A Review Paper on Critical Chain Project Management Method in Construction Project

Divyesh Sharma¹, Sonam Yadav²
¹Research Scholar, IES IPS Academy Indore-452001, MP, India
Email: divyesh67sharma@gmail.com
²Asst. Professor, IES IPS Academy Indore-452001, MP, India

Abstract:
Present research is oriented and focuses to analyze construction project management technique and methodology for under construction buildings taken as a live practical case for research as a problem location, i.e. the critical chain project management (CCPM). The research is identified to show offers and effect of CCPM technique to improve project performance and help decision for manager for improvement in existing method of construction and its planning. It is required to plan and design CPM and CCPM together, as CPM never offers execution methodology and must be subordinate to CCPM for execution of on time and under controlled cost project completion. The trends and original time and operational sequence records are collected for considered building construction cases to identify and trace overall activities on time scale. MSP (Microsoft Project) software is used to record data and to find critical path for building construction. The aim is to reduce time and hence cost of project utilizing CCPM and MSP together. Suggestions are scientifically implemented for activity and sequence of activities to improve project time. Improved suggested project schedule is compared with existing schedule to show results in comparative format with graphs and charts to prove effectiveness of CCPM and MSP utility.

Key words: CCPM, Microsoft Project, Project Management, Scheduling.

1. INTRODUCTION

Project is an effort taken to construct any product in this world. Project is having start and end dates. It depends on resources available and produced to use. Project is required to complete in limited duration of time and schedule is the activity performed by project manager to accomplish and achieve project in time with minimum cost. It is observed from past trends, records and experiences that about 50% of the time and cost is over estimated which was never been considered for project. This unexpected hike in cost tends to fail project estimation and duration. CCPM overcomes many construction project problems and is major evaluation in the field of construction project management. It helps to schedule and complete project in time as well it provides buffer time duration to protect problems and duration increase during project execution. In addition to provide a quicker way of completing project. Moreover, CCPM employs buffers to act as safeguards against various problems that may arise during the execution of the projects. MS Project is a software tool used in project management, it is developed, published and marketed by Microsoft. It is designed to be used in management of projects to develop plan, to assign resources for various tasks, to track the preplanned progress of construction process, to manage the available budget and to investigate, study and analyze work load in the organization. The software is having spread sheet environment in which the project manager can feed start and end task row by row for each activity of the project. Project manager can also assign the resources such and labor,
equipment’s and material for each of the activity. The complete tasks can also be assigned with subtasks. The process is then can be seen with Gantt chart which is appeared at half right side of the screen. Gantt chart represents the activities alternative and parallel too. Project manager can also view critical path for the project without performing any computational or mathematical approach and investing time.

2. Review

Muller (2001) Paper presented, CCPM using Buffers and Risk. This paper shows how statistical process control with the use of function points and standard process can improve the ability to plan and control projects. Using examples based on real-life experience, it provides a simple method for controlling variation and risk.

Jan and Shu-Hui (2006), Project scheduling and its control for construction application is critical and difficult due to limited resources. It always cost high with uncontrolled schedule. Theory of constraints and CCPM i.e. critical chain management is proposed to control activities for their completion in time duration. Buffer is availed to project manager for effective schedule and control. The study in this paper explained the applications of critical chain and buffers for construction planning, control and management in shorter duration of time.

There are many hidden constraints which cannot be identified, solved or handled by traditional CPM/PERT techniques. Critical chain with buffer effectively removes those hidden constraints. This study assigns safety time for each activity in construction and hence it overcome extended duration problem efficiently.

Stratton (2008), Critical chain was introduced in 1997 first, then software and their implementation in construction practices starts to develop for construction project management. Strategy and tactic tree is proposed and applied to review CCPM theoretically and practically with new improved guidelines. The paper includes the new findings and approaches with respect to current practices in construction industry. Paper concludes success of CCPM in construction industry, with strategy and tactic tree for the growth and betterment of CCPM for control and continuous improvement of construction activities and industries.

Robinson (2009), The researcher in this paper investigates and presents the success of critical chain in construction project. Research elaborates applications of critical chain including construction projects. Many reasons for failure of projects are listed and critical chain is suggested as a solution project management approach for project. It is concluded that buffers provided using critical chain approach results in lesser project duration and is more cost and time effective than any other project scheduling methods.

Kulkarni et al. (2009), Project management is noticed as a critical and difficult task and Critical chain is highly required due to the need of timely completion of the project and to improve service. Human behavior aspect is also discussed and addressed for any project success. It was concluded that CCPM provides better even excellent solutions and can be used parallel to or with CPM. MS Project was used in this paper to schedule construction project and time reduced by 20% to 30% can be converted into saving of cost and hence profit.

Stelth (2009), Construction projects are analyzed and scheduled with critical path method or techniques to find and determine longest path for construction project. Organizations are now a days motivated to assign or recruit a virtual project management team. The virtual project management team works with advanced techniques and even procurement of material is promoted from all corners of world. The advanced techniques too create their own challenges and problem which are addressed in this research paper. New
bottlenecks may arise which are required to solve using new procedures. Each project is required to analyze for their performance level and risk factors. Every time algorithm and scheduling is need to change with project size. Manager is required to apply advanced software skills to successfully establish construction organization in competitive world.

**Sarkar (2012)** Paper presented, Transition from Critical Path to Critical Chain: A Case Research Analysis. CCPM methodology is applied to private project construction initiative. The research analysis is carried by using MS project. Paper concludes that CCPM has indeed provided a more efficient and reliable method of project management.

**Gonzalez (2013)** Paper presented, Analysis of causes of delay and time performance in construction projects. The paper presented a methodology for analyzing the qualitative (delay causes) and quantitative (time performance) dimensions of the delay issue that uses two indicators (1) RNC as the cause of delay and (2) DI as a delay indicator. The methodology was tested in two case studies of building projects.

**Ma et al. (2014)** Paper presented, Improved CCPM framework for construction projects. The paper addresses two major challenges in CCPM-based construction scheduling including buffer and multiple resource leveling, where buffer plays a key role in ensuring successful schedule management. The case studies from real world were used in the paper to validate the proposed CCPM framework. The results shows that Uncertainty Aware Method (UAM) out performed.

**Joshi (2015)**, Limited fund is major factor for construction industries, Scheduling is critical task identified for any construction project manager. CPM/PERT are the techniques frequently used since 1970’s for project scheduling. Delays are major factor which fails project to achieve schedule and cost. Profitability can be achieved with higher ratio compared to capital invested using Microsoft Project software, and is proposed with this research paper. Resource allocation and resource leveling can be planned effectively with software proposed. The paper focuses mainly manpower allocation problem which is major constraint for construction planning. Sudden requirements of manpower in construction projects are focused and analyzed, it directly effects cost of project. It was concluded that about 10% increase in manpower increases project cost by 1% to 2% depending on project size, shape and location factors.

**Jain et al. (2015)**, Indian construction industry is working with traditional principles and methods, results in uneconomic working which costs high and is time taking. The research in this paper compares and observes working with Microsoft Project and traditional planning techniques. The use of Microsoft Project is concluded as efficient and effective for construction industry, Case study is performed and it is proved that use of software is cost effective and visible with no confusion to everyone involved in construction project. Primary and secondary data were collected for existing construction project considered and analysis is performed to achieve results for improved technique. It was listed in conclusion that there are many errors and complexity in traditional technique and activities are not clear for their resources and labor allocations. Microsoft Project provides effective approach with vision to complete project in planned cost and time duration.

3. Conclusion

Many researchers reported lack of awareness for application of scientific scheduling technique in construction industry. Researchers somewhere explained advanced scheduling methods theoretically. It is observed that:

- CCPM theories and practices are not implemented in stages with systematic approach especially in construction industries.
• Many research presented only theoretical analysis and comparison of CCPM.

• CCPM is seen limited and restricted up to theories and cases; practical achievement is unseen in India.

• If focusing on the specific construction industry projects then the method of calculation of project buffer is not appropriate.

4. References


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