Time And Resource Management In Conventional And Prefabricated Construction Using Ms Project

Snehal S. Dhumal[1], D. L. Mittapalli[2]
[1, 2] Dept of Civil Engineering
[1, 2] RMDSinhgad School of Engineering ,SavitribaiPhule Pune University

Abstract- *In India Construction Firms, Construct the Projects in a Traditional ways, this sometimes proves Uneconomical & Tedious too. It is also proves that Traditional way is Time Consuming and Confusing. The presented work will provide them an Opportunity to clearly observe the difference between the Microsoft Project (MSP) and the Traditional Planning Techniques which speeds up Construction and also make the Project Cost Effective with Proper Planning with the help of the case study on the single wing of project executed in Pune, Maharashtra, India. Disparate methodologies adopted for finding out various aspects that proves efficient planning & execution of the project, and International journal papers were referred to find out remedial measures. Finally coming to the conclusion with the help of methodology adopted includes defining of problem statement, insinuating the objectives from the data collected in two part viz. Primary data and secondary, analyzing the data. In our own life, every one of us is a manager of projects. We all work on different tasks with deadlines, from a house wife to an employee to financial analyst, from banker to doctor, from engineer to administrator, from a teacher to a student. We all work on tasks that are eccentric and involve people who do not usually work together, regardless of our occupation, norms, or location in an organization. Every project may have a simple goals that does not require many people or a great deal of money or it may be quite complex, calling for diverse skills and plethora of resources. But every one of us manages projects is the bottom line. Not only execution but effective and efficient execution of project is essential that is the purpose of dealing with the project which is needed to be highlighted.*

Keywords- Resource Management, Project Management, Construction Organization, Microsoft Project

I. INTRODUCTION

In our country the major construction activities involves, different building constructions which includes commercial and residential buildings, Heavy infrastructure projects such as dams, roads, bridges, and industrial constructions etc, using old and traditional construction practices these construction activities are carried out which causes several problems in the construction such as poor quality in construction, increased risk of crises, increased cost of construction, delay in deliveryof projectall these flaws in construction practices calls for an effective project management and quality control system.

Around the worldmany countries provide major preference to the construction industry, as shelter and transportation facilities are the basic needs of a society and also for the growth of the country, contribution of construction industries is vast.In construction project a lot of construction activities includes which are not limited only to the physical activity of allocating men, materials and machines, it involves more than this, such as effective management of machinery, man power as well as materials by proper planning using project management tools such as Microsoft Project, Primavera, Microsoft Excel and techniques such as CPM, PERT which helps to reduce the efforts and also helps to maintain the accuracy and quality of the project. By controlling the cost of construction, scheduling, managing resources, and maintaining the quality in constructionthe effective management of a construction project can be achieved. As these constituents contribute significantly to the efficiency of the project these can be effectively managed using Microsoft project software. In the present study for the purpose of scheduling the residential apartments effective construction project management techniques are adapted, as some of the areas under the scanner are schedule development, resource planning and budget cost of the project using the project management tool MS Project.

A. OBJECTIVE OF THE STUDY

1. The objective of research is to determine the time and cost performance of a construction project by using conventional and prefab construction methods.
2. The main objective of this work is to evaluate the effectiveness of conventional as well as prefabrication method for construction.
3. To study the Conventional & Prefabricated building construction.
4. To Analyze the time and cost required for various building components.

5. To compare the Conventional and Prefabricated building construction with respect to time and cost.

B.NEED OF THE STUDY

Planning and scheduling helps in future situation and implementation of project scheduling using MSP gives good controlling and clear schedule to a project. Resource scheduling reduces the unexpected loss of the project which may be caused due to the huge variations in the usage of the resources. Resource levelling is a complex issue which needs to be resolved in order to avoid delays in the project. Resource levelling helps an organization to make use of the available resources to the maximum .The idea behind resource leveling is to reduce wastage of resources i.e. to stop under allocation of resources .In real project management environment, a penalty is imposed if a project completes after its due date. some projects carry higher penalty than others. In this context, project manager can make a trade off among the projects penalties and can develop the cost effective project schedule, which satisfies the customer requirements. A project manager always has pressure to satisfy the demand of its stakeholders in terms of cost, quality, time and scope.

C.ABOUT MICROSOFT PROJECT

Microsoft Project has many unique features specifically designed to make the use of the software simple. However when it comes to updating a schedule using MSP, construction schedulers often find MSP extremely confusing. This is mainly due to the MSP's 'ease of use features' getting in the way of reflecting the consequences of the current status. It gets even more complicated if you ever have to do a forensic delay analysis on a MSP schedule. Cheer up, as all is not lost. A clear understanding of how MSP calculates a schedule will make it possible to properly use MS Project in place of a Primavera product, if needed. MSP has its advantages; it costs less than many of its competitors and it is 'user-friendly'. It is easy to start scheduling activities immediately. MSP easily produces decent default graphics and reports.

II. LITERATURE REVIEW

For completion of any construction project proper scheduling of resources is required for completion of activities within time and cost. Since 1950s for scheduling and controlling of projects, communicating plan and training new managers Critical Path Method (CPM) is technique that has been used. This technique has some limitations that it does not consider the resources required for the execution of construction project. Apart from CPM project scheduling can be done by using different software's such as MSP, Primavera, Optimization techniques, Fuzzy logic etc. The present study involves use of MSP Software for scheduling the activities of construction projects (Conventional and Prefabricated construction). By using the start date and end date of various activities MSP helps to define hierarchy of the activities of the project. With the use of MSP various resources involved in project are efficiently handled, cost budget of the project can defined prior to the start of the project or at any stage of the project.

P. M. Wale (2015) has been studied on Microsoft project and traditional planning techniques which speeds up construction. Also with the help of the case study on the single wing of project executed in Pune, Maharashtra and with proper planning of project cost effectiveness of project is evaluated. For study methodology adopted includes defining of problem statement, insinuating the objectives, data collected in two part viz. primary and secondary data, analyzing the data and finally coming to the conclusion.

RhutaJhoshi (2013) for achieving profit within limited time and funds several construction activities can manage. Thus by controlled method project management techniques are useful
In scheduling and coordinating various resources. The main aim of the study was to analyze the project management techniques by scheduling various construction activities, allocation of resources and resource leveling using MS project 2013 for residential building and also compares time cost implications with scheduled time and estimated cost.

T. Subramani (2014) has worked and studied on comparison of time performance of the conventional method of construction of high rise residential and industrial building system by originate level measures of industry norms for the overall construction period using scheduling simulation modeling.

Y. Umesh (2015) has studying on planning and scheduling of construction projects for sinking and scheming delays of the project. Due to improper planning and scheduling in construction industry extensive amount of time, money, and resources are wasted each year. The study includes planning, scheduling, and tracking of residential project with the help of primavera software and generating results.

RamyaSmruthy (2016)in this research work, a live project named as "RAMKY PEARLS" in Hyderabad is taken up as a case study. This project deals with construction of villas. For this project the scheduling and allocation of resources are done by using Microsoft project software which will help in scheduling and easily allocating resources to day-to-day

activities. These resources are most effectively utilized by using two different methods. In the first method, three villas are constructed one after the other. In the second method, three villas are constructed simultaneously with effective usage of time and resources. From these two methods, the variations between the time and optimum usage of resources are observed and all necessary data of information are collected.

III. RESEARCH METHOD

A residential building is taken for comparing and MS Project schedule is prepared for both the construction methodology (Conventional method and prefabrication method) by using the data inputs pertaining to construction methodology, activities and their durations, materials, resources. Project duration of each type of construction will be collected from the respective companies and compares the time of completion period by using with MS Project which gives the total project duration for both type of construction method. The data required for the objectives are the resources and completion times ofboth buildings construction under each category.

A. RESEARCH SECTOR

In this research we limited our research to India and focussed only on the real estate sector as this sector is having maximum number of projects which are behind schedule and of many reasons of delay of the project.

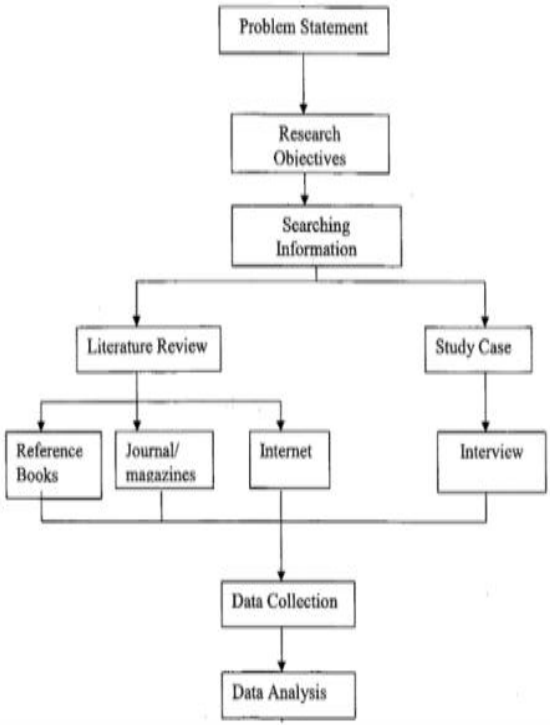


Fig 1.Flowchart of methodology

IV. PROJECT SCHEDULE PLANNING TOOLS

A. Milestone Chart –

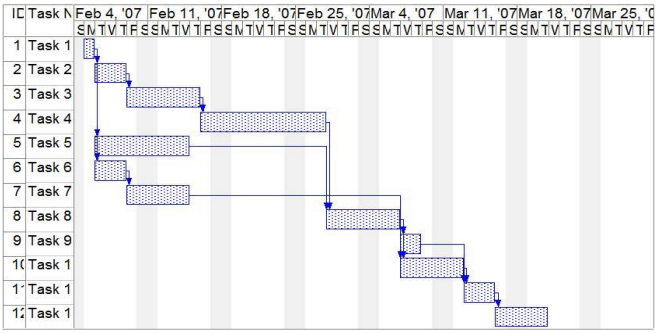
The milestone chart is portrayed on a project time line. It displays only the key project milestones.These milestones are typically associated with some major element of project risk, such as passing a test or gaining approval from a regulatory agency. Each milestone is represented by a diamond or triangle. These milestones normally become major reporting points to senior management. Large complex projects may have hundreds or even thousands of tasks. Senior management usually does not want to receive status reports at that level of detail, yet they want something more than just a ½ toll gate ½ reviews at the end of a phase. The milestones provide interim reporting points. Also, when planning a complex project, task leaders can become overwhelmed with all the tasks they must do. Having a focused sub-project for each milestone gives those task leaders a framework for planning and tracking project activities.

B. Task List –

Task	Date
Conduct ABC analysis	4/25
Prepare test plan	5/15
Build test samples	5/15
Analyze test data	6/7

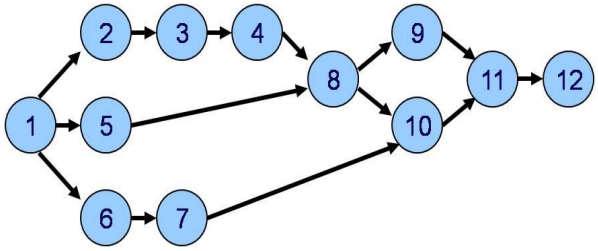
The Task Listis the simplest of the schedule format tools, yet it can be the most powerful and useful tool with extended members of the project team. A Task List is just an action item list for the team member that contains all of the tasks that individual is responsible for completing. This provides a focus for the individual as to what they need to do.

C. *Gantt chart (Bar Chart) –*



The Gantt, or Bar, chart is the most common schedule format used on projects. This format is excellent for tracking progress or activity for tasks once they have been scheduled. In the Gantt chart, every task is represented by a bar of a time line chart. The left edge of the bar is located at the time the task is planned to start and the right edge of the bar is located at the time the task is planned to end. As the project unfolds, the edges of the bars are often modified to reflect when the task actually started or ended. This format creates focus for tracking progress because it is clear to see whether a task should be completed, underway, or pending at any given time. The Gantt chart is used for daily/weekly tracking of project progress. It is easy to use and maintain. It has become the most commonly used project schedule chart because of its simplicity and the focus it creates when tracking the project. If the task estimates are relatively accurate, this is the preferred format. However, when task duration estimates are not accurate - either due to uncertainty in the amount of work or uncertainty in the resource availability.

D. *Network Diagram –*



The Network Diagram is essentially a flowchart of the project tasks. This format is a foundational technique for several analytical techniques. The network is created by determining predecessor and successor relationships and connecting the tasks based upon those relationships. This technique will create focus on the handoffs. In a complex project with many organizations/individuals involved, this technique can provide guidance as to who is the internal customer for each task. The technique is often viewed as a foundational technique since most of the advanced analytical scheduling tools start with the Network Diagram. When task durations are uncertain, the Network Diagram is often a better technique to use than the Gantt (bar) chart. The Network Diagram shifts the focus for uncertain tasks from arbitrary start and end dates to completion of the work and a hand off to the next task/activity.

V. CASE STUDY

A) PADMALAYA PROPERTIES PUNE

Company executed the works of building like residential and commercial complex in Pune. Padmalaya properties are an organization formed with the aim of handling large Civil Engineering Projects with quality construction and time bound completion of work. Padmalaya properties are trusted for quality and is acknowledged for an unshakable commitment to excellence in every aspect of construction.

B) URBAN GENESIS INFRACON PVT.LTD.

Urban Genesis Infracon Pvt. Ltd. committed to redefine the construction industry in India. They work with a singular aim to help construction companies grow faster in terms of efficiency, quality and business expanse. These Precast systems are ideal for repeatable, cellular structures like large hotels, residential apartments, low-cost housing structures, tiny industrial parks etc. The systems simplify design, are quick to erect and easy to finish. URBAN GENESIS INFRACON PVT. LTD. endeavors to liberate construction companies from the limitations of conventional methodology to propagate a sustainable transformation.

C. DATA COLLECTION AND ANALYSIS

As a basis of comparison between prefabricated and conventional construction methods for a G+5 residential building project, only structural work is taken into consideration, construction activities which constitutes major time and cost taken into consideration for comparison purpose in the project are:

- Foundation
- Beam
- Column
- Slab
- Wall

Now scheduling is to be done in Microsoft Project software for both construction methods and after that each activity has some resources and that is to be given to each activity. Then resources to be allotted to each activity. From that comparison of resources (only labor resources is considered) is done and according to their payments on each day total cost of project is to be calculated.

For conventional construction method area for plan is 58000 sq. ft. and for prefabricated construction method area for plan is 58000 sq. ft. is taken into consideration and then how many activities take part in one day that to be calculated while resources payment are to be given. All payments are to be calculated for both G+5 conventional and prefabrication construction method. Both construction companies are reputed in industry. Payment of resources given according to District Scheduled Rate from respected city.

Below table shows that G+5 construction of conventional structure where scheduling completed duration of 402 days and prefabricated structure where scheduling completed duration of 311 days. For completing this schedule multiple resources (only labor resources are considered) are required which is shown in table. Plan for conventional and prefabrication has to be shown below for comparison purpose.

VI. COST ANALYSIS

A. Comparison of cost for Conventional &Prefabrication Construction Method

Table 1.Resource Table on Conventional Construction Method

Resources	Man-Hours	Rate/day	No. of Workers	Total Cost
Labour	6736	300.00	842	1687800
Bhisti	800	432.00	100	306720
Mason	1590	451.00	195	601634
Bar Bender	368	432.00	46	157248
Carpenter	816	432.00	102	310608
Electrician	480	478.00	60	97512
Total				**3161522**

Table 2.Resource Table on Prefabricated Construction Method

Resources	Man-Hours	Rate/day	No. of Workers	Total Cost
Labour	5488	300	686	1000000
Bhisti	704	432	88	199584
Mason	1480	451	185	442882
Bar Bender	272	432	34	88560
Carpenter	464	432	58	142560
Electrician	304	478	36	51624
Skilled labour	1920	451	240	541200
			Total	2418494

B. Comparison of Resources for Conventional &Prefabrication Construction Method

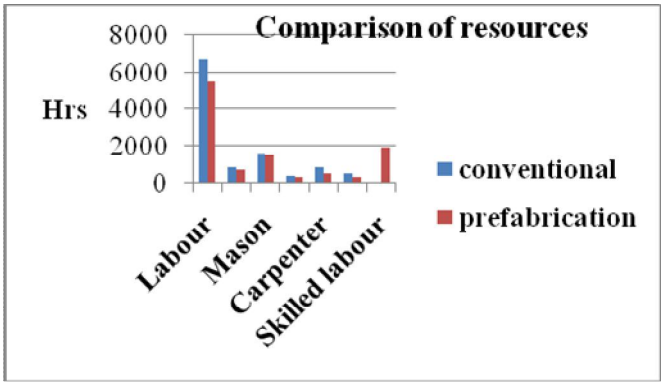


Chart 1. Comparison of Resources for Conventional &Prefabrication Construction Method

C. *Comparison ofConventional and Prefabrication method in Terms of Duration*

Table 3. Project Duration Table for Conventional Construction Method

Sr.No.	Description	Duration
1	Sub Structure - (Excavation, Foundation, Plinth)	72 days
2	Super Structure – (Column, Beam, Slab, Wall)	330 days
	Total Duration	402 days

Table 4. Project Duration Table for Prefabricated Construction Method

Sr.No.	Description	Duration
1	Sub Structure - (Excavation, Foundation, Plinth)	57 days
2	Super Structure – (Column, Beam, Slab, Wall)	254 days
	Total Duration	311days

D. Comparison of Total Duration for Conventional & Prefabrication Construction Method

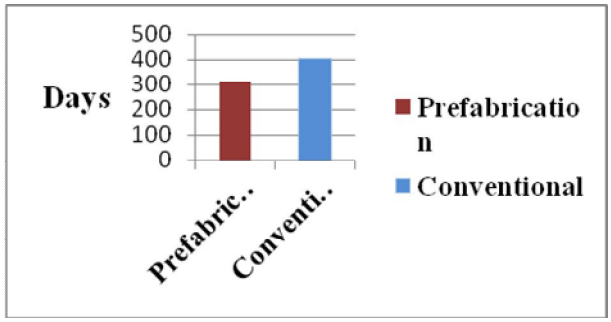


Chart 2: Comparison of Total Duration forConventional &Prefabrication Construction Method

VII. CONCLUSION

The duration of prefab construction and conventional method construction is found by preparing MS project schedule with the help of the data inputs from the respective companies. The duration of structure work is taking into the consideration. From this study it is found that a considerable amount of money will be saved by using prefab construction method. Precast beams, columns, slabs are manufactured in precast yard and can be installed at site, which reduces the time and human resources considerably.

The following conclusion can be drawn from the study:-

1. Indirect saving in cost due to reduction in man-days for the completion of structure work is approximately 25%.
2. The prefab construction takes less time in finishing work as electrical conduits and fittings are already installed in precast slab and wall panels.
3. Savings in plastering cost and time can be considered because finishing of prefabricated components are better than in-situ components.

REFERENCES

[1] N D. Jain,P M Wale, N R Godhani2, S R Beniwal, “Planning and Scheduling of Project using Microsoft Project” Volume 12, Issue 3 Ver. III (May. - Jun. 2015),

[2] Prof. V. Z. Patil,Rhuta Joshi “Resource Scheduling of Construction Project”: Case Study 4.438 Volume 4 Issue 5, May 2015.

[3] K.Chinnadurai, T.Subramani, “Construction Management And Scheduling Of Residential Building Using Primavera” ISSN 2319 – 4847 Volume4, Issue 5, May 2015 .

[4] Umesh.Y.Polekar, Rohit.R.Salgu , “Planning, Scheduling and Tracking of a residential Project using MS Project SoftwareISSN: 2321-7782

[5] Ramya N. Smruthi, "Study On Time And Resource Management In Construction Project Using MS Project"(2016)International Journal Of Advanced Scientific Technologies In Engineering And Management Science(IJASTEMS) ISSN 2454-356X, Vol 2, Issue 10, pp 50-55.

[6] Sharma Abhishek, K.K. Pathak,"Manpower Planning, Scheduling And Tracking Of A Construction Project Using Microsoft Project Software"(2015) journal of today's ideas-Tomorrows technologies, Vol. 3, No.2,pp 161-169.

[7] E. Suresh Kumar,S.Krishnamoorthi,"Scheduling And Financial Analysis Of A High Rise Building" (2015)ISOR journal of mechanical and civil engineering (IOSR-JMCE) ISSN 2320-334x, Vol 12, Issue 6, pp 01-06.

[8] R.A., Nebraska and Maher K. TadrosWilliam W. Holmes, 2005, NU Precast concrete house provides spacious and energy efficient solution for residential construction, Journal of Precast Concrete Institute.