OPTIMIZATION AND LEVELING THE RESOURCES OF AN EXISTING BUILDING BY USING PRIMAVERA SOFTWARE

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ABSTRACT

The resource optimization and resources leveling problem is common and has been studied numerous times. But this paper proposes a quantitative assessment approach for characterizing resource optimization for a resources constrained project schedule in an objective fashion. First of all level the resources with the help of primavera P6 Release 8.2 professional client software. And then the effective force, total force and stand by force is interrelation with a resource constrained project schedule are defined and after that two resources utilization ratios, termed as effective force ratio and stand by force ratio are defined for indicating optimization efficiency of deployed resources based on the schedule. The proposed ratios are applied to objectively for multiple alternative resource constrained project schedules given from various approaches and then approach in primavera P6. An case study was taken of an existing building, created an work break down structure, resource leveling and to demonstrate the effective application of proposed ratios on alternative resource constrained schedules. It is conclude that (1) resources are leveled with the help of primavera software; and (2) resource scheduling optimization techniques outperform primavera P6 in term of resources optimization which was unknown during the planning stage.

Keyword : - *Resource optimization; Resource leveling; Project scheduling; Resource constraints; Primavera P6.*

I. INTRODUCTION

Oracle's Primavera P6 Enterprise Project Portfolio Management is most powerful, robust and easy to use solution for globally prioritizing, planning, managing and executing projects, programs and portfolios. Primavera P6 Enterprise project portfolio management provides a single solution for managing projects of any size. Primavera P6 can provide planning, scheduling, cost and resource management software that enables organizations to make informed decisions and improve their ability to deliver programs and projects 'on time and on budget'. Primavera also helps in prioritizing projects and optimizing organizational capacity, executing complex projects with ease, allotting the right person for a project. A resources can be defined as an entity that is assigned to activity and is required to accomplish the task. The resource includes people, materials, equipment and money. It is recommended to create and assign the minimum number of resources to activities. The availability and skills of resources heavily drive mast projects or parts of projects.

Resource leveling is a function in primavera project management that allows you to optimize the use of resources by delaying activities and adjusting resources to reduce the peaks in the histogram. When this feature uses, the length of project may be extended. The resource leveling problem comes in the project because of the project duration is fixed. Most projects have a completion date, specified in contract document(Jaeho son and kris G. Mattila). If any over allocation in resource exists, then for reduce the over allocation resource leveling can used. Mainly there are two types of resource leveling in primavera P6, (1) Automatic leveling (2) Manual leveling.

Primavera P6 is best specified as tool for resource scheduling of residential projects and any other projects. The assessment of resource optimization for a formulated resources constrained project schedule is crucial

to the successful delivery of a construction project. During detailed planning such assessment is based on experiences instead of analytical ratios. The assessment of a resource schedule is based on (1) total project duration (2) resource direct cost. To make more comprehensive, the ratios on resource optimization are defined to add knowledge and practice in project management. So a residential building project is used to demonstrate how to implement the ratios and get optimization of resources.

Scope of Primavera

They are moving away from a traditional functional structure to a multiple-project organization that must achieve clear, but urgent goals, using limited, shared resources, and they need the fastest business payback from those projects to realize potential revenue and increase shareholder equity. PPM provides comprehensive information on all projects in an organization, from executive-level summaries to detailed plans by project. Individuals across all levels of the company can analyze, record, and communicate reliable information and make timely, informed decisions that support their corporate mission. By putting the right tool like P6 or MS- Project in the right hands, PPM enables an organization to -

- Make strategic business decisions
- Control the minute detail that is necessary to finish projects
- Understand current resource demands, set priorities, and Evaluate long-term staffing requirements
- Use skilled resources effectively and productively
- Reorganize projects to fit shifting priorities without sacrificing quality

Aim

This project mainly aims to achieve optimum resources utilization and resource leveling by using primavera software.

Objectives

The objectives of this research were: (1) Study the resources required for an activities, optimized and level them in proper manner; (2) Calculate the productivity of staff member as resource utilization; (3) recommended changes to the company to assure these optimized resource utilization; (4) to study the cost after resource leveling and resource optimization.

II. LITERATURE REVIEW

1. Jorge E. Gomar; Carl T. Haas; and David P. Morton, Journal of Construction Engineering and Management/March/April 2002, ASCE; "Assignment and Allocation Optimization of Partially Multi skilled Workforce"

Multi skilling is a workforce strategy that has been shown to reduce indirect labor costs, improve productivity, and reduce turnover. A multi skilled workforce is one in which the workers posses a range of skills that allow them to participate in more than one work process. In practice, they may work across craft boundaries. This research investigated the mechanics of allocating a multi skilled workforce and developed a linear programming model to help optimize the multi skilled workforce assignment and allocation process in a construction project, or between the projects of one company. It is concluded that the model will be most useful in conditions where full employment does not exist; however, it is also useful for short term allocation decisions.

2. James E. Seibert, Associated Member, ASCE, and Gerald W. Evans; Journal of construction engineering and management; "Time Constrained Resources Leveling"

They deals with the establishment of initial resource profiles for construction project, resource leveling of the schedule, analysis of resource usage versus assumed levels, and the adjustment of resource profiles based upon this analysis. The uses of management considerations as well as early start/ late start resource curves in the establishment of the initial resource profiles are discussed. Serial methods for resource leveling and a measure for judging the effectiveness of resource leveling techniques are presented.

3. Jaeho Son and Kris G. Mattila, Jouranal of construction engineering and management @ASCE/November/December 2004; "Binary Resource Leveling Model: Activity splitting Allowed"

In these studies and the resulting solutions, there exists a common element, which is once an activity is started, it cannot be stopped and restarted again. That is, it cannot be split. In many instances in actual construction, there exist activities that can be stopped and restarted. However, not all activities have this restart. This splitting of activities

results in improvement to the leveling solution that is traditionally achieved when splitting is not permitted. Example has been taken and the results are beneficial to construction professionals who may be unaware of the impacts of using activity splitting.

III. METHODOLOGY

Following methodology was followed

1. Observation

In this, first of all study the overall site condition.

2. Literature Review

A detailed literature analysis was done to review the optimization and leveling the resources and their performance. Various research papers and reports on optimization and leveling the resource were also be studied.

3. Data collection and assign

In this, data should be collected as per requirement and prepare data sheet and assign the data as per required.

4. Illustrative case study

Case study of an G+6 existing building was taken and apply the resource loaded schedule assessment ratios and observe the optimization of resources and level the resources.

IV CASE STUDY

The case study is adapted to demonstrate the proposed schedule assessment approach. The case study has taken of G+6 building located at chakan, pune. The name of the site is Rahul residential building. The Sealable Area required to built the building is 17,600 sqft. For G+6 the total numbers of flats are 15.

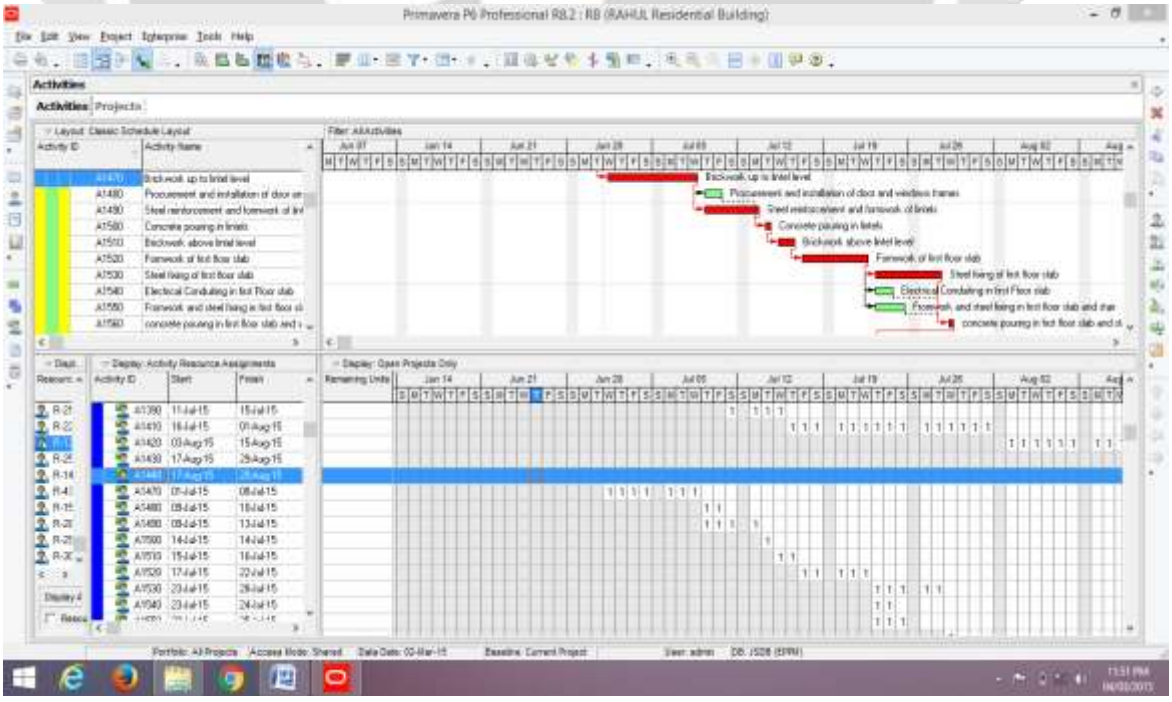

Fig. 1 Resource spreadsheet before leveling

After creating WBS and assigning resources to all activities, then with the help of spreadsheet the resources required per day should be known. In which maximum resources required for the day should be known and as we get total duration of project from summary task. The two resource utilization ratios, named effective force ratio(EFR) and ideal force ratio(IFR), are defined for a given resource loaded schedule. EFR and IFR can be used to evaluate how efficiently deployed resources can be utilized if a specific resource constrained project schedule is executed. The higher EFR value, the lower IFR value, and the higher resource utilization during project execution. On that basis the following formulas are created.

Total force:

Total force is defined as it is product of maximum resource required for the day and total duration required for project.

Total Force=maximum resource required for day*project duration

Effective Force:

Effective force is defined as summation of all resources required for the project:

Stand By Force Or Ideal Force:

Stand by force or ideal force is defined as it is difference between total force and effective force.

Effective Force Ratio (EFR):

The Effective Force Ratio is defined as it is the ratio of effective force to total force.

Stand By Force Ratio Or Ideal Force Ratio (IFR):

The Ideal force ratio is defined as it is the ratio of ideal force to total force.

By this calculation we get effective force ratio which should be greater than or equal to 60%. On that basis it was concluded that it should be profitable for optimization of resource utilization. This formulas should be applied in project before resource leveling and after resources leveling. And conclude the difference between them. The EFR and IFR should be calculated for all resources and the average ratio should be taken for the result.

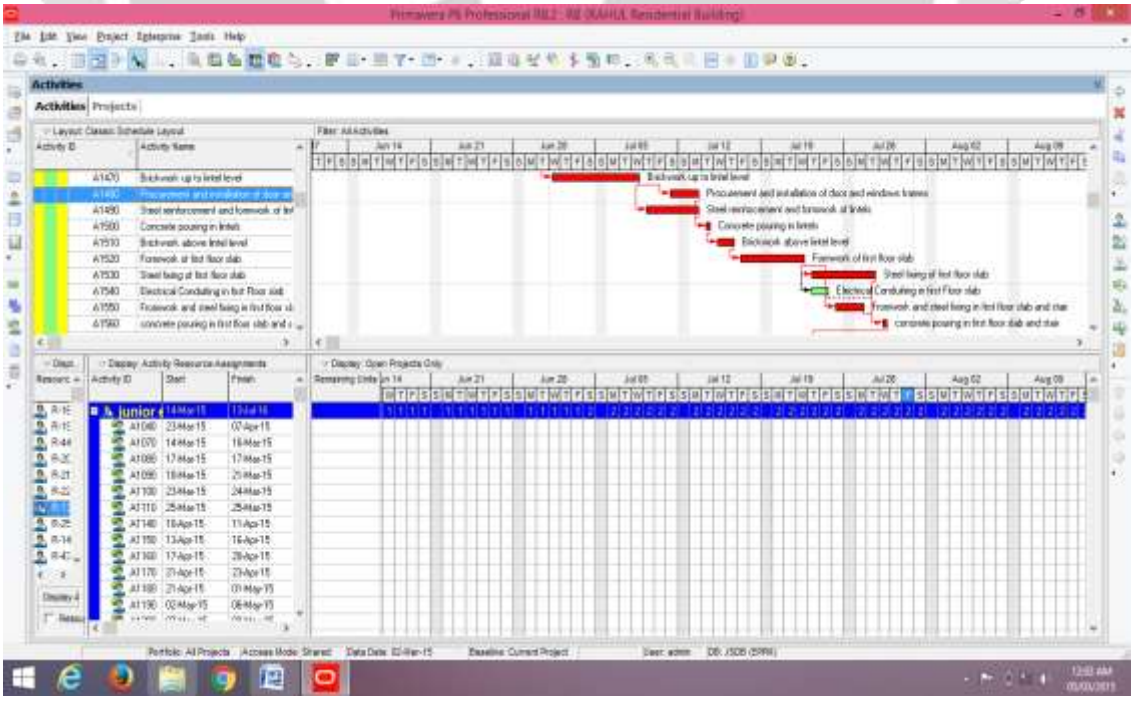

Fig. 2 Resource spreadsheet after leveling

Hence from above figure, before resource leveling the resource loaded schedule assessment ratios are EFR is 55.8% and IFR is 44.2%. Hence the EFR ratio is below the 60% so the above scheduling is in loss.

Resources analysis and leveling

Use the planning page for high level resource planning when the overall dimension of a project has been determined but not its specific activities. Analysis will provide a better result to utilize optimum resource allocation. The resource analysis will allow organizations to optimize project through effective resource management. Every organization is resource limited. Resources analysis tools combined with the portfolio management tools provide a complete solution for effective resource management. There are mainly two types of methods for analysis the resources,(1) Histogram, (2) Spreadsheet. After analysis, leveling can be done. In this project it can be done by Manual leveling method in which it should be done by priority basis. After resource leveling the resource loaded schedule assessment ratios are EFR is 64.5% and IFR is 35.5%. Hence from above result it was concluded that we are in profit with the optimization of resources.

V CONCLUSION

The resource optimization and resource leveling problem is one of the highly important issues in project accomplishment and has been ever taken into consideration by project manager.

Today's developing nation, it is necessary to invent our knowledge to learn various techniques of optimization of resources.

The assignment and partially multi skilled workforce can be optimized with Primavera software. Multi skilled workers should be selected first and used as the base workforce for the duration of project to obtain better result. Because of optimization and resource leveling, time and cost should be managed properly.

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References

1. Primavera Enterprise Project Management Manual P6

2. Textbook of "Estimating and Costing" by B.N. Datta.

3. Reference book of "Estimating and Costing" by R. C. Ranagawala

4. "Optimization of uncertain construction time-cost trade-off problem" by "Ehsan eshtehardian" (PHD, candidate of construction management, department of civil engineering of iust, tehran, iran eshtehardian@iust.ac.ir) august 4-5-2008

5. Jorge E. Gomar; Carl T. Haas; and David P. Morton, Journal of Construction Engineering and Management/March/April 2002, ASCE; "Assignment and Allocation Optimization of Partially Multi skilled Workforce".

6. Ming Fung Francis Siu, S.M.ASCE; Ming Lu, P. Eng., Simaan Abourizk, and Vincent Tidder; "Quantitative Assessment of budget sufficiency and resource Utilization for Resource Constrained Project Schedules".

7. James E. Seibert, Associated Member, ASCE, and Gerald W. Evans; Journal of construction engineering and management; "Time Constrained Resources Leveling".

8. Said M. Easa, Member, ASCE, Journal of construction of engineering and management 1989; "Resource Leveling In Construction By Optimization".