigned to whom and working schedule of each resource.

d. Calendar view: Tasks bars appear on the days they are scheduled to start.

e. Network Diagram view: It shows relationship among tasks and also the dependencies

1.5 MS Project capabilities and Features

- Helps in Developing and managing the project schedule.
- Allocating and managing the project resources.
- It allows to share resource with a common resource pools.
- Helps in Managing the earned value.
- Capacity to reach diverse reporting needs with the help of built-in and custom reports:

- Ability to manage multiple projects with master plan project:
- Provision of different views which can be customized:
- Project timeline view:
- Groups, Filters and Highlights will help along with task management:

1.6 Microsoft Project benefits

- It always stay in control.
- Through the introduction of traffic light and early warning signs, concentrating on critical route never loses and retains understanding of the conflicts.
- It is user friendly and is easy to learn.
- With the effective use of different calendar can optimize the resources utilization over the project in the group using shared resource pool.
- Stakeholder presentations and emails can be used directly by creating customized birds-eye view.
- It is used to assess impacts very quickly with various alternatives.
- Easily users can integrate MS-Project with other tool which helps to communicate with diverse stakeholders.

2. OBJECTIVES

1. To plan and schedule the activities for Commercial cum residential building of G+3 with basement using Microsoft Project.
2. To identify the total numbers of days required to complete the Commercial cum Residential building.
3. To identify the lag phase and to reschedule the activities considering the lag caused due to Heavy rain between July - August 2019 and delay due to Covid-19 between March - May 2020.
4. To summarise the total delay of the project.
5. Applying Advance scheduling technique, to compensate lag phase of project.

3. METHODOLOGY

A multi-storied commercial cum residential building, which is under construction is considered for present study. The study of the building focuses on the delay caused due to uncertainty in the construction work due to heavy rain and pandemic like Covid-19. Mainly we are concentrating how the delay was occurred and how to overcome the delay without causing much difficulties in the work is to be determined by applying the MS Project.

An analysis of planning and scheduling is carried out for the commercial cum residential building of G+3 with basement by applying Microsoft Project software and the total duration for the construction is determined. The first delay

due to rain is considered in the prepared schedule and the total number of days to complete the project with delay is identified. Then the second delay is considered which is occurred due to pandemic disease is also considered and total time required to complete the project along with delay is determined.

The methodology is conducted by considering the following steps:

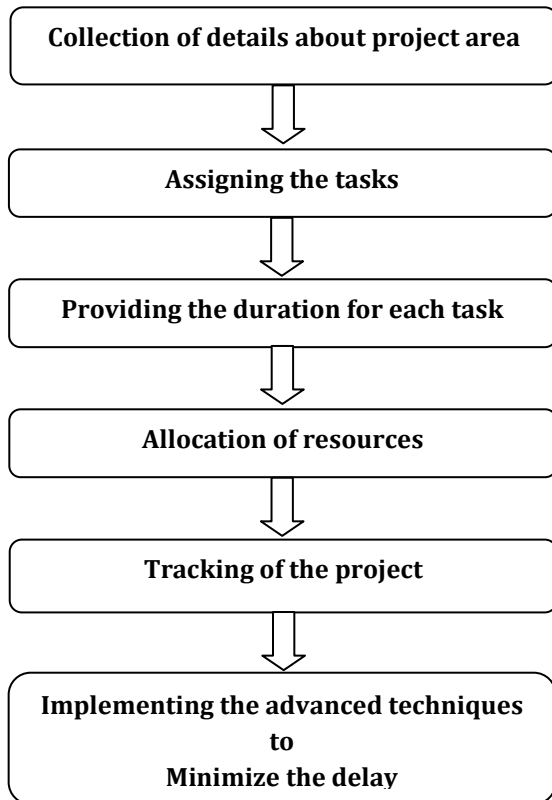


Fig-1: Methodology

3.1 Methodology involves following steps:

Collection of details about the site area:

Firstly the site details were collected, the collected details are:

- Project Name : DATTA RESIDENCY (F- BLOCK)
- Location – Manjunath nagar 2nd cross Hubli.
- Building entrance at North-East direction..
- Project area – 8330 Sq.ft.
- Type of project: Commercial cum Residential.
- No of stories: G+3 with basement.
- Start of the project: November 2018.

3.2 Study Analysis:

- Normally construction is carried out in Traditional way where lot of problems will arise like paper work, resource allocation, improper scheduling, time management, environmental issues etc.

- To overcome the above problems, project management can be carried out accurately and effectively by applying management techniques like Microsoft Project software.

3.3 Execution of project:

- To begin with, data is collected for a Commercial cum residential G+3 with basement and is analyzed. According to the collected data the tasks are performed using Microsoft Project software as follows:

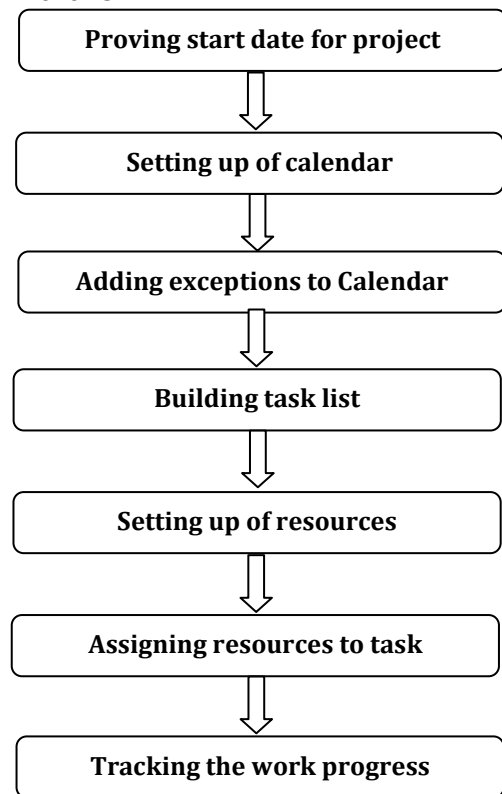


Fig-2: Execution in MS Project

3.4 Advance scheduling techniques are as follows:

Advanced scheduling technique consists of following steps: First visually highlighting the tasks successors and predecessors.

- A. Adjusting task link relationship:** Task link relationships can be adjusted using four types of dependencies, they are
 - Finish-to-start (FS)
 - Start-to-start (SS)
 - Finish-to-finish (FF)
 - Start-to-finish (SF)
- B. Adjusting link between the tasks:** By adjusting the link between the for more control over how the tasks are related.

C. Adding constraints to task : Constraints are used to determine the degree at which the task can be rescheduled.

- Flexible Constraints
- Inflexible Constraints
- Semi-Flexible Constraints

Some of the other methods to minimize the delay are:

- Increasing the number of resources
- Project Crashing

➤ **RESULT**

- Proposed Start Date: 08.11.2018
- Planned Finish Date: 22.07.2020
- Total Duration: 467days.

STAGE II: Project Duration considering the effect of Heavy Rain

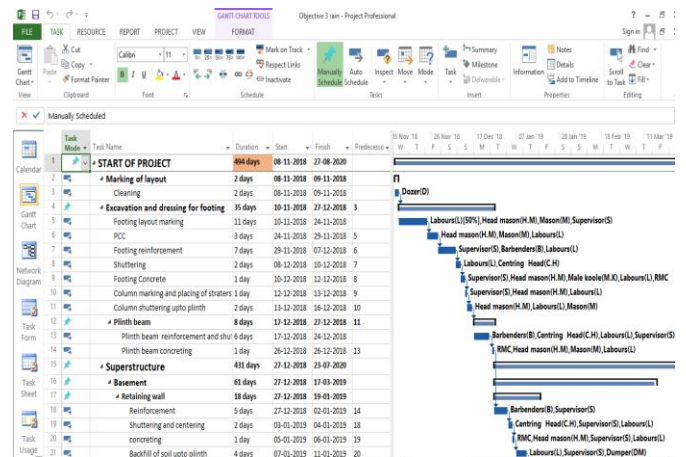


Fig -4: Delay due to heavy rain

➤ **RESULT**

- Proposed Start Date: 08.11.2018
- Delayed Finish Date: 27.08.2020
- Total Duration: 494days.

STAGE III: Project Duration considering the effect of Pandemic Covid-19

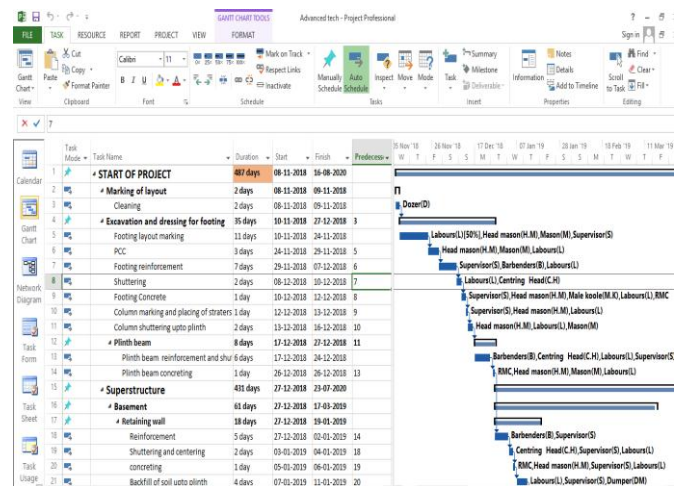


Fig - 5: Delay due to Covid -19

➤ **RESULT**

- Proposed Started Date: 08. 11.2018
- Delayed Finish Date: 27. 08. 2020
- Total Duration: 526

4. STAGES OF WORK

For the convenience of the execution of this work is divided into four stages, which are as follows:

- ❖ **STAGE I :** Project Duration without the effect of any delay
- ❖ **STAGE II :** Project Duration considering the effect of Heavy Rain
- ❖ **STAGE III:** Project Duration considering the effect of Pandemic Covid-19
- ❖ **STAGE IV:** Modified project duration applying Advanced project management technique

5. RESULTS AND DISCUSSION:

This work takes an account of the construction delays occurring during the execution of the Basement + G+3 commercial cum residential building which is a case study considered. The major hurdles encountered in project execution were Heavy Rains during July-August 2019 and the lock-Down due to Covid-19 during March-April 2020. These delays were considered in reframing the project schedule and a best possible attempt is made to restrict the increasing in project duration by increases the number of resources, project crashing, reducing dependencies and effectively tracking the critical path.. The results of this study are further discussed in this chapter.

STAGE I : Project Duration without the effect of any delay

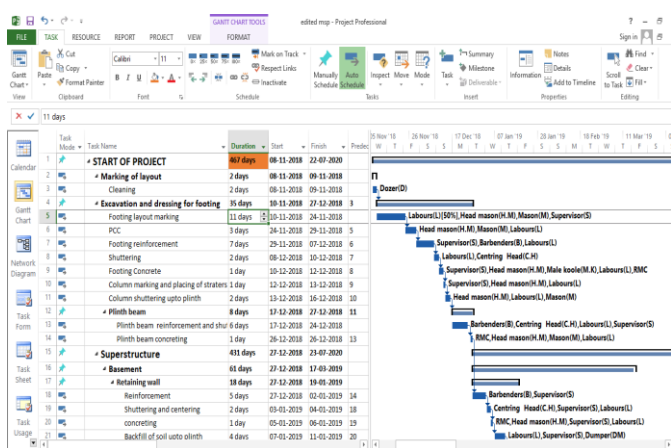


Fig - 3: Planning and Scheduling using MSP

STAGE IV : Modified project duration applying Advanced project management technique

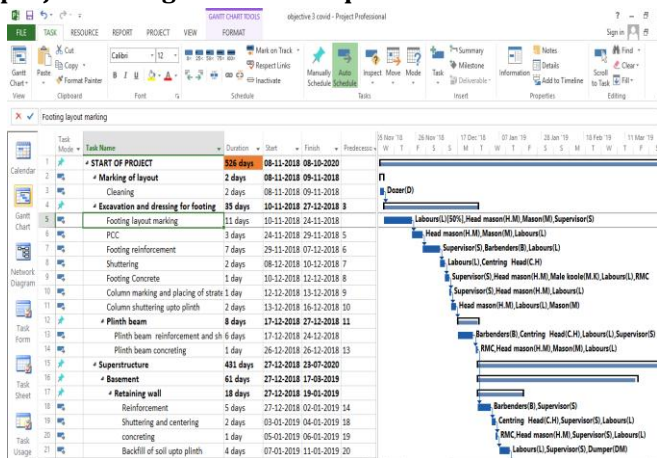


Fig – 6: Modified schedule with the application of Advanced scheduling technique

RESULT:

- Proposed Started Date: 08. 11.2018
- Delayed Finish Date: 27. 08. 2020
- Total Duration: 526

PIE-CHART REPRESENTING THE DIFFERENT STAGE

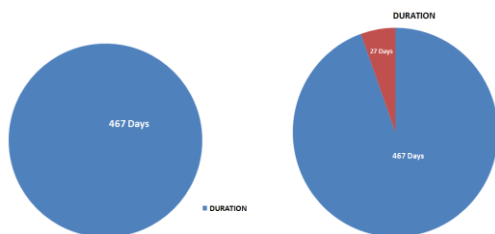


Chart – 1: STAGE - I Chart - 2 STAGE - II

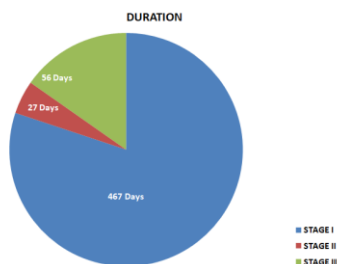


Chart – 3: STAGE - III

6. CONCLUSIONS

- The proper use of project management methods will minimize the construction time without compromising the quality and efficiency of the project.
- The use of MS Project software for planning, scheduling and tracking is more efficient than traditional methods of updating that provide a proper scheduled path.

- We can determine the duration and resources required for individual activity by applying MS-Project in advance.
- Time management and resource management are considered to be the key factors that are easily tracked during construction with the application of project management tool as MS project.
- From the present report, as expected, the construction of G+3 commercial cum residential building with basement is to be completed within 467 days within 22-07-2020. The delay occurred twice during the construction which caused the total delay of 88 days in completing the project.
- With the application of Microsoft Project, the project is rescheduled by considering both uncertainties, which will be completed by 13-11-2020 according to the rescheduling of the project.
- The connection between the successor and the predecessor is strengthened by using some advanced techniques in project management software, task relationships are modified, and constraints are added to reduce construction delay.
- Resources enhancement, project crashing, reducing dependencies and effective tracking the critical path are employed to minimize the delay in construction
- The rescheduling of the project is made with the use of MS Project techniques and the overall completion period is shortened by 68days with the completion date of 16-08-2020.

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