

# Planning and Scheduling Multi- Storeyed Residential Building using Microsoft Project and Application of Material Management Technique

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**Abstract:-** Material management is beneficial to the storage and economic construction of the material. Projects are classified according to their usage and cost, and it is necessary to be strictly vigilant about which one to find the critical project. The results show that using material management technique helps in efficient material flow, better quality control and reduced material waste. Planning and scheduling analysis of the residential building using the project management technology (ABC analysis) with the help of M S Project software. ABC Analysis provides a complete understanding of the different materials used in residential projects and their impact on the total project cost. It focuses on projects that achieve the greatest possible savings. Construction materials manufacturing industry consumes a lot of resources and money, and therefore these waste materials should be avoided. This help brings the economy in the construction

**Key Words:** Material Management, ABC Analysis, Planning and Scheduling, Microsoft Project (MSP), Residential Building, Manufacturing Industry.

## 1. INTRODUCTION

The construction industry is the world's largest industry. It's more about supply than production. The construction project covers a wide range of sectors including private buildings, industrial buildings, commercial buildings, and effective buildings. After the agricultural industry, the construction industry is the second biggest sector in India it has a great impact on the budget of any country. Especially for emerging countries, India is affected by huge gross domestic product (GDP) due to huge investment. In fact, the evolution of this industry is a statistical figure of a country's economic situation. This is because a broad employment circle of labors is used by the construction industry. Although current products of high quality in the manufacturing sector, service transportation schedules, actual service costs and low failure rates, on the other hand the construction industry is often contradictory. Most projects show cost overruns, time constraints, and conflicts between parties.

### 1.1 CONSTRUCTION PROJECT

A construction project is a plan to build a building or structure. Construction projects include processes involving the assembly of large amounts of infrastructure or buildings

in the field of civil engineering and construction. Building projects include frequent small projects where they are not considered as a separate activity. Larger-scale construction projects include human multitasking which in most cases is implemented by the project manager and managed by the construction manager. In addition, these types of large-scale construction projects are managed by design engineers, construction engineers or certified project architects. In order to complete construction projects in a cost-effective manner, effective planning is essential. Any construction management team involved in infrastructure design and implementation must implement a number of safety measures and analyse the total cost of the project to demonstrate that no work injury or financial problems have been encountered. Exact planning is essential in all construction projects as it will have a rigorous environmental and financial impact.

### 1.2 CONSTRUCTION PROJECT MANAGEMENT

India is a developing country, and India's economy and construction industry are directly or indirectly interconnected, so proper management of costs and time in the construction sector is essential. Information technology plays a vital role in the construction sector, and all work was initiated on paper 15 years ago, such as the design of project structures. Now we use a variety of design software such as AutoCAD, Rivet and more. Project management is our ability to make great profits in a short period of time. The key to knowledge and skills in project planning and management is the success of each organization and the individual working in different volumes. Effective use of PPM tools enhances the reliability and cost- effectiveness of any organization. The planning project includes the following, i.e., determining the time, location and goals of the project.

### 1.3 MATERIAL MANAGEMENT

Building materials for any building project are a extremely significant with respect to cost of element. The complete price of the installation of material can be 50% or more of the complete price. The objective of material management is to assure that materials are accessible when required, so efficient procurement of materials plays a important role in the successful completion of the project. Management of materials is an significant component of the building industry. Organizations therefore need to know the effect of suitable material management methods on the efficiency of

project implementation. A big body of literature and reports deplores the construction industry's inefficiency and productivity. Building projects are often delayed, face budget overruns and abrupt demands. Properly enforced material management plans to allow quick flow of materials and equipment to the site, help enhance project surface planning, raise labor efficiency, enhance planning and decrease project expenses.

#### 1.4 THE INFORMATION COLLECTED DURING THE RESEARCH PHASE IS FOR REFERENCE, AS FOLLOWS:

1. Date of starting and ending the event
2. The delay caused during work execution
3. Architectural and structural drawings
4. Activities and resources used in the field for various activities
5. The amount of resources used for various activities.
6. The relationship between activities as planned and performed during execution.
7. Current prices of various resources (materials, labor and equipment)
8. Various problems occurred during planning and actual execution, such as duration, overallocation of resources, fatigue of labor due to long hours of work, etc.
9. Miscellaneous data

#### 1.5 BENEFITS OF MATERIAL MANAGEMENT

A highly efficient material management system which is advantageous in the following ways:

1. Reduce the overall material budget.
2. Improve the material being processed.
3. Reduced repeated commands.
4. The material is obtained at the desired time and at the desired amount.
5. Enhance labor productivity.
6. Better project timeline.
7. Quality assurance.
8. Improve material handling.
9. Health relationship with suppliers.
10. Better coordination.
11. Improve inventory control.
12. Improved usage of store space

#### 2. OBJECTIVES

A detailed study was carried out considering the construction of G+5 multi-storeyed residential building regarding cost, time and resource management. In this work, an attempt is made to improve existing construction practices by setting out following objectives.

1. To study the existing traditional work execution approaches of construction execution phase of project.
2. To obtain total cost and duration of project by scheduling G+5 residential building with use of M.S. Project software

3. To study various resource controlling techniques to optimise the cost and duration, so as to increase the efficiency of the project.
4. To list out the various materials on priority of maximum cost and carry out ABC analysis to categorise materials of prime importance

#### 3. METHODOLOGY

Construction projects require a range of inputs, from labor to various types of materials and tools. Determining the exact cost of all inputs for a particular job can be challenging. Cost accounting techniques in construction management require input, and workers and entities in the work record keep This activity based costing can be useful for the construction project manager to keep track of its total work cost. In this project we have implemented a proposed theoretical model for the effective adoption of activities based on costing to get the best duration and cost. Based on Activity Costing (ABC) to prevent cost distortions and provide a processing view of which traditional cost accounting cannot provide. This project shows how the concept based on activity costing can be adapted to the quality associated with measurement quality. This study of the main goal is to find out the best duration for the completed project. The data is set from the construction project. The expected time for the completed project is found by using the release chart and by software. The set of data is analysed and found out for the best duration and cost. The result of this project is that the activity of the active application shown is based on costing.

#### 3.1 TRADITIONAL EXECUTION METHOD

Scheduling is fundamentally carried out using data collected from various sources in MS Project as a reference for a detailed study of problems that arise during traditional execution. Therefore, based on the research of the obtained data and the collected information, for the current case study, the following steps were carried out, which were used as a comparative reference for further research.

1. For a project, scheduling for various activities is carried out as per actual work execution.
2. The task and duration are being entered in accordance with the exact occurrences of event.
3. According to traditional site execution, the predecessor, relationship, constraints, and lead and lag time are entered into each activity.
4. Allocate resources to activities based on the amount of resources used on the site and their standard rates.

Therefore, the total duration is 708 days. According to the implementation of regular activities on site, the total cost of project Rs 73,105,862.57 / - was obtained. The M.S. Project file contains information about Gantt charts, calendars, WBS,

activities, duration, start date and completion date, precursors, constraints, lead and lag time, network.

### 3.2 ESTIMATION USING MICROSOFT PROJECT SOFTWARE

The detailed estimates was worked out to get the quantity and cost of the materials needed for each activity. Secondly, a project schedule for various activities with a series of construction sequences was obtained, Activities based on rate analysis also met various requirements for human resources and machinery, Calculate and plan the manpower and equipment required based on workload/workload

Therefore, considering the amount of material calculated and the corresponding material resource standard rate, MS Project is used for planning and scheduling. Based on the information collected, the number of each activity plan and standard labor and equipment costs are treated as daily expenses for each task and assigned to the activity.

In order to understand the actual execution method carried out on the site, the planning and scheduling of work was carried out in MS Project.

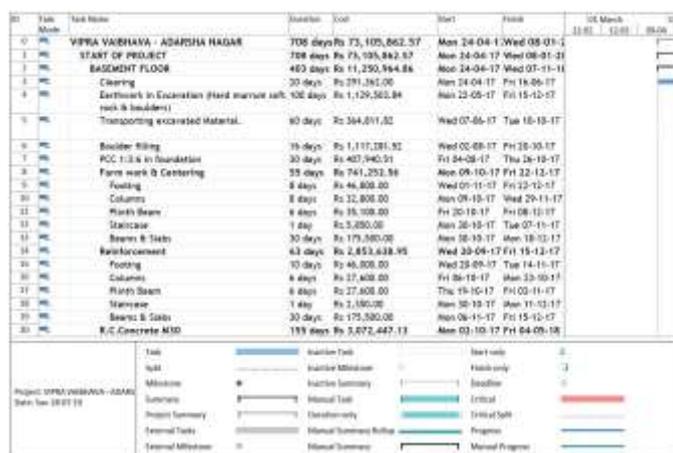


Fig 1: Estimation in Microsoft Project

Table 1: Project Details

<b>Project Type</b>	Residential Building
<b>Project Scheduled</b>	April 24, 2017
<b>Project About to Complete</b>	December 12, 2019
<b>Duration</b>	708 Days
<b>Total Project Cost</b>	Rs 73,105,862.57 /-

### 3.3 ABC ANALYSIS

The concept of ABC Analysis applies to optimization planning and execution. The introduction of the Pereto rule states that 20% of materials will cover 80% of construction costs. ABC analysis is applied to activities to categorize A items, B items and C items to identify the prime critical items that contribute maximum construction cost and thus the

efficiency of the construction process is improved by realizing resource optimization. Various items are arranged according to their impact on the total material cost. After arranging the materials in the chronological order of their cost, the items are categorized in their respective categories, namely "Class A", "Class B" and "Class C" items.

Thus the observations made were,

**A-Items:** The firm with the "highest annual consumption value" of the product is 70%80% of the annual consumption value of the firm. Ironically, it accounts for only 10%20% of this total inventory item. They require strict inventory control, greater protection of storage areas and improved sales forecasts, reordering should be frequent, weekly or even daily avoiding A-projects from inventory is a priority

**B-items:** This is an inter-group project with a medium consumption value of 15%-25% of annual utilization. It consumes 30% of this total inventory item.

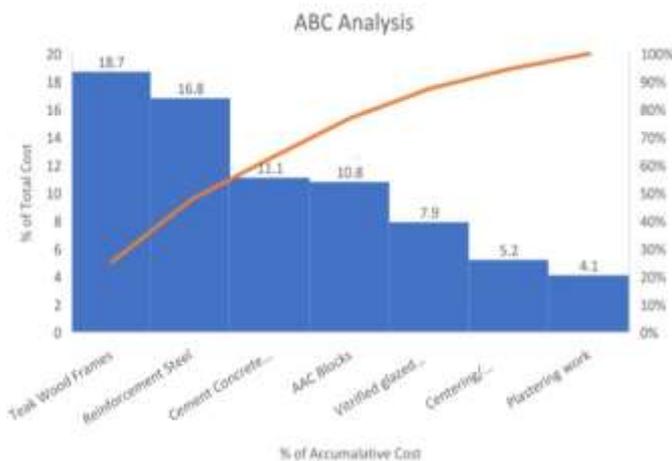
**C-items:** The annual consumption value of 10%-15% of the lowest value product of the year. In the contrary, it accounts for 50% of this total inventory item. C items are the lower annual consumptions.

### 3.4 STEPS FOR THE CLASSIFICATION OF ITEMS

This is the most popular inventory control technology. Eighty percent of this price of material acquisition is needed for only twenty percent of costly products for effective stock control in the store where the big amount of products is to be processed, classifying them is essential to take particular care of costly products, which one is lowered by the amount. In the most significant organization, the ABC analysis is widely used.

The material must be classified according to its sales value. In this technique, as described below, all sales products are categorized into three groups such as A items, B items and C items.

1. The total cost of all activities involved in the project comes from the analysis and reporting of traditional implementation methods.
2. Activities with their own total budget costs are chronologically ordered, starting with the highest cost in descending order of their count.
3. Calculate the percentage of total cost per activity in descending order.
4. Draw a curve in graph showing the percentage of items and percentage of cost.
5. Mark the curve A, B and C categories



Graph 1: ABC analysis

The graph above reflects the cumulative percentage product as the x-axis, and the cumulative percentage is the total price as the y-axis. The figure demonstrates how the distinct categories of items needed for ABC analysis are classified. Items range from 10 to 20% are Class A items, items ranges from 15 to 25% are class B items, items range from 50% are class C items. Items percent and complete cost percent are classified according to their effect on the material's complete price.

The total percentages of items used in Class A, Class B and Class C items is shown in the table below.

Table 2 : Total Percentage of Items

CATEGORY	ITEMS	% OF ITEMS	% OF TOTAL COST	ACTION
CLASS A	Teak frame, Reinforcement, Cement concrete engineering, AAC block, Ceramic glazed tiles, Centering/shutdown work, Plastering work	20%	74.6%	Close Control
CLASS B	Aluminium windows and ventilation, Artwork, Handrail, AW. Lifts, Boulder Surin, GI gate, Composite wall and door, MS Grill for W and V	30%	16.5%	Regular Analysis
CLASS C	Kitchen Otts and sink, Flushing door shutters, Fully inlaid teak shutters, Granite doors and sashes, Wall-mounted mixer/steering gear with adjustment, PVC door, Toilet European, Wall putty, PCC, Sink, SS rose shower / head with shower, Excavation work, Polished cadappa floor, Nosing Cadapa, SS Jagwar Grohe BIB Faucet, Pillar cock in the basin, Wall-mounted sink cock, Nahi Trap, Healthy disgusting	50%	8.14%	Infrequent Analysis

The class A, class B and Class C percentage of material used is represented by pie chart as show in below.

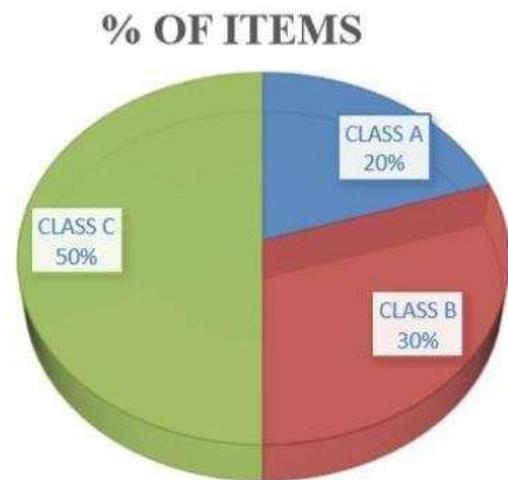


Fig 2: Total % of Items

The impact of products in categories A, B, and C on the complete price of materials is illustrated in the following pie chart



Fig 3: Total % of Cost

ABC Analysis provides a complete understanding of the different materials used in residential projects and their impact on the total project cost. It focuses on projects that achieve the greatest possible savings. Proper application of ABC Analysis in material management can reduce waste of materials in site.

#### 4. CONCLUSIONS

The adequate use of project management methods decreases building costs and time, without influencing quality and efficiency. The use of Microsoft Project software provides a correct scheduled route that helps to set a route for all operations to check for deviations from planned costs and schedules. It enables project managers attain competent project efficiency by minimizing waste and optimizing

resources through adequate scheduling planning and controlling operations during building procedures.

ABC analysis helps to better plan and improve inventory turn-over and enables the management to discriminate products and focus first on the most significant products that are A-class materials, then on the B-class components of the second-class products and then on the other C-class materials.

In the present work it was concluded that 20 percent of the products consume 74 percent of the Class-A cost, 30 percent of the materials have 16 percent of the Class- B cost, and 50 percent of the components have 8 percent of the cost value, which is our Class C cost value.

Based on ABC Analysis, the need for control, requirement, check and stocks of the items is as concluded in the table

**Table 3: Level of Supervision for Material Categories**

Particulars	A-Class Items	B-Class Items	C-Class Items
Control	High	Intermediate	Low
Requirement	Low	Intermediate	High
Check	Tight	Intermediate	Low
Safety Stock	High	Low	Rare

## REFERENCES

- I. SK. Nagaraju, B Sivakonda Reddy Resource management in construction projects International Journal of Latest Trends in Engineering and Technology Vol. 2, No 4, ISSN:2250-3498, August 2012
- II. A. Kastor , K. Sirakoulis The effectiveness of Resource levelling tools for resource constraints project scheduling problems. International Journal of Project Management.19 August 2008
- III. Sachin S. Pal, Prof. Himanshu Ahire Study of Material Management Techniques on Construction Project. Journal of mechanical and civil engineering Vol. 13, Issue 4 Ver.II, ISSN: 2278-1684, p-ISSN: 2320-334X, PP 12-17, August 2016
- IV. Anuj Dubey Resource levelling for a construction project. Journal of mechanical and civil engineering Vol. 12, Issue 4 Ver. IV, ISSN: 2278-1684, p-ISSN:2320-334X, August 2015
- V. Karim Zaharm, Mohamed Nour Osama Hosny Cost Optimization using learning curves and line of balance scheduling. International Journal of Engineering Inventions. Vol. 5, ISSN: 2278-7461, p- ISSN: 2319-6491, May 2016
- VI. Patel Vatsal , Dr Jaysehkumar Pitroda. Impact of material management on construction project delivery. IJCRT Vol. 5, Issue 4, December 2017
- VII. S. Ragavi, Dr. R.N. Uma, Review of project management software M S Project and Primavera. International

research journal of engineering and technology. Vol. 3, eISSN:2395-0056, p-ISSN: 2395-0072, November 2016

- VIII. Sayali Sudhir Mahagonkar, Prof. Amey A.Kelkar, Application of ABC Analysis for material management of a residential building. International research journal of engineering and technology. Vol. 4, e-ISSN: 2395-0056, p-ISSN: 2395-0072, Issue:4, August 2017