Critical Chain Project Management : Integration of traditional Project management and Theory of Constraint

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Summary

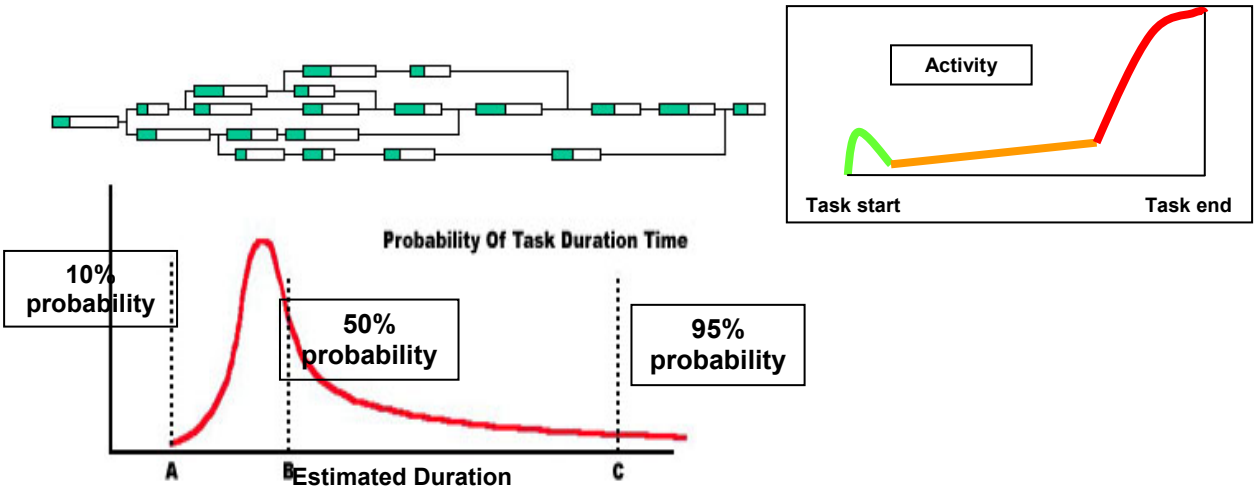
1. Is 'Speed to Market' the driving principle in most decision making and to beat competition ?
2. Are the individual tasks/milestones targets low on importance for business compared to project completion commitment ?
3. Are the projects fed into the system with strict 'time to market' deadlines to beat/meet competition or regulation ?
4. Is the 'Return discount factor' (risk associated with every project) very high because of rapid technology obsolescence, market competition and ever-changing business demands ? (NPV = FV / (Discount factor)^^ (Project duration)).
5. Is the firm focus on earliest delivery of business value instead of optimized resource utilization (Bigger Top line impact vs minor bottom line gains).
6. Project business value is measured by NPV and not only by ROI.

If your answer is 'YES' to any of the above : CCPM does apply to you.

The pitfalls of traditional project management are best explained by two dominant laws :

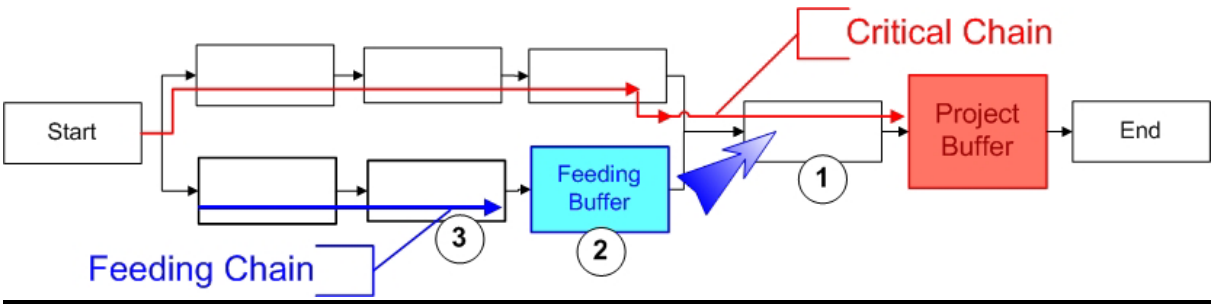
1. "Work expands to fill (and often exceed) the time allowed." -- Parkinson's Law
2. "Whatever can go wrong, will." -- Murphy's Law

CCPM avoids both of these pitfalls (avoid bad multitasking, manage project not tasks) through simple but lasting change of project management culture. CCPM's approach to traditional project management is constraint driven and the constraint itself is the 'Critical Chain'. Traditional critical path (longest sequence of activities) coupled with resource constraint is defined as critical chain. CCPM's revolutionary approach based on Goldratt's Theory of Constraint injects delivery speed, employee motivation, teamwork and transparency in the project system.



The Core Concepts :

1. No task level targets
2. Management commitment to critical resource availability
3. Categorize tasks into Critical and non critical
4. Estimate each task aggressively with 50% confidence instead of traditional 90% confidence factor. (avoid Parkinson's law to take effect)
5. Provide considerable buffer at the end of the project to save the project level commitment (scheduled delivery date). This helps to mitigate Murphy's law.
6. Identify resources for critical tasks and keep transparency in communication, let information flow downstream. Avoid multitasking on critical chain.
7. Agree with the critical item resources a 'Readiness Lead Time' upfront so that they can drop all current work items and start working on the critical item on planned start date. **(Resource Buffer)**
8. So as soon as estimated time left for the last non critical item before start of a critical item, communicate to critical resource. (image 1)
9. To make sure critical tasks always start on time, keep buffer after the bunch of non critical tasks **(Feeding Buffer).**



10. Generally a normal project would include 20%-30% critical tasks and 70%-80% non critical tasks.
11. Hence majority of the tasks are protected by double buffer (Feeding Buffer) and all critical tasks are protected by single buffer (Project Buffer).
12. Since the aggressive estimates are of 50% confidence, generally they are shorter by half in duration.
13. Since the initial high level 'guesstimates' are equally likely (equal probabilities) either to finish early or finish late, CCPM capitalizes on all these early finishes and use the time as Project and Feeding buffer.
14. Hence, the maximum possible time saving is as much as 50% in CCPM as compared to tradition WBS approach at the same time we are 100% confident to meet project target by avoiding Parkinson's and Murphy's law.
15. Tracking projects is simpler : just track the % Buffer used up and take timely corrective and preventive measures. As a result there is a high % effort saving on Project Management (tracking, follow-ups, reasoning/justifying for delay, health reports to business etc etc.)
Essential behavioral changes to get started:

1. Management must encourage the use of mean task-duration estimates by not pressuring people to perform to the estimated durations.
2. Management must enable people to focus on one task at a time.
3. Resources must focus on one task at a time and pass on the results as soon as the task is complete.
4. Everyone must use the plan and the buffer reports to decide what to work on next.

In order to perform any task on a project, two things are necessary:
- → the task input from a predecessor and
- → Resource availability.

The definition of the critical path does not address the potential resource constraint. The resource need is implicit in the critical-path definition for many tasks because the task duration assumes a specific level of resource availability. The critical-path definition does not treat the constraint of resources across project tasks and does not allow the critical path to jump logic paths.

The basic definition of the critical chain is to simply identify the constraint of the project, or "The sequence of dependent events that prevents the project from completing in a shorter interval. Resource dependencies determine the critical chain as much as do task dependencies."

Based on WBS performance for old projects, we can estimate the average % tasks delayed or on time
1. list work items
2. map dependency
3. put aggressive estimates
4. identify critical non critical tasks and resources
5. identify 'critical chain' as 'constraint, make

CCPM vs PMBOK 9 Knowledge Areas : A comparative Study

2. Project Integration Management :

- The two biggest factors impacting project duration :
    - is the practice of estimating tasks according to non dedicated elapsed time and subsequently, managing execution of those tasks to due dates.
    - Minimizing padding on individual task estimates assuming dedicated effort and less important task due dates.
- Protection from individual task variance must be accumulated into project buffers and not managed individually.
- Project buffer duration is 30%-50% of the length of the critical chain.
- Reduce the frequency of management would intervene due to task time variation by 97.5%.
- Shrink task time : remove padding and take dedicated elapsed task time.
- Relay runner ethic : resource to complete task as quickly as possible and pass on the next available resource.
- Resources on the critical chain the flexible enough to start on a range of dates instead of a particular date.
- No scope for student syndrome and Parkinson's law to take effect.
- Ultimate objective is to get the project done on-time or before time not the tasks done on time.
- Three useful ratio metrics :
    - % critical chain completed upon % project buffer consumed
    - % feeding chain completed upon % feeding buffer consumed
    - Buffer consumption speed. (Days per week)

2. Project Scope Management :

- Keeping the cycle time to a minimum the project benefits are maximized in terms of NPV.
- Very quickly project scope becomes obsolete and CCPM support agile heavily on this aspect.

3. Project Time Management :

- Dual saving on time estimates : dedicated and no padding.
- Start task as late as possible (no slack time) : to avoid 'Parkinson's law and student's syndrome. Late start means higher NPV, less risk of bad multitasking.
- Avoids **"Layered Padding",** e.g. 1 day of hard work for a team member, suddenly becomes a 2 weeks project ->
    - Team member to team lead : 2 day (1 day padding)
    - Team lead to Program Manager : 1 week (3 days padding)
    - Program Manager to Business user : 2 weeks (1 week padding)

4. Project Cost Management :

- Focus on early business value or NPV of every project and for multi project portfolio instead of individual resource efficiency. Multitasking enables resource optimization for managers and CCPM discourages multitasking.

- (Contract head count environment) & (Low imp. On velocity) & (Low NPV) == High individual efficiency.
- (Business Value driven env.) & (High competition) & (Low indiv. Efficiency) == High NPV.

- (High team size to manage) & (Non dedicated-bad multitasking) & (High cross portfolio risks) == Longer projects.
- (Smaller team) & (dedicated time estimates) & (Buffer management) & (indep. Projects) == Shorter projects.

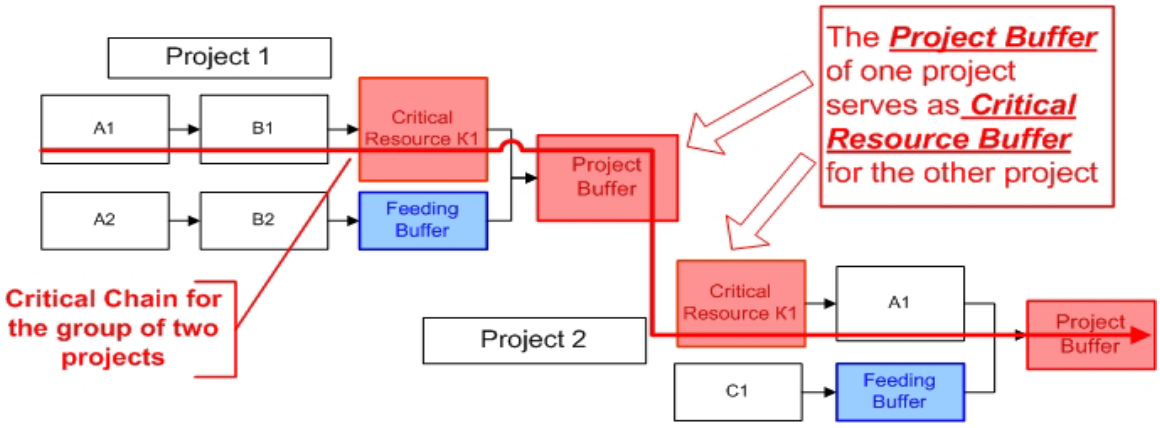
Priority	Status	Project name	Project manager	Deadline	% accomplished
1	-	Project 1	John Screw	25.12.2006	98
21	-	Project 2	Mary Mess	31.01.2007	48
13	-	Project 3	Peter Pickpocket	14.02.2007	63
54	-	Project 4	Mary Mess	03.03.2008	15
23	-	Project 5	George Binladin	24.05.2007	41
13	-	Project 6	Helluv O'Booze	01.08.2008	18

5. Project Quality Management :

- Project Dollar Days : This is an effective Productivity ratio measure/tool for a multi project environment. Number of dollars generated by collection of projects (NPV of all cash flows) divided by the number of man days consumed by projects. Useful for PM office, senior management.
- If the project hits upon a quality issue, more resource required for rework and hence more man days, the Project dollar days comes down.
- If the project gets delayed, the NPV comes down and the productivity ratio comes down.
- Quality control : Instead of task level controls, CCPM builds project level controls, with more opportunity of root fixes and less follow ups and micro management. CCPM appreciates all types of common causes of variation and manage them through buffers.

6. Project Human Resource Management :

- Pull instead of push motivates individuals and empowers them to finish work as early as possible.
- Less stress for employees, less last minute surprises, fear of failures.
- Improved productivity and team effort.



7. Project Communication Management :

- Resource manager and project managers work together on effective reporting of alerts downstream to allow pull.
- Lighter tracking and reporting purely based on buffer management.
- Drum buffers should always be informed and team need to identify the drum buffers accurately.

8. Project Risk Management :

- The risk management primarily constraint based, CCPM looks at critical chain as constraint and continuous focus to minimize the same.
- Project buffer and feeding buffers act as contingency reserve for project deadline.
- Easy and early identification of project risks, categorizes risks in terms of their relative impact on project end date.
- Balanced reaction to risks and issues.

9. Project Procurement Management :

- Procurement decisions are made purely based on project completion time and quality instead of cost.
- Every procurement (vendor deliverable or infrastructure) on the critical chain must be delivered ontime, early delivery is valued higher than the additional procurement cost to do so.
- Buy or make decisions are important while considering options to bring the project duration down, contract out non critical deliverables to deliver project early.
- Solicit trade off between : cycle time, cost and risk from vendors. Two simple case studies of CCPM. (Image) : How Confluence, a software solution provider in financial service industry has turned around the business performance through CCPM since year 2001.

Conclusion

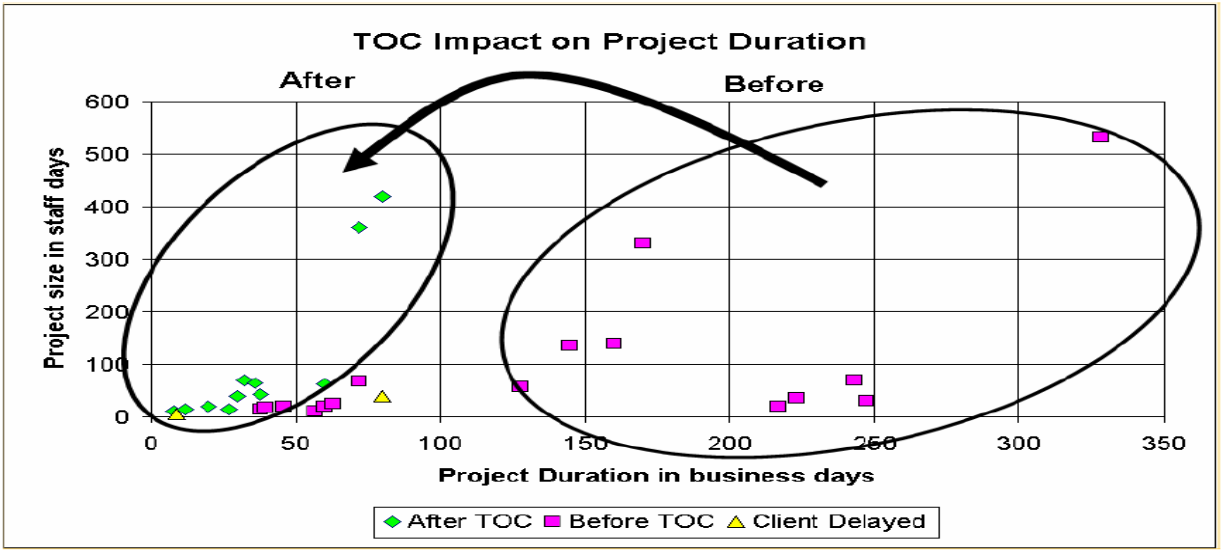
- → CCPM is not another quality or management concept. It is close to our daily operation and requires simple culture change.
- → Management paradigm needs to change before we try CCPM. It is a paradigm shift from 'individual resource productivity' to 'individual project speed and productivity'.
- → CCPM does not apply well for commercial product or service sellers or providers, because time value of project is less important for them.
- → Operations, IT projects that support its own business, benefits most from CCPM.
- → In today's world cost cutting, CCPM may lift up a project delivery cost (to make it faster) but enhances the top line heavily through early business value or the time value of projects.
- → CCPM is where predictability of Newtonian 'physics' (read as project management) meets the 'unpredictability' of Quantum 'physics' and where the biggest, most complex, unpredictable and ever challenging constraint of any project management being : 'The Human resource', the quanta!

Sample CCPM result : A case study :

Confluence, which provides software solutions for the financial services industry, consists of approximately 50 highly innovative people led by young visionaries.

Confluence undertook a TOC Multi-Project Management implementation in the spring of 2001.

The facts:
See the picture below. The vertical axis denotes project size, in units of actual staff-days spent on the projects. Data points at the same vertical position denote projects of equal size. The horizontal axis denotes project duration, in business days. Weekends and holidays are excluded from the data.



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Author Biography:

Pallab Bhattacharya, is a MBA with 10 years of experience in Project and Program management in IT, Banking and Financial domain. He is a senior Lean Sixsigma Champion and currently Head of change delivery for HSBC India operations. He holds many certifications like CSSBB, CMQ/OE by ASQ, CSQA by QAI, Certified Lean Manager by Expertrating, Certified Scrum Master by Scrumalliance. Pallab is a senior member with ASQ, he has published multiple papers on isixsigma and ASQ conferences.