

Resource Scheduling in Construction Project Using MSP

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ABSTRACT: Every one of us is a manager of projects of our own life. 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 different tasks with deadlines. Regardless of our occupation, norms, or location in an organization, we all work on tasks that are eclectic and involve people who do not usually work together. The 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 the bottom line is that every one of us manages projects. Owing to this the purpose of dealing with the project should not be only execution but effective and efficient execution of project is essential which is needed to be highlighted. Construction Firms in India, Construct the Projects in a Traditional ways, this sometimes proves Uneconomical & Tedious too. Traditional way also proves to be 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. For finding out various aspects that proves efficient planning & execution of the project, disparate methodologies adopted and to find out remedial measures, international journal papers were referred. 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 and finally coming to the conclusion.

KEYWORDS: Microsoft Project, Project Management, Planning, Construction Organization, Activities

I. INTRODUCTION

Project Management is the Application of knowledge, skills and Techniques to project activities to meet project requirements. It is a strategic ability to do something successfully for organizations, enabling them to patch the project results to Organizational goals and thus, better compete in their markets. It can be also defined as the process and activity of planning, organizing, inspiring, and controlling resources, procedures and protocols to achieve specific goals in scientific or daily problems. A project is a temporary aim designed to produce a special product, service or result with a defined starting and end (usually time-constrained, and often constrained by funding or deliverables), undertaken to meet eccentric goals and objectives, typically to bring about beneficial change or added value. The temporary nature of projects stands in contrast with business as usual (or operations), which are recurring, permanent, or semi-permanent functional activities to produce products or services. In implementation, the management of these two systems is often quite distinct, and as such requires the development of divergent technical skills and management strategies. It has always been practiced casually, but began to evolve as a prime profession in the mid-20th century.

Importance of Project Management

Project gets started at the right way but as it proceeds further, gets off the track. Owing to this its important to manage the activities in the right way, thus project management plays a vital role in arranging the critical activities of the project which is called as task to function in the appropriate way. Project Management aid the project in better efficiency to deliver services.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 1, January 2017

About Microsoft Project Microsoft

Project is a project management software program developed and sold by Microsoft, which is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analyzing workloads. Project creates budgets based on assignment work and resource cost. As resources are assigned to the task and the program calculates the cost equal to the work times the rate, which rolls up to the task level and then to any summary tasks level and finally to the project level. Resource definitions (Labour, equipment and materials) can be shared between projects using a shared resource pond. Each resource can have its individual calendar, which defines what days and time is resource present. Resource rates are used to calculate resource assignment costs. Each resource can be assigned to multiple tasks in multiple projects and each task can be assigned numerous resources. The execution of the scheduled task work based on the resource availability as defined in the resource calendars. All resources can be defined in Work, Material and Cost. Therefore it cannot estimate how many finished products can be obtained with a given amount of raw materials. This makes Microsoft Project unsuitable for solving problems of available materials constrained production.

II. LITERATURE REVIEW

Castor (2008) in his studies he compares software's MSP ,primavera and open workbench for resource leveling in two real time project as a case study and the result shows primavera gives most theoretically unlimited number of criteria as priority rules and he suggest project management software's to incorporate more efficient methods for resource constraints.

Maruthi S (2015) carried out studies in two phases at first phase the project schedule and resource allocated done using MSP software and at second phase, optimization has been carried out by modifying the man power requirement for various tasks to remove any sudden variations in demand of manpower. And concluded manpower resource has been optimized by modifying the particular activities duration and by modifying predecessors without affecting the project duration.

Rhuta Joshi (2015) analyzed man power resource constrained project using Microsoft Project 2013 by resource leveling and compares the time cost in residential building . It helps to resolve resource conflicts and also useful in minimizing the project duration within limited availability of resources to make the project profitable .they concluded that without proper resource scheduling the project gets delayed and they can be leveled to reduce project duration and cost.

B.S.K. Reddy (2015) they done resource optimization exercises on two on-going projects in Dubai, UAE. they individually leveled and then combined option with aggregated and then levelled clearly indicates reduction in demand of resources by 5.65% in later option, which could be best considered for economy . they concluded Resource levelling at project job site and forwarding demand leads a possible sharing of resources among projects. Ismail Abdul Rahman identified commonly used techniques and software of time management together with their effectiveness level in large construction projects. Data was collected from the construction organization that deals with huge projects. Relative Importance Index calculation was employed to assess the level of effectiveness for time management techniques and software adopted in the construction project. Minh Shrestha, hinted that the main function of a software is help, and develop the quality of output with less effort than manual ways. A project has disparate requirements and the aim of the adopted software is to fulfill those requirements effectively in terms of time and cost. In addition, the issues of scheduling, tracking and physical element must be considered while adopting the project management software.

Abhishek Sharma(2015) Many project suffers time and cost overruns due to improper planning, scheduling and completing works that results in numerous issues like delay in providing facilities, development, cutback in quality of construction and making the project more expensive. A little consideration shows that the time required to complete the project is inversely comparative to the supply of manpower. As the manpower is increased, the completion time of the project is decreased and on the other hand if the manpower is decreased, the completion time of the project is increased. A comparison between the baseline duration and cost to actual duration and cost of manpower of project is also determined using project management software tool Microsoft Project. The schedule report is examined and causes for delay are analyzed. This delay is due to inadequate manpower, contractor not starting the multitasking activities at site,

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

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Vol. 6, Issue 1, January 2017

shortage of shuttering material and the work executed by the activity in haphazard manner at site. P M Wale(2015) skills and Techniques to project activities to meet project requirements. It is a planned ability to do something successfully for organizations, enabling them to patch the project results to Organizational goals and thus, superior battle in their markets. the process and activity of planning, organizing exciting and controlling resources, procedures and protocols to achieve complete goals in scientific or daily problems. that help to overcome the problems faced outstanding to traditional way of Planning and Management. It helps for the optimum and effective organization of activities which helps to give the vision to complete the project in planned duration and within the market.

J. Jayalakshmi(2014) ,This study compared time performance of the conventional method of construction for high- rise residential and Industrial Building System (IBS) method by overall construction period . The scheduling was developed using Primavera project planning software. The positive changes include creating a healthy working environment among those involved directly in the construction industry. The major players in the are architects, engineers, town planner, developer, contractor and the supplier or manufacturer have to play their roles in enhancing their working system, management and administration to enable the modernization in the industry.

E. Suresh kumar(2015)Scheduling using MSP Software is a development which involves estimation, sequencing the activities, resources allocation and timing. The construction scheduling is to complete the project in time and equal the resources with the allocated time. EV Analysis is a standard method of measuring a project's progress at any given point of time, forecasting its completion date, final cost and analysis difference in the schedule and budget of the project. Scheduling using MSP Software gives good controlling and Rhuta Joshi (2013)to achieve the profit within little funds and time by using project management techniques for scheduling and coordinating the various resources by controlled method. Management techniques such as Critical Path Method, Program Evaluation and Review Techniques (CPM/PERT) have been successfully implemented in various Civil Engineering projects. These techniques help management in capable and economic use of resources for completion of project objectives with infinite availability of resources, though it is observed that resources are limited in real project scenario. It has been practical that the project delays occur due to inadequate supply of resources. Project management software like MS Project and Primavera project planner are used in construction industry. the Project management techniques by scheduling various construction activities, allocation of resources and resource leveling using Microsoft Project for residential building.

Raj saran(2015) Planning and scheduling is very significant in construction projects because of the increasing complexities in this field. Construction Planning is the necessary predecessor to Scheduling and includes major work tasks, determining universal series, construction methods and conveying tasks. Improper planning can lead to most important delays in the project work. Projects nowadays huge amount of paperwork, which makes the management very bulky. These problems can be solved using a project planning software which helps to give a structured move toward to planning. In this study, a case of a two storey research lab has been taken to demonstrate how proper planning and scheduling is done using Primavera software.

Sushant pradhan(2014) Every construction industry expression a stiff struggle in every section of project, be it technique, equipment, methodology or management. The goals are been created and the level is getting higher. Construction Industries involve themselves in frequent projects and also aim for higher yield as financial benefit is the ground certainty. The task becomes tougher when one indulges to maintain customer satisfaction i.e. quality and duration at the same time. Rarely have the companies failed to attend the assure. Companies in the past have faced a lot of problems particularly when it comes to multiple projects. The data are stuffed, the cost has been overrun, the duration is extended and the resources have been over-allocated. Thus resulting in inappropriate project management.

T. Subramani (2014)This study compared time performance of the conventional method of construction for high- rise residential and Industrial Building System method by originate level measures of industry norms for overall construction period using scheduling simulation modeling. The positive changes include creating a healthy working environment among those involved directly in the construction industry.. Improved Customer Satisfaction Whenever you get a project done on time and under budget, the client walks away happy. And a happy client is one you'll see over. Smart project management provides the tools that enable this client/manager bond to continue. Services The same strategies that allowed you to successfully complete one project will serve you many times over and also reduced risk and cost of schedule swamped. It helps easily plan and manage project activities, It optimizes management of all

International Journal of Innovative Research in Science, Engineering and Technology

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resources, It gives clear visibility of what's going on in the project, It allows quick and easy forecasting of WBS's, activities or projects.

Y.Umesh(2015) Proper planning and scheduling is very essential in construction projects for sinking and scheming delays of the project. Extensive amounts of time, money, resources are wasted each year in a construction industry due to improper planning and scheduling. With globalization the construction projects have become infinite and complex. Planning of such projects requires huge amount of paperwork, which can be reduced with the help of project planning software. These study are to plan, schedule, and track a residential project with help of primavera software, study the results generated, it is possible to propose which method is suitable for the chosen residential project.

Veena H.C(2015)Resource management is one of the most vital aspects of construction project management in today's economy since the construction industry is resource exhaustive and the costs of construction resources have gradually, risen over the last several decades. These techniques help to reduce project duration use of unlimited availability of resources for completion of a project. Through it is observed that resources are limited in real project situation. It has been observed that the project delays occur due to inadequate supply of resources. In large scale projects, preparing a correct and workable plan is very difficult. Project management software like MS Project and Primavera project planner are used in construction industry. The main aim of this study is to analyze the schedule control techniques by constraints and activity types is done using primavera software for an apartment building.

III. METHODOLOGY

3.1 RESEARCH STRATEGY

We conducted interviews with the project manager of the site and collected information regarding the site layout, series of construction activities, activities duration, activity linkages, construction time line, resources used, construction milestones.

We went through the Bill of Quantities of the project and jolted down the activities and quantities to analyze the project duration.

3.2 RESEARCH SECTOR

We limited our research to Pune, 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.

3.3 METHODOLOGY USED IN THIS THESIS

A residential building was taken for comparing and MS Project schedule was 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 the each type of construction was collected from the respective companies and compares the time of completion period by using Critical Path method with MS Project gives the total project duration for both type of construction method.

3.4 CASE STUDY

A) IVRCL PVT LTD,PUNE

Company executed the works of building like residential and commercial complex in Pune.

IVRCL is an organization formed with the aim of handling large Civil Engineering. Projects with quality construction and time bound completion of work. IVRCL is trusted for quality and is acknowledged for an unshakable commitment to excellence in every aspect of construction.

B) Intellectual Building System PVT. LTD

iBuild is 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. Build's 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. iBuild endeavors to liberate construction companies from the limitations of conventional methodology to propagate a sustainable transformation. Company provides variety of products like hollow core slabs, restricted column and beams, precast staircase and landings and accessory elements.

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3.4.1 COMPANY A (For questionnaire survey)

- 1) Why specifically you chose conventional method over prefabrication for construction?
- 2) What is the slab cycle duration at your site?
- 3) What is the labour requirement at your site and extent of dependability on labour?
- 4) Any Special type of Formwork is used at your site?
- 5) What type of wall masonry is used at your site?

3.4.2 COMPANY B (For questionnaire survey)

- 1) What are the benefits of Prefabrication over conventional method of construction?
- 2) What is the economical reach of prefabricated components considering the transportation cost?
- 3) What is the minimum slab cycle that can be achieved using prefab method?
- 4) Why prefabrication is not adopted in small projects?
- 5) What is the labour requirement for prefabrication method of construction?
- 6) What is the labour requirement for prefabrication method of construction?

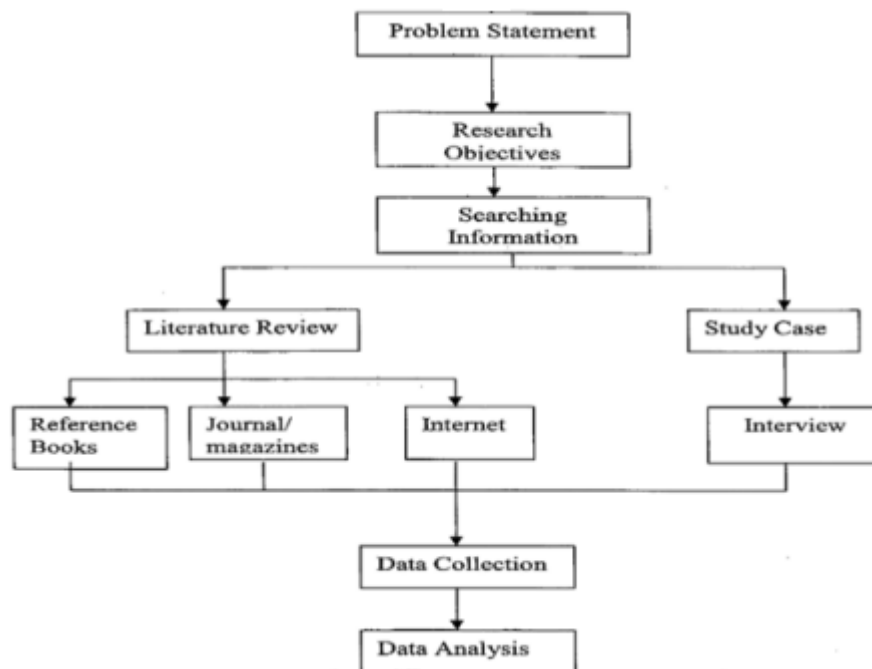


Figure 1: Flowchart of methodology

IV .PROJECT SCHEDULE PLANNING TOOLS

The project schedule is the time-based and/or sequenced description of all of the project activities. The time element is one of the triple constraints that every project leader must contend with: scope, schedule, and resources/budget. There are a variety of techniques for both displaying the project schedule and analyzing the project schedule. Each technique focuses on a different aspect of the project. Depending upon the project objectives and major risks, different techniques should be used by the project leader. A brief description of each technique is listed below along with suggestions for when and when not, to use them. The techniques for displaying the schedule are the Milestone Chart, the Task List, the Gantt Chart (Bar chart), the Network Diagram, the Two Dimensional Task List, and the Calendar View. The schedule

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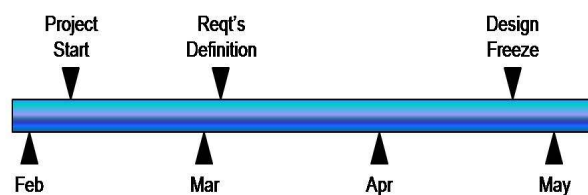
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analysis tools are the Critical Path analysis, the Critical Chain analysis, the PERT analysis, the Resource Leveling analysis, and a variety of Schedule Acceleration Techniques.

4.1 Milestone Chart

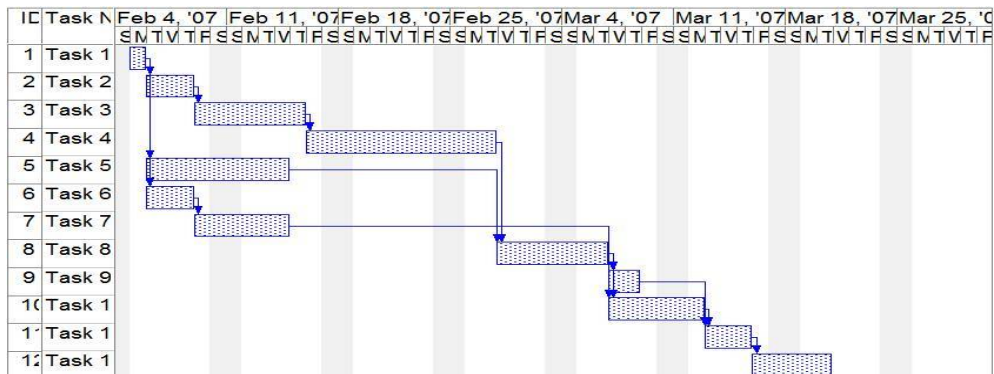


The milestone chart is portrayed on a project time line. It displays only the key project milestones. These milestones are typically associated with some major element of project risk, such as passing a test or gaining approval from a regulatory agency. Each milestone is represented by a diamond or triangle. 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 review 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.

4.2 Task List

The Task List is 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. This format works very well with extended team members on large projects. In those cases, the project may contain hundreds of tasks but often the extended team member is only involved in a small number of those tasks. The extended team member can review their task list and understand what they must do on the project without going through the hundreds of tasks, searching for those requiring their effort. If the team has many extended team members with limited involvement in the total project, this technique usually is the best method for communicating and tracking scheduling of the work from those extended team members.

4.3 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

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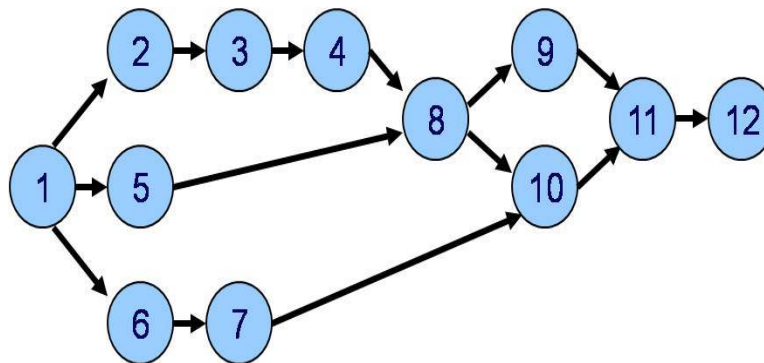
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to reflect when the task actually started or ended. This format creates focus for tracking progress because it is clear to see whether a task should be completed, underway, or pending at any given time. The Gantt chart is used for daily/weekly tracking 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.

4.3 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.

4.5 2 : D Task List

The 2-Dimensional Task List is only needed occasionally. However, in those situations it both simplifies planning and tracking while improving the ability of the project manager to manage many of the project tasks effectively. This technique is used for scheduling and tracking a large quantity, or batch, of items through the same set of project tasks or activities. The 2-D task list is a matrix with the vertical side being a list of the items in the batch and the horizontal being the set of tasks. The planned date for task completion of each item through the set of tasks is set in the corresponding box of the matrix. As a task is completed, normally the background color of the cell in the matrix is changed so that it shows completion. This change in color allows the project manager to quickly see when one item in the batch starts to fall behind or when many items in the batch become bottlenecked at one step in the set of tasks. When I use this approach, I will place a summary task on the project-level Gantt Chart or Network Diagram that represents the activity within the 2-D Task List. Through the use of the matrix, hundreds of tasks can be tracked efficiently without burdening one of the other techniques with redundant activities.

V. CONCLUSION

The main goals of this survey have been achieved. The total cost and total duration for the double storey residential building have been determined for both prefab and conventional construction. And also we had known about the advantages and disadvantages of both prefabrication and conventional construction by the survey conducted in similar companies. The comparison showed there is enormous cost difference between the methods, which the prefab is very

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high when compared to conventional on this type of individual houses. The prefab construction for individual double storey residential building cost is 13% more than the conventional construction. This is main drawback for prefab construction which is not economical to construct in this case. At the same time the prefab construction is easy to work and reduces the project duration, is reduced by 63 days when compared to the conventional. It's the main advantages for prefab construction and also it helps when there is labour shortage. As a result of survey we had known that the prefab construction have more advantages and procurement in industrialized, heavy infrastructures. But in individual houses there are lot of constraints and lack of knowledge its get struggling to implement in our country. At this stage conventional construction is economical and comfortable when compared to the prefabrication construction.

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