A Study on Employing of Optimum Resources In Multi Project Scheduling

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Abstract: **Resources management plays a key role in the success of any construction project. Incapable resources usage has its effect on the cost and schedule of a project. Construction contractors usually deploy simultaneous multiple projects under limited resources e.g. labors and machines condition. The resources are always limited in nature.. The main problem of the construction people to make use of the resources in fruitful manner. The most important part of a construction project scheduling is the assignment of resources and the harmonization of their work to minimize the project duration. These problems can reputedly be solved as the well-known problem in the operation research: Resource-Constrained Multi-Project Scheduling (RCMPS).The ever increasing project complexity is the key driver for construction mangers to take up the critical path method (CPM) based scheduling software like Primavera Project Planner.**

Keywords-. Resources management, Resource-Constrained Multi-Project Scheduling (RCMPS), Primavera Project Planner.

I. INTRODUCTION

A project is an interrelated set of activities that has definite starting and ending points resulting in the accomplishment of a unique, often major outcome. A project may be defined as a means of moving from a problem to a solution via a series of planned activities. It can be of any size and duration, a project has a definite beginning and end, a project consists of several activities. Essential features in every project are; they must be planned out in advance and the execution of the project must be controlled to ensure that the desired results are achieved.

Construction contractors usually deploy simultaneously multiple projects under limited resources (e.g.labors and machines) condition. To perform multiple projects, a construction contractor can access two sources of resources: *internal resources*, which are under the contractor ownership and *external resources* which can be obtained from the open market. The common objective is to create the most efficient schedule possible to maximize the usage of the contractor's internal resources and just use the market to balance the contractor's operation Because the project duration is one of the main factors of competiveness on the difficult construction market, the most important part of a construction project scheduling is the assignment of resources and the harmonization of their work to minimize the project duration. These problems can reputedly be solved as the well-known problem in the

operation research: Resource-Constrained Multi-Project Scheduling (RCMPS) .The scheduling of multiple projects under resource constraints demands extreme difficult computation.

On most projects it is possible to carry out multiple activities simultaneously. Usually it is possible to perform several activities at the same time; however there will be activities which cannot begin until a preceding activity has been completed. Such relationships are referred to as dependencies or precedence and when planning a project it is important to establish the order of precedence of dependent activities, and to establish those activities which can be performed in parallel with other activities. Regardless of the nature or size of the project a successful outcome can only be achieved by using sound project management techniques.

II. RESEARCH SIGNIFICANCE

For most of the civil engineering projects the resources in the form of material, labor and equipment are well defined. However, anticipated availability of these resources is seldom available throughout the multi-project which leads to fluctuation in the project duration. The scarcity of resources can be envisaged as constraints within which the project has to be operated. Such a study enables one to have a foresight on the how the project will progress as and when the constraints strike the project during its different phases of execution. Though the effect of constraints has been studied in a generic manner, specific study with reference to typical Indian medium size projects is not found in the literature. Such a study will have enormous research significance since the results of which can be straightaway applied to many infrastructure projects being undertaken in India. Therefore this multi-project work is undertaken to study the impact of multi resource constraints on the project duration with reference to the two constructions of Green Square apartment at and godown building at Madurai.

III.DATA COLLECTION

Green Square Apartment in Madurai is a type of residential building construction.

Details about the project

Flat -1= 977Sqft

Flat -2= 880Sqft

Flat -3= 977Sqft

Flat -4= 1040Sqft

Flat -5= 1103Sqft

Plinth area = 4558Sqft

Total area of the building = 22790Sqft (G+4)

Godown building in Madurai is a type of commercial building construction.

Details about the project

Plinth area = 4095.38Sqft

Total area of the building = 6401.35Sqft

for the (relatively) short duration of a construction project. Overtime or double shift work also provide some flexibility.

Scheduling for the project:

Major activities

1. Basement

2. Stilt floor

3. First floor structure

4. Second floor structure

5. Third floor structure

6. Fourth floor structure

7. Finishing work for ground floor

8. Finishing work of first floor structure

9. Finishing work of second floor structure

10. Finishing work of third floor structure

11. Finishing work of fourth floor structure

12. External finishing work

13. Painting work for ground floor

14. Painting work for first floor

15. Painting work for second floor

16. Painting work for third floor

17. Painting work for fourth floor

18. External painting

Total of 18 major activity

Overall activity in project is 85 activities.

IV. RESULTS AND DISCUSSION

4.1. General:

Using the Primavera Project Planner the impact of identified constraints on the duration of the project is studied and presented in this chapter. The original duration of the project without any crucial relationship and constraints either on the machine or the labour is found to be as follows

Table 1.Scheduling of the project without any constraints

Project	Duration	Start date	Finish date
Green Square Apartment	18 months	October4,2012	April 20 ,2014

The schedule report gives us the following details

Total number of activities = 85
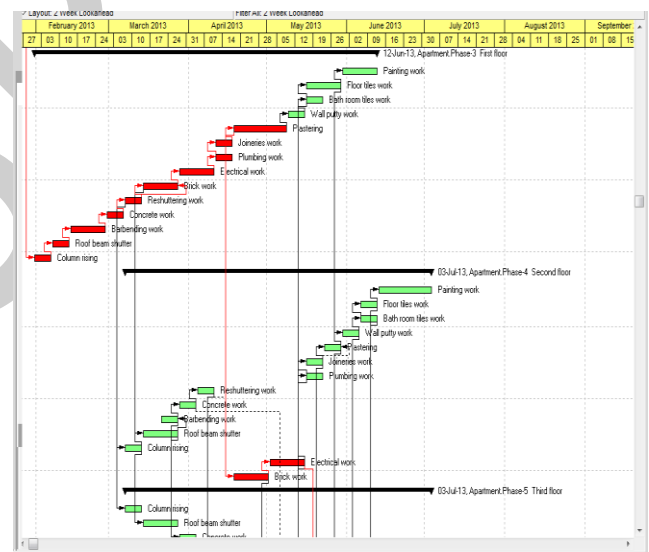
Figure 1. Scheduling report

The **Figure 1.** shows scheduling for various activities for executing the project. Communicating the project schedule is a vital ingredient in successful project management. A good presentation will greatly ease the manager's problem of understanding the multitude of activities and their inter-relationship. Moreover, numerous individuals and parties are involved in any project and they have to understand their assignments.

4.2. Baseline resources allocation of the project

Table 2. Standard labour estimate(As per CPWD)

Activity	Quantity	Labours(per day)
Excavation	320 cum	JCB 1
P.C.C	10 cum	HM ¼,M 2,L 20
R.C.C	10 cum	HM 1/2,M 3,L 23
Brick work	10 cum	HM 1/2,M 9,L 18,B 2
Plastering	100 sqm	HM 1,M 7,L 10,B 1
Flooring	100 sqm	HM 1/2,M 4,L 4

*HM-Head Mason ,M-Mason-Labour,B-Bhisti

Table 3. Resource allocation (Parametric estimation)

Activity	Quantity	No.of days	Labours(perday)			
		(Per floor)	HM	M	L	B
Excavation	320 cum	4	-	-	2	-
P.C.C	10 cum	4	2	16	160	-
R.C.C	10 cum	7	4	21	161	-
Brick work	10 cum	7	14	42	70	28
Plastering	100 sqm	21	32	22	315	42
Flooring	100 sqm	14	7	28	28	-

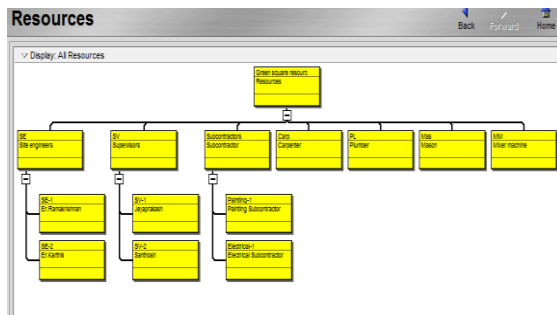The resources report shows the following details

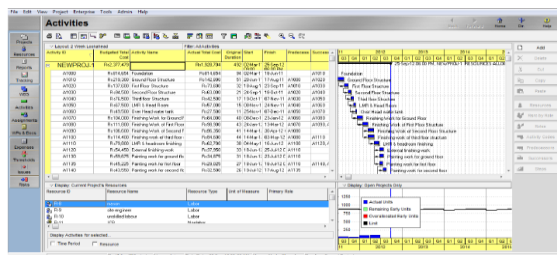**Figure 2.** Listing of resources

Figure 3. Baseline resources allocation

The baseline resources allocation fields show the total planned resources, number of resources for all assigned tasks, or for work to be performed by a resource an a task. From the above **Figure 3.** we can assess the resources for the project.

4.3. Resources over allocation

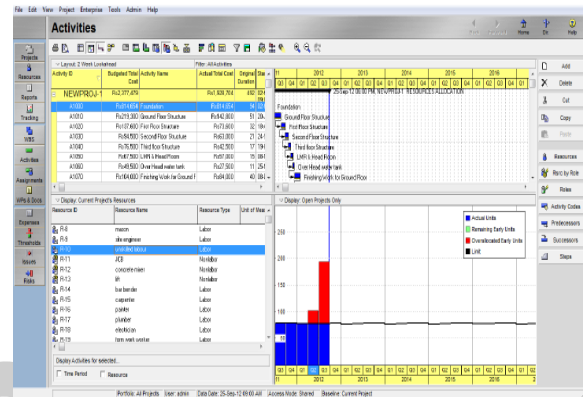The resources over allocation report shows us the following details

Figure 4. Resources over allocation

The **Figure 4.** reveals the over allocation of the resources in the project. The over allocation of resources over certain time period can be seen in the above figure. The resources can be leveled and over allocation can be eliminated by leveling the resources.

4.4. Resources leveling:

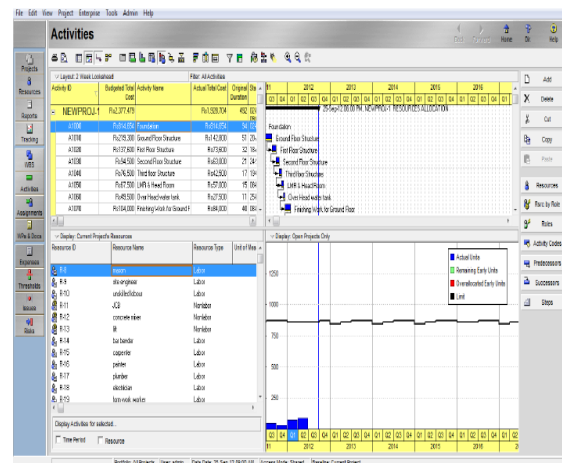The resource leveling report show us the following details

Figure 5. Resources leveling

Table 4.Scheduling of the project with resource constraints

Project	Duration	Start date	Finish date
Green Square Apartment	12 months	October 4,2012	September 25 ,2014

VI. CONCLUSION

The use of Primavera Project planner, which proved to be very useful during the execution stage, which avoided many problems have arisen if had it been done in office or any other place. An attempt has been made for sharing the various resources for the project, which has been utilized.

By resources constraints concept, the uncertainties of the project will be defined at the early stages of the project.

Construction projects are often deployed in an open execution environment, during the execution phase of construction projects, the initial scheduling always has to be adapted to the reality state due to dynamic and incomplete data.

Hence project activities must be subject to considerable uncertainty, which may lead to numerous schedule disruptions. Further research should focus on finding the solution that to make the stability for the project scheduling.

It is visualized that successful implementation of this system will enable generation of reliable plans and constraints-free assignments, in turn, reduce production risks and improve on- site productivity.

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