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Delay Analysis of an Ongoing Site Construction – A Case Study

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ABSTRACT -- Delay is a project management technique used to analyze the success of a project. In the construction industry, delays often cause contractors to miss deadlines. Time and cost are very important constraints in any project. Delaying a project at just the right time allows better decisions to be made and potential problems to be spotted early. Currently in charge of construction management of UVCE Boys Hostel at MS PROJECT. The purpose of this research is to find the delay factors that affect the project, compare the planned and actual schedule, and find the overtime that occurred. All additional costs incurred during the implementation of the project are also incorporated here. Important factors identified in this case study include cement delivery delays, labor productivity delays, steel procurement delays, and lack of formwork materials. It's a major delay effect and has an excessive cost.

Keywords—Planning, Schedule, labour productivity

I. INTRODUCTION

Construction industry has witnessed a drastic growth over the past few years. Construction development administration includes arranging, planning, creating, financing and oversees the development of project. It also includes the election, procurement, installation, testing and commissioning of facilities, equipment and technology. Development directors' part includes arranging, plan, executing and tracking the development venture. Construction managers plan, schedule, implement and monitor the construction projects. Every construction project has a clear role with assigned responsibilities, along with a management system to hold everyone accountable. A clear leader with good communication skills must lead the construction team for the success of the project. Assign roles and responsibilities to team members with the appropriate skills. Leverage people's key strengths to achieve the best results.

Construction delays are considered as the time lag in completion of activities from its specified time as per contract or can be defined as the late start or late completion of project activities to set baseline schedule, which directly affects the project specified cost. The building sector is a crucial aspect to a country's economic development. Construction is the process of converting plans, concepts, standards, specifications, and resources into a physical building that meets owner's precise criteria.

The construction project has multiple numbers of issues. The methods utilized to dissect the actual delay on the project and forecast the effect of current delay on project completion dates. However, delays can happen for different reasons such as climate, equipment failures, labor shortages, missing or incorrect information.

Delay in the construction process might result in noteworthy loses for all the parties that are involved. There are some reasons, like weather that are past your control, but most of the project delays can be dodged. When it comes to avoiding delays in your projects, nothing includes a more critical affect than having a detailed project plan. A project plan that can easily be overhauled as the project moves forward offers a bird's eye view of the project.

II. LITERATURE REVIEW

According to this study, project managers play an important role in planning and execution of the construction projects. The main objective is to create the overall plan and reduce the time and add up taken a toll of the extend. This add up to consider was carried out to have a legitimate by and large plan of the extend and optimized use of the asset to total the venture. Time overruns and cost are the main reasons for any construction project. This is also the main reason which causes negative impact on the development of the country growth. Other than the effective planning it has been reported that 86% construction projects are getting delayed. There are multiple reasons for such delay which results in cost and time overruns. Construction delay in project is troublesome and more expensive. It is essential to implement the project management with the assistance of any management software as it will eliminate the delay causing in the construction projects as we can keep a track on the project. In this way a project can be more successful. Thus planning, scheduling, tracking plays a vital role in any project. On studying the above journal papers, it has been

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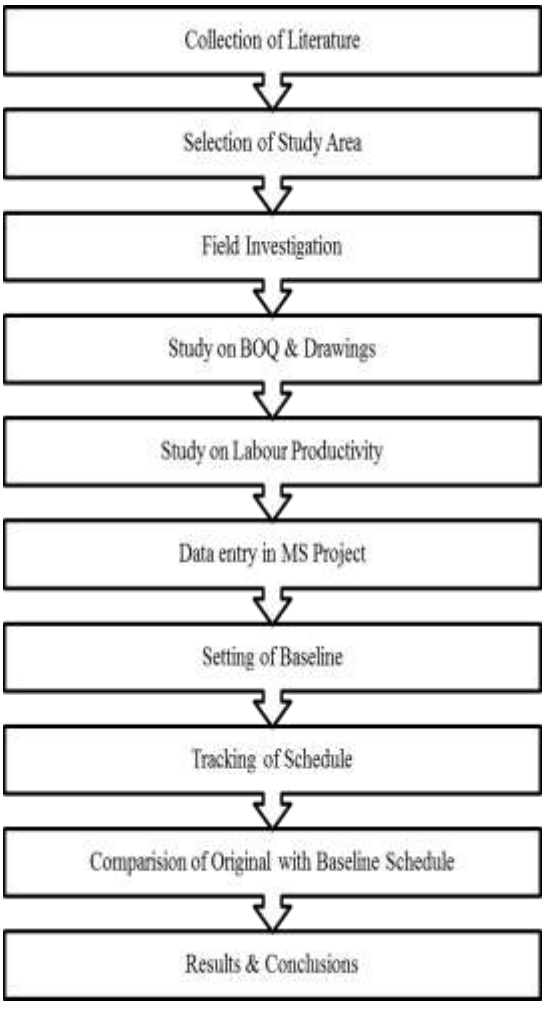
observed that the construction projects delay due to many factors and guides that the project managers can overcome the delays by their previous experience and can avoid or mitigate the delays. They also presented an overview of many sorts of delay, risks that are related to project planning and scheduling, as well as how to strongly absolute the project. The main effects about delay are cost overrun, time overrun and total abandonment.

III. METHODOLOGY

In this study a G+3 Boys hostel building is taken. Analysis was carried out giving comparision between ACTUAL AND PLANNED SCHEDULE even cost comparison is given. Collected all the respective drawings, carried out field visits, study of BOQ. The data was studied and then entered into MS project and schedule was made. Even study on labor productivity was done as productivity plays an important role in construction. Firstly, planned schedule was made and it was compared with the actual schedule.



IV. SITE DESCRIPTION

The building taken for study is a G+3 floor UVCE Men's hostel. It is located in UVCE Hostel Campus near K. R. Circle Bengaluru. The Name of the Agency is M/s. Gandhiraju Construction Pvt. Ltd Bengaluru. Total project period is 11 months and the start date is 01/03/2021. The planned end date is 01/02/2022. Extent of land provided for the project is 2.30 Acres. The proposed hostel (Master plan) is designed for 500 UG, 200 PG, and 100 PhD students. In this Master plan there are two blocks of hostel and one block of Mega mess. Each hostel block has ground floor and 6 upper floors and the Mess block has stilt and 5 upper floors, having mess in 2 floors, multipurpose hall in 1 floor, auditorium in 2 floors, The whole project will be taken up in different phases. In phase-1 one hostel block with G+3 is considered. Main entrance to the proposed site is West side. Large open to sky courtyards (2 No's) are provided at the centre to achieve ample light and ventilation within the building. 2.20 wide corridors are provided for free movements of students. Phase1 Hostel block is G+3 floors (Above 3 floors in future expansion). Phase 1 Hostel block is proposed for total 440 students out of 500 UG students. 26 rooms in ground and 28 rooms typical floors (1st, 2nd and 3rd floors) It has an area of 1350 Sqm on each floor. 4 staircase and 2 lifts of 13 passenger capacity are provided. Electrical and storeroom are provided in GF. Warden room is provided near the lift in GF. Each floor has an activity room. The phase 1 portion proposed land is at 105.5 level and phase 2 (Existing boy's Hostel) is at 103.5 levels, thus there is 2m level difference between the existing building ground level and proposed building ground level. Thus, the plinth level of the proposed boy's hostel shall be 104.25 level. 9m setbacks are provided all around to meet the building byelaws.

DELAY ANALYSIS

Construction delays are considered as time slack in completion of activities from its indicated time as per contract or it can moreover be defined as late completion or late start of activities to the baseline schedule which will directly influence the cost of the project. Construction delays are basically the circumstances where the construction project finish at a later time than anticipated due to causes related to the client, consultant and contractor

The causes for construction delays:

- Poor site management.
- Securing finance.
- Changes in design.
- Rework due to errors in construction.
- Accidents due to poor site safety.
- Unrealistic project scheduling.

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- Labour shortage.
- Material supply.
- Permits.
- Weather condition
- Poor communication and coordination by contractor
- Shortage of materials.
- Long time to get permits.
- Environmental aspects

The major effects that cause due to construction delays are

- Cost overrun.
- Time overruns.
- Litigations.
- Poor quality of work due to surge of completion.
- Disputes among client and contractor.

Construction delays can be avoided, but is that indeed conceivable to a wide degree, yes. Whereas you can't prevent each delay, you will have to take necessary action to keep your project on track and overcome from delays that can occur.

The following can avoid project delays:

- Setting a realistic goal for your project.
- Communication breakdowns.
- Hold a team meeting.
- Review designs thoroughly
- Gather the right resources.
- Prepare for weather delays.
- Schedule carefully.
- Track and measure progress.
- Resource availability.
- Forecast

V. COMPARITIVE ANALYSIS

Calculation for resources:

Example1: Plinth beam reinforcement for Block 1

Total quantity from BOQ = 6664 tonne

Manpower required = $\frac{6664}{4*150}$ =11

So, the required quantity is in the ratio of 1:1 i.e., 1 skilled
bar bender and 1 Helper.

Example 1: Lower ground floor Block 1 Slab shuttering

Total quantity from BOQ = 915.2 sqm

Manpower required = $\frac{915.2}{30*8}$ = 3.81 = 4

So, the required quantity is in the ratio of 1:1 i.e., 1 skilled shuttering labour and 1 helper.

Example: Blockwork for First floor block 1

Total quantity from BOQ = 1078.65sqm

Manpower required = $\frac{1078.65}{3*13}$ = 27.65 = 28

So, the required quantity is in the ratio of 1:1 i.e., 1 skilled mason and 1 unskilled labour

Example 2: Internal plastering for Ground floor block 1

Total quantity from BOQ = 4125.07 sqm

Manpower required = $\frac{4125.07}{12*20}$ =17.18 =18

So, the required quantity is in the ratio of 1:1 i.e., 1 skilled mason and 1 unskilled labour

PREPARATION OF PLAN AND SCHEDULE

1. **Firstly,** collecting of planned program chart and calculating the respective resources that are required for each activity. And then adding the resource to the particular task
2. **Secondly** maintain baseline project to the planned schedule and assign of baseline project.
3. **Lastly**, updating the progress of the project to each activity of actual dates and percentage of actual work completed.

In this project, it can be clearly observed that the project is delayed by days. The major delay factors include covid breakdown, heavy rainfall and cutting of trees at site and labour productivity delay.

As per planned schedule and actual schedule till Second floor internal plastering June 27 2022

Planned duration =360 days

Actual duration = 530 days

Variance in BL project duration is 170 days

The prepared plan and schedule for UVCE Boys Hostel building project.

The project consists of G+3 floors

Example: Foundation of Block 2 consists of WBS and activities

The WBS are Footing earth work, Footing PCC, Column marking, footing reinforcement and shuttering, footing concrete.

WBS for Foundation block 2

Footing earth work it is 1st activity and is delayed by 90days. Foundation of block 1 and 2 was supposed to start at the same time, but due to the covid lockdown it got delayed.

Next activity is Footing PCC it takes the relation finish to start and is delayed by 1 day due to labour shortage at site.

Next activity is Footing marking it takes the relation finish to start and is not delayed.

Next activity is Footing reinforcement it takes the relation finish to start and is delayed by 1 days due to labour productivity.

Next activity is concrete Footing concrete M25 it is delayed by 2 days due to non-availability of concrete/concrete materials.

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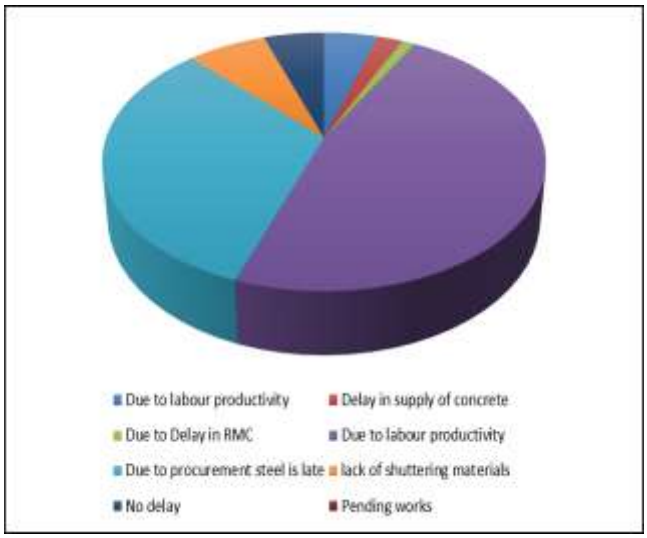
Similarly, the other WBS and activities takes place

The overall summarization of this project is recognizing the delays and the necessary recommendations needed are suggested to overcome the problem of delay. Basically, the delays differ from one project to other. Here a different way of approach is made to understand the causes of delays and to overcome it.

Pie chart for Factors causing delay

DELAY FACTORS	DELAY IN DAYS	VARIANCE IN AMOUNT MATERIAL AND LABOURS Rs.
DUE TO RMC	2	10,18,056,2
DUE TO SUPPLY IN CONCRETE	5	32,941.83
DUE TO LABOUR PRODUCTIVITY	113	8,88,835.90
DUE TO PROCUREMENT OF STEEL	11	9,38,462.50
DUE TO SUPPLY IN CEMENT	22	62,883.33
DUE TO LACK OF SHUTTERING MATERIALS	17	1,37,734.39



Factors causing delay

Variance in days associated with the project

PARTICULARS	VARIANCE IN DAYS
ACTUAL DURATION	530
BASELINE DURATION	360

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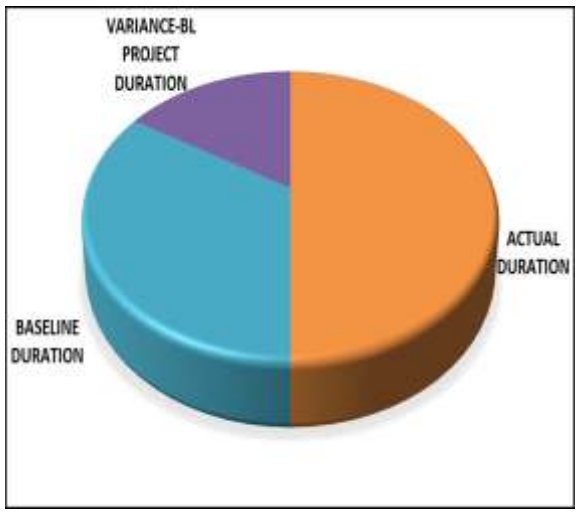
VARIANCE-BL PROJECT DURATION	170

Variance in days associated with the project



Pie chart for Variance in days

The above tabular illustration shows the possible losses that have occurred during the execution of the project and have caused delay by one or other reason. In this project the delay is **170 days** and the additional cost that as incurred to project because of delays is **Rs 2060857.95.**

This project mainly includes many other activities which have incurred a great loss. As the size of the project increases the loss also increases tremendously. So, it's very important to take care of these factors and plan accordingly. This study helps us to take the preventive measure for the future projects and helps to minimize the losses.

Here the study totally summarizes the reasons that cause the delay in the respective activities of the work. A live construction project was undertaken for case study and the practicable reasons for delay caused in the activities were recognize and the impact that has incurred due to the delay. The reasons that caused delay were identified as covid lockdown, heavy rainfall, delay in procuring of materials, lack of resources. This delay has led to a drastic increase in budgeted cost, consuming more time in completion of project, improper use of resources. This delay can be overcome by effectively monitoring and strong teamwork.

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