Approach of Critical Chain Project Management in Residential Construction Project

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Abstract- ***In today's competitive environments it is very important to complete the project with the least possible time. So, it is very important for project managers to plan & schedule the project effectively such as to achieve their targets within the stipulated time. One of the traditional methods used worldwide is Critical Path Method (CPM) which leads to ineffective scheduling. In CPM, the task estimates are based on guess work which leads to increase in the project completion duration. Also, the availability of resources is not considered by the scheduler to develop optimal schedules. To overcome the shortcomings of CPM, a new project management methodology called "Critical Chain Project Management" (CCPM) was developed in 1990"s by Dr.Eliyahu M. Goldratt after which various additions were given by different researcher to his research. CCPM is based on the philosophy of "Theory of Constraints" (TOC) which believes that every system has a constraint & without eliminating this constraint the system cannot progress. CCPM achieves its goal through buffer management. The developing countries like India mostly face the problems of project delays so CCPM can be applied to save the projects from time and cost overruns.***

Indexed Terms- CCPM, CC, TOC, Project Network, Activities.

I. INTRODUCTION

With regards to CCPM, in a single project environment, the unique constraint is the longest chain of activities in the project network which is called the „Critical Chain"(CC).The Critical Chain is the sequence of both precedence & resource dependent tasks that prevent a project from being completed in a shorter time given finite resources. If the resources are available in unlimited quantities, then a project"s Critical Chain is identical to Critical Path. Since the introduction of CCPM its use has grown considerably & is being applied in more & more challenging project management environments. CCPM was developed with a goal of delivering the projects within their original cost & time estimates.

II. AIM OF THE PAPER

- To Compare CPM with CCPM
- To understand the CCPM approach in the project
- To find the Project constraints and key parameters

III. PROBLEM STATEMENT

Runal Developers is a leading Pune based real estate company. The company has carried out various residential & commercial projects in Pune and other parts of India. The Runal Gateway Project which is currently being developed by the company at Ravet has been considered for the study. The scope of the whole project is large and complex. The project has a builtup area of about 634,662.28 Sq. ft. The site is spread over an area of about 10 acres. There are four residential towers A, B, C& D which will be constructed in this project including various Commercial, Entertainment, Educational, Recreational and Sports Zones. The residential tower „C" up to third floor level has been chosen for the analysis work. The project is late on schedule due to change in Architectural design, Structural Design,

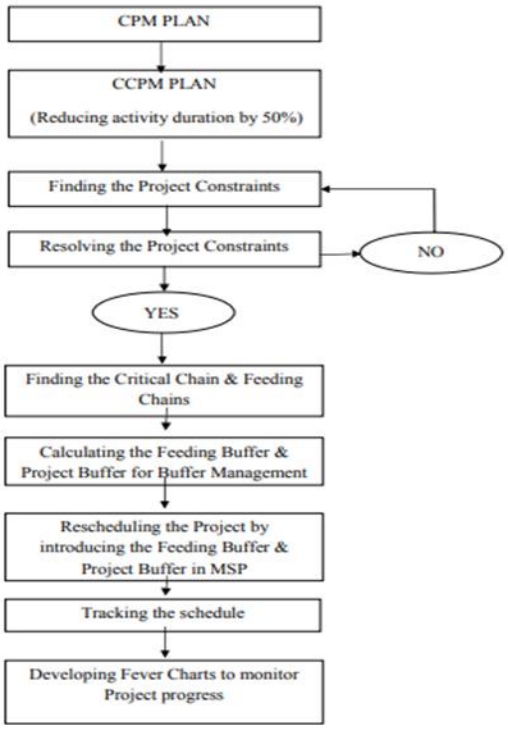
Scope of work, Resource Contentions& management decisions. The challenge is to monitor and control the project and reduce the delay which has been introduced due to the above reasons and not let it protrude further and present a method which is easy to understand to the management to take necessary actions to reduce the further delays.

The Project will be rescheduled by customizing MSP to introduce CCPM approach to schedule the project by Cut & Paste Method and monitor it using Fever charts. The project will be tracked to check the consumption of the Feeding & Project Buffer. The % project complete will be plotted against % Buffer consumption which will be done at regular intervals of 15 days and the Fever Charts will be developed.

Answers have to be developed for the following questions:

1. What is Project Duration after scheduling using Cut & Paste method?
2. How the Buffer insertion does protect the project from delays?
3. How can the fever charts help to monitor & Control the Project?

IV. METHODOLOGY



Project involves the planned set of interrelated tasks to be executed over a fixed period and within certain cost and other limitations.

Like most organizational effort, the major goal of a project is to satisfy a customer's need. The major characteristics of a project are as follows:

- An established objective.
- A defined life span with a beginning and an end.
- Typically, doing something that has never been before.
- Specific time, cost and performance requirement.

There are typically five phases of project management which are as under:

1. Initiation
2. Planning
3. Execution
4. Monitoring & Controlling
5. Closing

V. CRITICAL CHAIN PROJECT MANAGEMENT

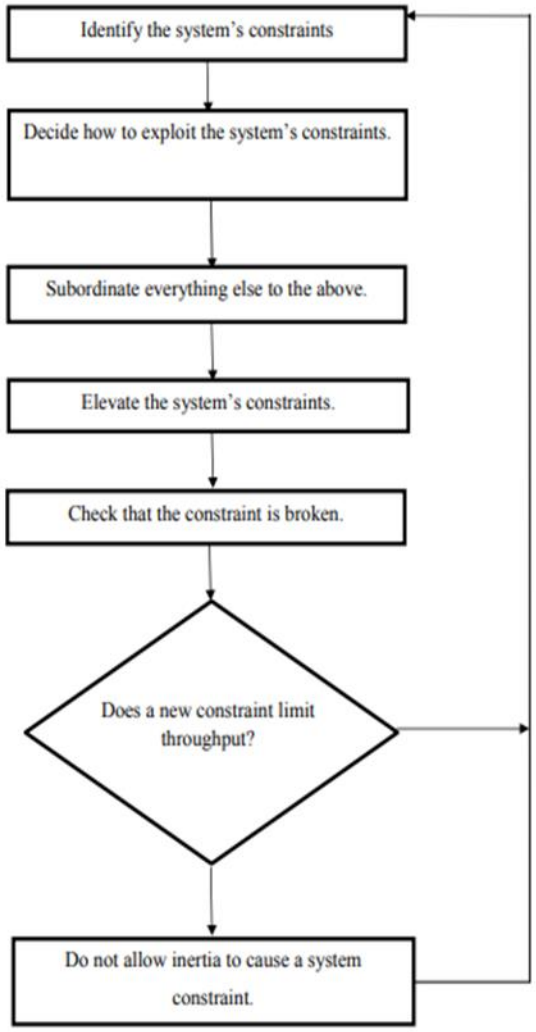
In the current scenario Project Management is becoming challenging day by day due to the demanding customers. The CCPM aims at providing a solution to the present problems of project management. The CCPM methodology addresses the basic problems in the areas of estimation, planning and execution of the projects. It also addresses the issues related to human behavior in a systematic manner. CCPM helps in faster delivery of projects. It is aimed to deliver projects 10%-50% faster compared to traditional methodologies and achieves these improvements through a process of waste reduction. CCPM achieves its objectives through buffer management. Buffers are available at appropriate stages of project. CCPM has been used in the company "Geometric Limited, India" for last 3 years and has been clearly shown to achieve the gains which the customer is demanding. According to PMBOK Critical chain method is a schedule network analysis technique that modifies the project schedule to account for limited resources. A mix of deterministic and probabilistic approaches to schedule network analysis is used. In many organizations, the behavior which is prevalent is multi-tasking i.e. to put a worker on more

than one tasks to complete their projects. This has led to look for a new approach called Critical chain Project Management**.**

To derive the Critical Chain solution Dr. Goldratt applied the five focusing steps, identified in his writings.

i. Identify the systems constraints
ii. Decide how to exploit the constraint III. Subordinate everything else to the above decision
iii. Elevate the system's constraint
iv. If, in a previous step, the system's constraint has been broken, go back to step 1

Following are the focusing steps of CCPM: -



VI. THEORY OF CONSTRAINTS

CCPM (Critical Chain Project Management) is a Project Management Methodology based on Theory of Constraints (TOC). TOC is an overall management philosophy introduced by Dr. Eliyahu. TOC is an overall management philosophy introduced by Dr. Eliyahu M. Goldratt in his 1984 book titled „The Goal". Later he introduced another business novel in 1997 "Critical Chain" in which he addressed the application of „theory of Constraints" (TOC) to project management. „ProChain Solutions Inc."has developed an add-on to Micro-soft Project and a package, ProChain Plus, that deals with multi-project scheduling to help the scheduler to easily use the CCPM methodology.

VII. NEED FOR CCPM

In Project Management, the following are the pain points for the project manager. These are common to almost all types of projects viz. engineering, construction, software development or product development. Even though the projects are diversified, the complaints are basically the same in every sphere.

1. Usually they cannot meet the original due dates.
2. There is significant re-work.
3. Very often the resources are not available when they are needed (even when promised).
4. Delays in getting approvals from government organization or any other party concerned.
5. Necessary things are not available on time e.g. specifications, designs, authorizations etc.
6. Too many customer changes as customers are very demanding now a days.
7. There are fights about priorities between projects which waste a lot of time.
8. Actual work is significantly more than what was originally planned.
9. Projects are full of surprises and dealing with each such surprise puts pressure on one of the commitments and finally time, cost or quality have to be compromised.
10. Projects commitments are always on 3 dimensions of time, content and budgets.
11. When we act upon to take care of one commitment, the others tend to get compromised.
12. Bigger uncertainty leads to bigger conflict.

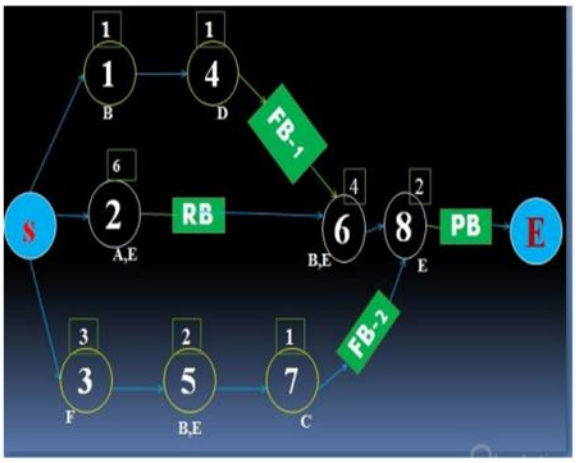
VIII. KEY PROJECT PARAMETERS

2. % longest chain complete: This indicates the progress on the critical chain of the project. 3. % Buffer penetration: This indicates the % of buffer consumed against the total project buffer 4. Critical resources: The resource generating contention a) Identify the most critical resource and ensure his activities are strongly WIP controlled. b) Mostly he is the tech lead and is encouraged to devote himself to design and review activities only. 4. Stopped activities: These are the ones which, if on the critical chain are going to result the buffer penetration. We must make sure to make resources available for activities on critical chain. 5. Daily activity tracking with focus on: a) Effort Remaining. b) Resolution of Issues faced. c) Precise tasks assignment to individual. d) Visual Control with Status Flash. e) Work-In-Progress control. f) Strong Change Management to ensure minimal addition of new tasks to the commitment. g) All decisions are subject to its impact on critical chain

IX. UNDERSTANDING CCPM APPROACH WITH THE HELP OF EXAMPLE

Data Assumed:

1. Project Network consists of 8 activities.
2. The number above each activity is used to refer to the aggressive activity duration while the label below the node refers to a renewable resource that is required to perform the activity.
3. The renewable resource A, B, C, D and F have an availability of one, while the renewable resource E availability is restricted to two units.
4. One project buffer is added to protect the critical chain S-2-6-8-E and two feeding buffers FB-4-6 and FB-7-8 are added to protect the feeding chains 1-4 and 3-5-7 respectively.
5. The resource buffer RB is added to assure the resource B will be available on time to start with activity 6.



Network diagram

CONCLUSION

CCPM Considers Task & Resource Dependencies, Supports the bottleneck resource to avoid delay on the critical chain, Availability of resources is considered by the scheduler to develop optimal schedules.

It mainly focuses its attention on both Single and multiple project environments. It sets a project completion time and determines under explicit consideration of uncertainty which activity requires particular attention to avoid delaying project completion. It Monitors project progress and health by monitoring the consumption rate of the buffers rather than individual task performance to schedule.

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