



## **A REVIEW ON COST OPTIMIZATION BY RESOURCE ALLOCATION USING PRIMAVERA P6 SOFTWARE**

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**Abstract:** Resources play vital role in construction projects. The performance of construction industry depends chiefly on how best the resources are managed. Optimization play pivotal role in resource management, but task is highly haphazard and chaotic under the influence of complexities and vastness. Management always looks for optimum utility of resources available with them. Hence, the project management has got important place especially in resource allocation and smooth functioning with allocated budget. To achieve these goals and to exercise enhance optimization certain tools are used for resource allocation optimally. Implementation of construction project needs a proper planning and scheduling is of vital importance for the project to be executed and run smoothly. A best schedule has to be prepared in such a way that meets the primary objectives of the total project. Those essential destinations are to make a quality venture, finished on time, inside spending plan, and in a sheltered workplace.

**Keyword-** Primavera, Project planner, Optimization of resources, Resource management, Resource levelling, Resource Allocation, Project Scheduling

### **I. INTRODUCTION**

The development of infrastructure plays a main role for the development of country. The important part of economic growth of the country depends on the road transportation. The construction projects like road construction needs a careful attention while planning as well it requires a very huge amount of resources. As it's known the road construction projects is different from one another as there will be changes in place, situation, weather condition by seeing all this it is very tedious in planning and allocating resources as the resources are repetitively used in the execution of the project The time taken for the construction of road projects at the beginning of 19th century took a very long duration because of lack in techniques used which leads to wastage of money, time as well as the resources used for construction. As the days passed their we saw the improvement in the construction technologies used which could complete the project with the appropriate usage of money, time and resources for these improvements their comes the proper project management tools which would help in planning, scheduling and resource allocating one such tool is Primavera P6.

#### **A. Project Planning**

Project management could play a very important role in the construction industry. By using these management tools it will be very helpful to execute the project in a very economical way as well with the limited duration with usage of optimum resources. This also enables to store the information and manage the project in a central location .The project management consist of balancing the needs which could be identifiable or unidentified expectation of the stake holders by giving the quality, scope, and time of the project. The project management uses the information and turns it in a manner for execution in a skilled way with lot of strategies to satisfy the requirement of the construction

projects. Every project has main goals to achieve that are:

- a. On time project completion
- b. Optimal usage of resources
- c. In minimum investment

The goal of project planning is to create a work chart with the activities which should be done one after another with a proper date of start and completion. By scheduling we could know the activities which are in a crucial position where it should be started and completed within the duration so that it will not affect the project completion duration. The allocation of the resources required for the project activities will cut down the wastage of materials which could affect the funds that are allocated for the resources in a project.

### **B. Scheduling**

Scheduling refers to slotting out the time duration by the thorough and explicit analysis of the planning team to each and every activity to know the final project duration and the project delivery date. In other words it governs the timing of each work activities recognized by the planning process before or during project execution. Typically, it shows and signifies the sequential order or phasing various individual project activities in a systematic way to complete the project. The schedule is a tool or a technic of every project management team which is used and practiced to predict most probable project completion time and thus enabling the in/ on time resources conception which are budgeted on the particular work. The general steps to develop a proper schedule are as follows:

- a) Proper time estimation of every activities.
- b) Project planner should know the obligations of time for the project completion and delivery.
- c) The activities such as must start and must finish should be establish well recessed.
- d) Sorting out of activities which are crucial to timely completion of project should be recognized and kept in mind.

## **II. PRIMAVERA**

Primavera is an undertaking venture portfolio administration programming. It incorporates venture administration, item administration, cooperation and control capacities, and coordinates with other endeavor programming, for example, Oracle and SAP's ERP frameworks. Primavera was propelled in 1983 by Primavera Systems Inc. It can perceive principles for elite undertaking administration programming, is intended to deal with extensive scale, very advanced and multifaceted activities. P6 Professional can be utilized to sort out tasks up to 100,000 exercises, and it gives boundless assets and a boundless number of target designs. Huge information requires complex yet very adaptable association apparatuses to give you a large number of approaches to arrange, channel and sort exercises, ventures, and assets. Advantages:

- Balance resource capacity
- Plan, schedule, and control complex projects
- Allocate best resources and track progress
- Monitor and visualize project performance versus plan
- Conduct what-if analysis and analyze alternative project plans
- It is very helpful in planning and scheduling of the projects quickly and conveniently.
- It recognizes the available floats and determine the all possible critical paths by the project.
- In this software there is facility to get the attractive customized colorful Gantt charts, network diagrams, histograms and time based logic diagrams
- It creates principal program schedule by integrating the schedules from owners, engineers, architects, planners and subcontractors.
- It controls budgets, estimates even after changes at finishing point to relic successful delivery of the project.

- It enables spot and instant planning for the forthcoming days, weeks, months, years and so on and activities.
- Application of works to allocate the resources for the activities can be done precisely to haunt how the work is carried.
- Improves relationship and alliance by timely E-mailing to the concerned entire project.
- It expedites the communication related to project status to the stakeholders, contractors, owners and other project management team members by customized reports of industry standards.
- To build any kind of new projects lowering of templates
- is the best practice to follow up and it is even helpful for the complete project as well
- By using earlier performance of activities in the project earned value analysis can be done to see the future more accurate cost to completion.

### III. OBJECTIVE

- a. The objective of this thesis was to understand the importance of Primavera P6 Web in the complex construction projects like school project.
- b. Objective of this work was achieved by enlisting and observing the advantages of P6 web over the client based version.
- c. This software proves to be efficient and adds value to a project.
- d. It is tried and tested software and certainly it improves the efficiency of overall project.
- e. It acts as excellent communication bridge between upper management and all other teams who physically check on the progress of project

### IV. LITRATURE REVIEW

SIMRANJEET SINGH and SAKSHI BHATIA (2022) primary goal was to understand more about the functions of planning, scheduling, resource allocation, and project progress control. The first and most crucial thing we can say is the start and end dates of the project may be obtained through proper Primavera planning. The resource allocation for each activity can be seen, and resources may be modified and reallocated at any time. Each activity's numerous resources, whether material, machinery, or labor, can be allotted, RASIKH RIYAZ et al. (2022) a survey discovered both Primavera and MS Projects are reputable project management tools that meet project objectives as well as organizational requirements. It is difficult to distinguish one tool from another tool since they employ different tactics and have diverse characteristics. In order to produce a high-quality CPM schedule, we should determine which software enables the specific project services to be fulfilled based on the project requirements. Although each tool has a unique set of capabilities, they all attempt to deliver professional construction management services. Both MS Project and Primavera P6 were used to track the industrial project, and both software programmers assisted in the seamless tracking of construction work, NIDHI RAGHUWANSHI and PROF. M. C. PALIWAL (2021) found that by allocating and overseeing each task in accordance with the project's running circumstances using the project management platform Primavera P6, time and money might be saved. In addition, additional water logging in excavation work caused by the environment (rain water) was examined, and the problem was rectified to avoid losing 5 days, ABDUL AZIZ ET AL. (2019) give his opinion financial and work management of any project decided its successfulness. The study aimed to know difference between the manmade and primavera software, in estimation of scheduling of financial and work management of a project with help of primavera software. The estimated project completion time for G+4 building, Osmania University, Hyderabad is formed 560 days by the contractor, which is approximately equal to 18months, but the same project, precise planning, controlling implementation and monitoring of every activity using primavera tool, the expected time of the project completion is estimated to be 486 days only. The planning of various activities



throughout the project run would be optimum, then financial and work management can be done properly. The Primavera software P6 is a perfect and efficient tool for the project management and for the purpose of monitoring and controlling of the various construction projects, DIANA M. FRANCO-DURAN et al. (2019) said that project management software has become an essential tool for planning and control projects. Primavera P6 and Microsoft Project are two of the most frequently used scheduling software in the construction industry. Although these programs help users to develop the project plan and to report the project status, they do not appropriate support the decision process when dealing with resource project allocations and constraints. In order to mitigate the resource supply- demand problem, Resource-Constrained Scheduling (RCS) techniques have been incorporated in Primavera P6 and MS Project. After testing Primavera P6 versions (P6 v8.3.2 and P6 v16.1) and MS Project v2016, both software packages still create phantom float in resource-constrained schedules because they do not apply any algorithm to remove phantom float. The actual float values may be shorter than calculated during RCS. This makes impossible the identification of the critical path and thus, the anticipation of the impact of a delaying event in the project completion time, SHAH HARSH et al. (2018) give his opinion from the study: All project managers are aware of earned value management to help cost control. Using this concept to track a real-time project is extremely useful and gives an instant feel about the performance of the project. The expected outcome of the project will show the difference in scheduled performance and actual performance of the project for a particular period of observation. Based on the performance, we can find the reasons for variance of schedule and variance of cost. Also, we can predict the future of the project. This study also indicated that EVM has significant value and presents unique features that can benefit clients, consultants and contractors involved in the wide range of construction industries. EVM keeps the project managers on alert on any mishaps to take corrective actions on the right time. It also provides an efficient way to manage risks in a construction projects and try to avoid them in fut Ghadge et al. discussed that project cost is the one of the governing factor in project success. Project management is used to increase productivity in terms of human resource and materials. Earned value management (EVM) is a project performance evaluation technique which has been adapted for application in project management. The technique helps in comparison of budgeted cost of work to actual cost. The present study deals with the review of the project management involving earned value analysis. Nimbale et al. considered that owing to an expanding setting of condition, Construction industry is ever forthright for the improvement and headway in instruments and gear highlights, apparatuses of correspondence, systems of effective administration, instructing the HR about it. This exceptional specialization requires profoundly engaged whose development was intended to begin at Pune, Maharashtra, India. Undertaking Planning and Controlling devices or systems. In the present investigation we actualized the PC based Project Management programming/apparatus Primavera P6 for the Planning, Scheduling and Allocation of assets for a (G+8) private condo building It knows the likeness between the arranged the arranged advance of development work and real advance of the performed work. In this way the centrality and the benefits of utilizing Primavera will be sketched out through the information comes about acquired. The acknowledgment of the product Primavera as a stage of booking is been on a blast in Multi National Construction Companies, yet because of obliviousness and absence of Project Management ideas and demoralize towards the utilization of PC based projects, little and medium scale Indian development organizations go up against different issues, for example, wasteful arranging, venture delays, wastefulness of assets and numerous different issues. In this way, we likewise endeavor to teach one such medium scale development organization about the upsides of Primavera projects. T.Shiva Nagaraju et al. discussed the role of scheduling and proper usage resources to timely completion of a construction project. Results showed the drawbacks of the present project management system in station work project and the importance of efficient planning, as well as the

need and effectiveness of project management software like Primavera P6 in a construction project, R. Kohli reasoned that Efficient task administration is the need of great importance and it is the sole duty of the undertaking director to guarantee the working of the venture as indicated by its dispensed spending plan and due dates. For any development venture, legitimate arranging, booking, compelling asset allotment and refreshing the exercises is to a great degree basic to improve the task and build up most extreme spending augmentation. Dishonorable planning, sporadic checking and poor treatment of the continuous exercises builds the venture term and sum with a significant edge. Subsequently, it is fundamental to embrace expansive scale administration extends effectively with the assistance of PC helped programming. The well-ordered strategy to embrace an undertaking has been clarified and a definitive use of Primavera P6 Enterprise Project Portfolio Management (EPPM) has been condensed.

## V. METHODOLOGY

The methodology used in this project is divided into 3 main phases. By adopting planning and scheduling the activities critical path will be obtained by schedule reports by logical relationship which will be helpful in execution. Resource availability can be known and assigned, analyzed and levelling will be done. The results obtained are concluded. The entire project is integrated with Primavera and reports are generated. Following flow chart explains the phases.

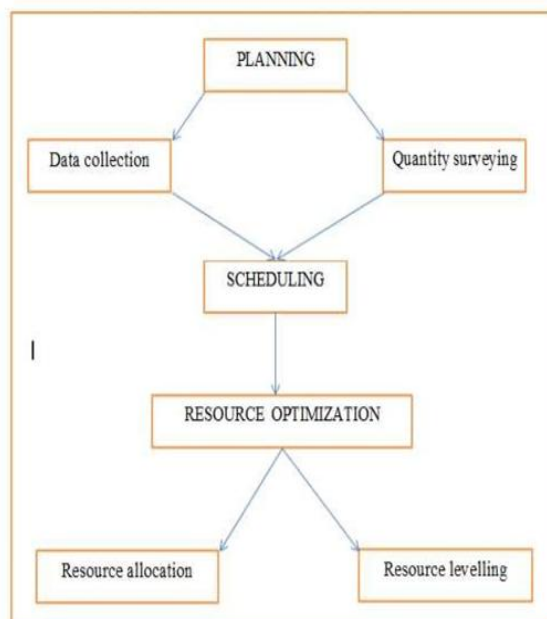


Figure 1: Showing the Phases of Methodology

### A. PLANNING

Arranging can be characterized as drawing up strategy or plan of acting, doing, continuing, making, and so forth. Created before the begin of venture.

#### 1. Time Plan

Time is the pith of all development undertakings, and contracts regularly have statements sketching out honors or punishments for finishing a work later than a calendar date. In the event that development of a venture is to continue effectively and at the booked rates, it is important to know precisely in advance the sorts and amounts of different assets that will be required and the correct dates on which they will be required. An investigation of the data got from the basic way study will empower the venture organizer to know ahead of time what assets will be required and when they will be required and furthermore the correct dates on which they will be discharged for use on the task.

Such arrangement allows the best usage of all assets and the finish of the venture in the endorsed foreordained way.

## 2. Manpower Plan

Labor design concentrates on order of labor, their numbers and the period amid which they will be locked in for every movement. In this investigation labor design gives an unmistakable picture of labor necessity in correct number amid the execution time of the venture. An immediate measure of labor consumption alone on the site can be gotten effortlessly. It helps in proficient and ideal planning and arrangement of labor in the undertaking. For instance any movement 'A' takes a month and a half, it must be founded on a given number, say 15 people of a specific ability required to finish the action. It is conceivable that by utilizing 30 men, this action could be finished in 3 weeks. One needs to see in the case of utilizing 30 men for 3 weeks will be more temperate or 15 men for a month and a half.

## 3. Material Plan

The material arrangement includes request of different materials like bond, sand, and block, steel and so forth. To achieve the movement under thought is known. Their amounts are known by estimation of required amounts and the real date when they will be utilized is known by beginning date of that action specified in the movement timetable and this decides their conveyance date also. Materials ought to be conveyed on an undertaking site just before they are required. However early conveyance date isn't attractive in light of the fact that it is conceivable that the material may break down or it might prompt the clog of worksite where the accessible space is restricted

## 4. Construction Equipment Plan

Development exercises are presently being progressively automated everywhere throughout the world including India, to guarantee opportune fruition of ventures. Gear are utilized as a part of present day development for mass exhuming, trenching, compacting, evaluating, raising, cementing, boring and so on., in structural designing task needs an assortment of hardware and it is basic for the specialist/temporary worker to recognize what sort of hardware and what number of the gear and for how long for each will be required for the reason. With the goal that he may mastermind them opportune by contracting or by obtaining or by some other means and the work may not be postponed in light of non-accessibility of gear.

## 5. Finance Plan

A financial plan shows the amount of cash flow required at different stages of the construction project for the payment of materials, labors, equipment's and others. It also given the fact that large construction projects require huge investments and a long time to complete; it is obvious that all the money is not required at any one point in time. Contractors fund their projects from their working capital, a part of which is raised by the contractors using their own sources, whereas the rest comes from a combination of avenues such as mobilization advance for the project, running account bills paid by the client, secured advances against materials brought at site, advance payments, and credits from supplier against work done. Thus, a careful analysis needs to be carried out to determine how the requirement of funds varies with time.



**Fig. 2 Financial Planning**

**B. SOFTWARE ATTRIBUTE**

**1. Relationship**

A relationship establishes the dependency between any two tasks. Task with dependency relationships are linked. A task that must occur previous to another task is a predecessor task. The task that occurs after in the relationship is a successor task. Tasks are linked with dependency relationship. Gantt charts display these links as lines running between taskbars, an arrow at one end point to the successor task.

The relationships can be classified as Finish-to-Start (FS)

The successor activity can begin only when the predecessor activity completes (see Figure 4.1). If the predecessor activities end date is delayed then the successor activity will also be delayed.

Start-to-Start (SS)

The start of the successor activity depends on the start of the predecessor activity (see Figure 4.2). They may end at different times (depending on the duration of each activity), but they can start at the same time. This relationship is utilized when two activities will be launched at the same time

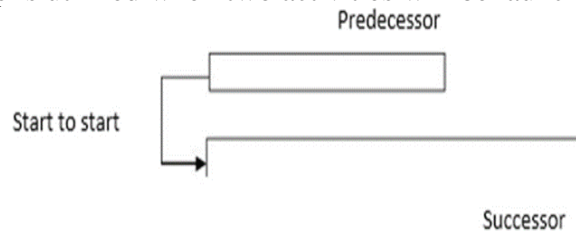


Figure 4.2: Relationship of Start to start

**2. Finish-to-Finish (FF)**

The finish of the successor activity depends on the finish of the predecessor activity (see Figure 4.3). The two activities may start at different times (depending on the duration of each activity), but the completion of the two activities is coordinated. This relationship is utilized when the completion of two activities should be linked together

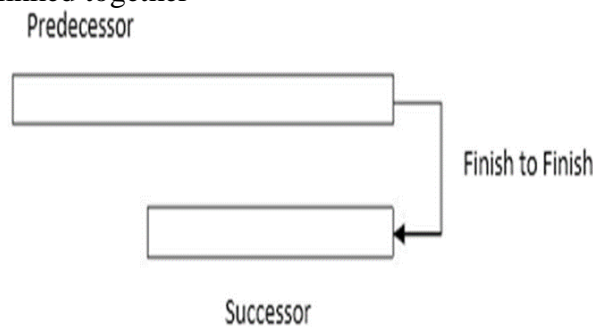


Figure 4.3: Relationship of Finish to Finish

**VI. CONCLUSIONS**

This study aims for manpower & resources planning and scheduling of a project. On the other hand one can develop a plan and schedule for equipment with their costs or for complete construction resource of a project. In the present scenario there is an immensely increase in demand for the road construction projects due to the rate of development in India which is increasing day by day .in India as we have observed there are many underperforming projects which is effecting on time and cost.to overcome all the facts that are effecting the construction of project with poor performance there we



should include proper planning and scheduling techniques to have a good and effective performance of the construction economically. So to include the best planning and scheduling techniques we can use Primavera P6 for the minimum duration construction of road construction. Primavera P6 gives a proper project management solution for the planning and scheduling team of the enterprise.

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