

# Planning and scheduling of a multi-storeyed residential building with conventional execution approach as compared with application of project management techniques

Rashmi J V<sup>1</sup>, Amey A Kelkar<sup>2</sup>, Vishwanath K G<sup>3</sup>

<sup>1</sup>P G Student, Jain College of Engineering, Belagavi-590006, Karnataka, India

<sup>2</sup>Asst. Professor, Dept. of Civil Engineering, Jain College of Engineering, Belagavi, Karnataka, India

<sup>3</sup> Professor, Dept. of Civil Engineering, Jain College of Engineering, Belagavi, Karnataka, India

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**ABSTRACT:** Success of every construction project is governed by two vital components; cost and time. The main aim of project management is to complete the project within specified time, cost and scope along with assured quality. Adopting conventional execution practices, it is difficult to constantly measure the progress of work, evaluate plans, track the cost and time as well as adopt corrective measures wherever required. Planning effectively by systematic application of project management skills and techniques has become the need of the hour in order to overcome the problems faced by adopting conventional construction execution practices.

There are various tools and techniques available for optimizing the construction procedure to prevent cost and time overruns. The monitoring tools adopted during construction plays a significant role for thriving completion of project on time and within estimated budget.

In this study, an effort is made to estimate the overall cost and time required to execute a multi-storeyed residential building by use of conventional construction execution practices and by adopting project management techniques to compare the results for justification.

**Keywords:** Project Management, Microsoft Project (MSP), conventional construction execution, cost optimization, time optimization and resource optimization;

## 1. INTRODUCTION

Project management involves the application of various knowledge areas, tools and skills along with numerous techniques to congregate project requirements like duration and cost.

The factors that affect project management are:

1. **Project cost:** Projects must be within the planned budget.
2. **Project time:** Project must be delivered on specified time.
3. **Project scope:** Project must be within précised scope

4. **Project requirement:** Project should meet client's requirement without affecting the quality, budget, précised scope and should be completed and delivered on specified time.

### 1.1 Project Management in construction

A project generally starts at the right pace but as it proceed, activities gets off the schedule due to various tribulations like; improper planning, uncertainties, non delivery of resources on time, execution delays, environmental factors and so on, which directly impacts on cost.

Thus, application of project management in construction aims to accomplish the precise goals by virtue of perfect planning, scheduling, executing, monitoring as well as controlling time, finances and utilizing all resources effectively. It is an interconnected group of processes which directs the project team to accomplish a successful project within specified cost as well as time.

### 1.2 Project Management Software

Project management can be implemented to projects achieved via software like Microsoft Project and Primavera, which are applications developed to help manage projects and other works effectively. The applications are able to perform the following:

- a) Develop and schedule a plan
- b) Create an appropriate standard base calendar or based upon usage working calendar
- c) Assigning relationships between scheduled activities
- d) Define resources required for the project
- e) Helps to level and smooth out the resources between activities
- f) Helps to update and track work progress regularly
- g) Performs earned value analysis
- h) Allows to incorporate revisions and reanalyzes the data

i) Provides results for documentation

### 1.3 About Microsoft Project

Microsoft Project is a Project Management software, developed and sold by Microsoft. It is designed to assist the project manager to develop the plan, schedule the activities, assign resources to the activities, track the progress, manage the budget and analyze the work loads. Microsoft project can identify different classes of users. These different classes of users have diverse access levels to various project views, levels of project and other data. Software is applicable to track single project with numerous activities and resources. It comprises of an option to visually choose the resources as per the requirement. Calendars, tables, filters, views and other customization aspects in Microsoft project are stored as an enterprise inclusive (global), which can be accessible to all users. Microsoft project utilizes the team collaboration and accesses the results.

### 2. OBJECTIVE

A detailed study was carried out with respect to construction of a multi-storeyed residential apartment regarding cost, time, labour and material management.

The objective of the study was to compare the Conventional approach (Plan A) and Project Management approach (Plan B) of execution taking into account the cost and duration criteria to understand and improve the construction execution practices.

### 3. METHODOLOGY

A multi-storeyed 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-storeyed 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**.

#### 3.1 Case study details

- Name of the project: "Banashankari Gardenia", residential project at Tilakwadi, Belagavi
- Location: P.No. 9, CTS No. 197, Agarkar road, Tilakwadi, Belagavi

- Type of the project: Residential apartment
- No of stories: G+3 with basement
- Start of the project: January 2016
- Completion of project: March 2017
- Site area: 796.74 sqm
- Type of construction : RCC framed structure

### 4. STUDY ANALYSIS

The study has been conceded in two stages.

- Conventional execution approach which is also the traditional way of construction execution practices.
- Project management approach which provides an accurate and effective plan by applying management techniques for construction execution.

The analysis is carried out using M.S.Project software. Based upon the calculated data, network diagram is prepared as well as relations are assigned to activities with respective resources to calculate critical path. The variance between the duration and cost is calculated using MS Project.

#### 4.1 Plan A- Conventional approach for execution

The data obtained from the construction site was analyzed and incorporated into MS Project application to obtain a detailed result of the cost and duration planned for construction of the building.

As a result, A duration of 418 days and cost of Rs. 3,89,43,521/- has been estimated for executing activities by conventional approach which is shown in the fig- 1.

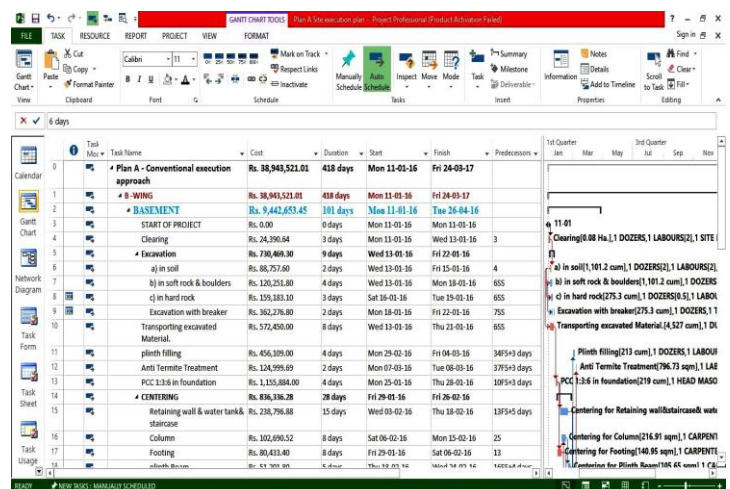


Fig -1: Planning and scheduling for conventional execution approach.

### 4.2 Plan B- Project management approach:

The data obtained from the construction site along with Plan-A: Conventional execution approach, was analyzed and a plan was prepared again in MS Project with the application of project management skills and techniques, to get the clear picture of the duration and cost for the construction of the building.

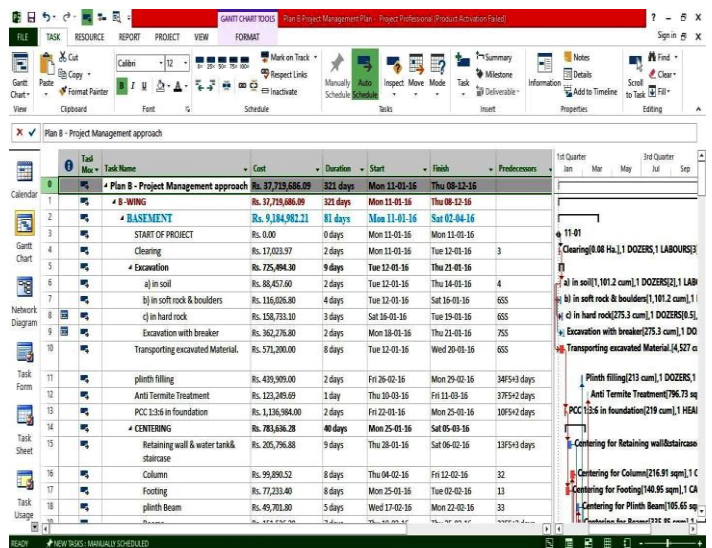
This approach was being carried out to present an idea about, accurate planning and scheduling of project by prevailing over the problems that occurred during actual conventional construction execution practices like:

- Construction activities were not planned and scheduled accurately which resulted in extension of project date and increase in cost.
- The activities were not executed as per the prepared plan due to various unplanned sources and non-consideration of uncertainties, which resulted in delay.
- Over-allocation of various resources due to improper resource management, which resulted in delay for completion of project.
- Labour fatigue owing to over time of the work causing labour inefficiency.
- Improper identification of parallel activities which would have been started simultaneously.
- Slack time and non critical activities were not recognized, which could be crushed to reduce the extension of project.

Thus, Resource optimization, identifying resource wastages (i.e. non-value adding activities) and fast tracking the scheduled activities to optimize duration, were the main factors taken into consideration in the project management approach.

As a result, a duration of 321 days and cost of Rs. 3,77,19,686/- has been estimated for executing activities by project management approach which is shown in the fig-2.

Fig- 2: Planning and scheduling for project management approach- (Plan B).



### 5. RESULTS AND DISCUSSION:

The results of analysis for Plan A and Plan B are represented in Table 1 and Chart 1.

Table No. 1: Cost and time for Plan A and Plan B

PLANS	METHODS	COST	DURATION
A	Conventional execution Approach	Rs. 3,89,43,521/-	418 days
B	Project Management Approach	Rs. 3,77,19,686/-	321 days

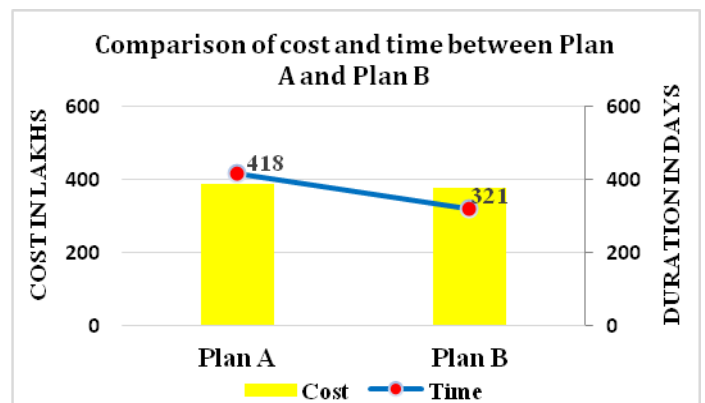


Chart 1: Cost and time comparison for Plan A and Plan B

1. The graph shows a considerable amount in reduction of cost and time by the application of management in project execution. The duration has reduced by 23.2% and cost of 3.14% between the two plans.
2. Most of the activities were carried out either parallelly or sequentially. The rescheduling of activities with proper sequencing its occurrence, along with accurate planning, optimization, and proper allocation of resources as well as fast tracking the scheduled activities has enabled to reduce the duration to a considerable extent.
3. The reduction in cost is not significant as the use of men, materials and machinery is similar.

## 6. CONCLUSIONS

1. The use of project management techniques in a proper way reduces the cost and time of construction, without affecting the quality and performance.
2. Use of Microsoft Project software gives a proper scheduled path which helps in setting a track for all the activities, to check if there is deviation from planned cost and schedule.
3. Application of proper management helps project manager to achieve efficient project performance by waste minimization and resource optimization along with proper planning, scheduling and controlling activities during construction processes.
4. Time management and resources management are considered as leading factors which highly affect the competent and timely completion of project within schedule.
5. From the present study it is concluded that, with proper application of project management skills and techniques like: Resource optimization, identifying resource wastages (non-value adding activities) and fast tracking the scheduled activities to optimize duration, a reduction in time of 23.2% and cost of 3.14% can be achieved.
6. The reduction in cost could be higher if we consider the saving in interest cost for the investment. Considering the interest cost, the saving will be about 16%

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