Highlights of CCPM - Critical Chain Project Management
The TOC way of managing projects

By Oded Cohen – International Director – Goldratt Schools

ABSTRACT

For many years the systemic approach to improve systems dealt with three major issues: the problem, the solution and implementation of the solution.

Theory of constraints (TOC) has taken this approach further with the constant view of providing the managerial and analytical tools for handling the process of improvement. These tools ensure a high impact with a minimal level of effort and provide significant return for the investment in making it happen. TOC is also the explicit fourth step in providing an engine for continuous improvement to ensure that systems never rest on their laurels but continue to grow and achieve higher and higher performance relative to their goals.

CCPM – Critical Chain Project Management is the TOC solution for better managing projects. It is a knowledge-based approach.

This article outlines the CCPM solution. It introduces the key injections – the elements of the CCPM solution. The complete solution for managing a single project contains 9 injections: 1 injection setting the right mindset for managing the TOC way, 3 injections for planning and 5 injections for execution control. CCPM provides a guide for every project manager who wants to deliver assigned projects on time, within budget, and with the promised deliverables.

This article is a shorten version of the article called CCPM – the TOC solution for improving the management of single projects and the use of the

"U" shape for structuring TOC knowledge and developing TOC logistical applications[1]

1. Introduction

TOC started years ago with improving production. It was only natural that the knowledge that was developed, and the experience that was gathered, would attract the desire to improve project management.

Like production – project management needs good planning and an effective way to manage the execution of the plan. The unfolding reality of the execution differs from the plan due to the statistical fluctuations. The level of uncertainty is significantly higher in projects as many of their planned activities go forward with little prior experience (if any at all).

The traditional TOC solution for production, the DBR – Drum Buffer Rope for planning and the Buffer Management (BM) can be used as a base for the systemic management of projects. We just need to amend and modify the solution to accommodate the high uncertainty in the expected durations of the task, as well as the high percentage of the "touch time" – the actual time needed for the tasks to be worked on by the resources relative to the overall lead time of the project.
The current way of managing projects is dominated by CPM – Critical Path Metohd used by P.E.R.T. (invented over 60 years ago).
The problem with PERT is that it does not provide the expected results. Project managers around the globe struggle to deliver within the agreed time, budget and deliverables. So, what are we missing?

Analyzing the reality of project management reveals that in the majority of the projects with commitments to time, money and specifications, going

[1] The article appears on Goldratt Schools book – Project Management the TOC Way, CCPM, 2010.

over budget is the most unpleasant and painful failure. As the project struggles to be completed, there are demands for more and more features. This creates a huge pressure on the executives and the shareholders. In return, a bigger pressure is put on the shoulders of the project managers through the use of financial control.

Tighter financial control has proven to deliver better results in some cases. Still, most of the projects do not meet the three requirements – time, budget and specifications. Financial control forces the project managers to focus on every single activity and to try to complete it within the estimated time and budget. Given that a project may have many tasks performed at the same time, the managers find themselves incapable of controlling all the open tasks. TOC suggests an alternative way. Rather than trying to complete every single task on time, TOC provides a focus on the on-time completion of the entire project.

CCPM – Critical Chain Project Management is the name given to the TOC solution. The name was chosen to denote the departure from the conventional method of critical path. It **focuses** on completing the whole project on time. It is **holistic,** as it looks at the project as a whole and not on every single task in isolation. It is **logical,** as we can provide the conceptual base of the solution using the TOC thinking processes. It is a **win-win,** as it takes into account and supports the important needs of the key stakeholders.

The move from managing projects through their locals (the tasks) to the global (the project as a whole) demands a change in the mindset of project managers. They have to commit to deliver the project on the promised due date.

Therefore, when we come to design the CCPM solution we have to consider three aspects:

- Mindset
- Planning
- Control of the execution

These aspects provide the basic structure for the CCPM Solution:

The objective of CCPM – the strategy is:
Deliver the project on time, in full and within budget.

The Tactics – what is needed to be done to achieve the strategy is:
Implement all injections (elements) of CCPM for planning and for controlling the execution. The solution contains 9 injections in three groups.

Figure 1: The general structure of CCPM solution for managing a single project

2. CCPM – Overview

Improving with TOC – CCPM for managing single projects

The system's performance measurements are:

- *On-time completion (due date performance)*
- *Within project budget*
- *Meeting project specifications (commitments and promises to the customers)*

The full list of injections for the solution is:

Mindset – Customers' orders are the Prime Driver – the Drum

1. Achievement of the delivery commitments is established as a Prime Measurement for managing project environment.

Planning injections:

2. Project Planning Diagrams are in place with tasks resourced and estimated for duration (while estimates of durations are "challenging but achievable").
3. Critical Chain determination including resolving resource conflicts.
4. Buffers are inserted in strategic points.

Execution control injections:

5. Tasks are performed according to the status of their corresponding buffers.
6. Resource Availability is monitored in anticipation of a new planned task.
7. BM for corrective actions (expediting) is in place.
8. Buffer penetration reasons are reviewed periodically for POOGI.
9. Resources are monitored as potential CR – Critical Resources.

Implementing TOC CCPM

Implementing TOC CCPM is a project on its own. It contains technical activities as well as communication with the relevant people in the organization. They are the ones who must implement the technical part and the managerial and behavioral facets of the injections.
As such, it is recommended to address each and every injection on its own, according to the sequence suggested by the template for the TOC solution. For every injection we collect and present the necessary knowledge to ensure the understanding of WHAT it is and HOW we are going to implement it.

The **WHAT** is taken from the conceptual TOC knowledge as recorded methodologically on the U-shape[2]. It covers the essence of the injection itself, the major UDE(s) it addresses, the DE(s) (the Desired Effects), the

[2] The U-shape is described in details in the book Ever Improve by Oded Cohen

positive outcome of the injection in the system, the logic of closing the performance gaps and, eventually, the improved performance.

The **HOW** contains all the practical aspects of the implementation. It deals with the technical parts, and also suggests ways to overcome obstacles – both technical and behavioral. The necessary deliverables (I.O.(s) – Intermediate Objectives) are suggested based on experience with implementing injections in reality. The end result of the HOW part is a mini-project that contains the skeleton of the activities and deliverables of the implementation of the injection. The WHAT and the HOW are captured by the full "injection flower".

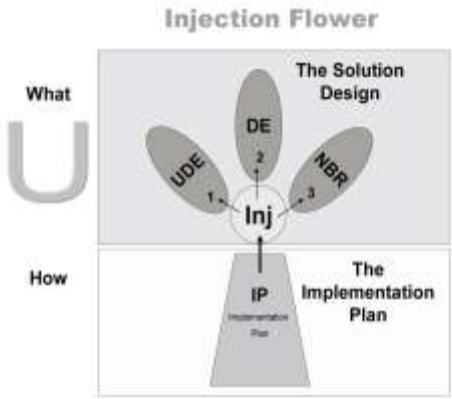

Figure 2: The injection flower

The suggestion to deal with one, or only a few, injections at a time constitutes a **modular** implementation process with a mechanism to capture all relevant knowledge, experience and know-how associated with the injection. Every injection is developed and implemented as a module on its own. This is the base for a databank that can grow and incorporate the experience while the project is in progress.

Let's start with the first group.

Mindset – Customers' orders are the Prime Driver – the Drum

The first group contains just one and very important injection:

Injection 1

Achievement of the delivery commitments is established as a Prime Measurement for managing project environment

What – The essence of the injection:

The injection is manifested through the commitment by all levels of management that meeting the promised delivery date promised to the customer (internal or external) is the most important measurement that all projects strive to achieve. The promised delivery date must be displayed and made visible to all the relevant people associated with the project.

Measurements have significant impact on the behavior of people in the organization. Hence, it is important that the way project managers and projects are measured reflects the importance of on-time delivery.

Even though this part deals with managing single projects, each project operates within an environment of many projects. The overall performance of all the completed projects can reflect the overall level of reliability of the project environment. When a project misses the delivery date, it hurts the company's performance by delaying the income or the benefits that are generated by it. There are three ways to measure the lateness:

i. The number of projects that were delivered on time (or early) versus the total number of projects within time "buckets" (e.g. month, quarter, year). This is needed in order to measure the Reliability of the company. It is measured in percentage (%) and is known as DDP – Due Date performance. The amount of money that has been delivered on time or early versus the total value of the projects within time buckets (%).

The financial impact of the late delivery – T$D – Throughput Dollar Days. This measurement states the amount of money to be received that has been delayed multiplied by the number of days delayed. Measuring performance continuously, ideally on a weekly basis, can highlight the trends in improvement or deterioration.

The Current Reality – Undesirable Effects (UDEs)

To enable the implementation of the new mindset for all levels of management, we need to highlight the current situation. It is unsatisfactory. This is done through recording the UDEs which are the permanent problems that prevent project managers from the successful completion of projects (time, budget and scope).
Typical UDEs in project environment are:

- There are too many cost overruns against budget
- Existing projects are disrupted by 'extra work'
- Many projects take longer than expected
- We often struggle to hit intermediate deadlines
- Revisions for late changes to the scope hold us up
- Top management is under pressure to add more resources

We use the CRS – Current Reality Study - to establish that the current situation of the specific area. It must fit the generic environment in which the injections will operate well, as this environment suffers from the above UDEs.

The Future Reality – the DEs – the positive outcomes of the injection

When the new mindset is adopted, the right measurements are operational, and all the injections are in place, we can expect a significant improvement in the completion of the project commitments – time, budget and specifications. When describing the future reality, we portray the vision of how the environment will operate once the injection is fully implemented.

We can expect the following **positive outcomes**:

- Established reliability by on-time delivery of projects.
- Improved focus due to clear measurements of the magnitude of lateness of projects.
- Desire for better tools for project planning and execution control driven by a strong desire to know the real status of the project in conjunction with the on-time delivery.
- Less need to expedite as early indications of threat to the due date may prompt project managers to take corrective actions when there is still time to recover from the potential lateness.
- More stability of the process due to the focus of project manager on the time aspect of the progress of the project.
- Potentially more sales due to increased reliability.

Injection 1 is successfully implemented when the proper measurements for on-time delivery such as DDP or T$D reports are produced and management (project and top) uses them.

HOW – The way the injection will operate in reality and the plan to implement the injection.

Once we know the "What", the essence of the injection and the relevant knowledge, we need to describe how it will operate in reality in conjunction with all the other entities. When this is clear, we can move to develop a mini implementation plan to build what is necessary for the injection to function.

Operating the injection includes:

Technical procedures and reports.

Management needs to get information about the progress of the orders. Some of the injections are activated through technical procedures, usually with the help of IT programs. This part usually deals with the information flow.

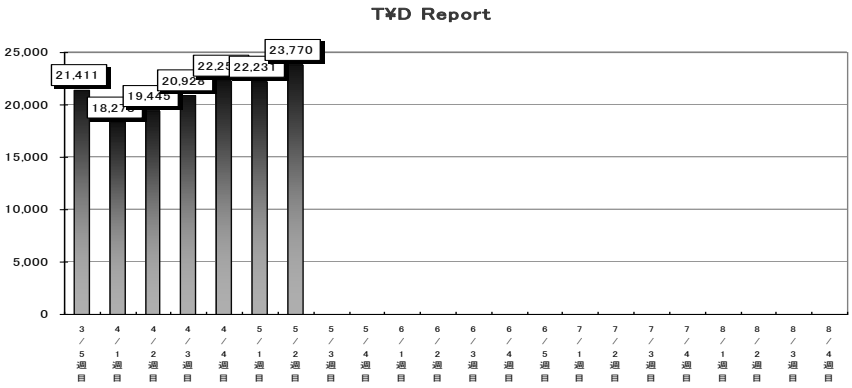

Figure 3: And example of T$D in Yens.

Managerial procedures.

The managerial procedures establish what decisions and actions should be taken by management in order to ensure on-time delivery. Many times these decisions are carried out through the use of IT programs. This part deals with the decision flow.

On-going procedures are developed as a part of the implementation plan, usually facilitated by a TOC practitioner.

Implementing the Injection

Implementing an injection is a mini-project in itself (a part of the overall project on implementing the TOC Solution). Therefore, implementing an injection needs a plan which consists of tasks and deliverables. Deliverables are tangible outcomes that are produced or achieved by the processes. Tasks are actions that are performed by the resources. Each task needs one or more resources and has an expected duration for completion.

An example: Designing the integration of the injection into the current system.

At the outset of the implementation the current managerial processes are recorded on the deployment chart. The deployment chart describes the synchronization between all the functions that participate in the planning of the project and the control of the execution of the plans.

The new injection contains changes to the way projects are managed within the organization. The changes are reflected in the managerial procedures. To enable management to make decisions according to the new injections some reports must be prepared through technical procedures. The above changes should be reflected on the deployment chart. This calls for several tasks to be performed in the implementation plan. Here is an example of a chunk from an implementation plan that contains three tasks and one major deliverable.

Figure 4: An example of part of an implementation plan.

So far we have covered Injection 1 that deals with the mindset which is absolutely necessary for implementing CCPM. Let's move to the second group of injections 2-3-4 that deal with Project Planning.

Planning injections:

This group of injections deals with creating a quality project plan.

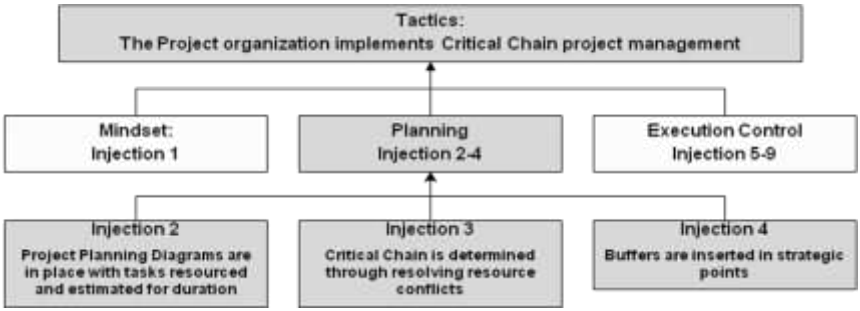

Figure 5: CCPM Planning Injections

The criteria for good planning contain three elements. Good planning should:

i. Provide financial benefits – by the successful completion of the project on time, within budget and according to the promised specification. The project generates Throughput for the contractor of the project. (Covered by Injection 1)
ii. Be realistic – the plan does not contain conditions that are known to be unrealistic (such as resource loading over 100% of available capacity). (Covered by Injection 2 and 3).
iii. Immunize against disruptions (Murphy and uncertainty). (Injection 4)

Injection 2

Project Planning Diagrams are in place with tasks resourced and estimated for duration (estimates of durations are "challenging but achievable")

What – Project plans are being created in a **diagrammatic format (**bar chart (PERT) or a Gantt chart) that clearly show all the important tasks of the project.

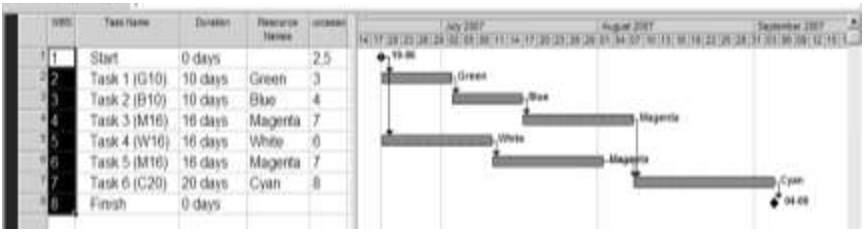

Figure 6: An example of a project planning diagram as a Gantt Chart

While developing the project diagram we have to ensure:

Data integrity – all tasks have to be checked for dependencies. **Estimation times** – challenging but achievable. The time estimations have to go through a challenging process.

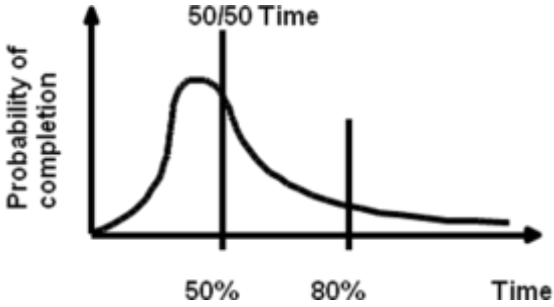

Figure 7: The statistical pattern of the task duration time

The TOC recommendation is to use the time estimation called 50/50 (median in statistical terms). This is to denote that there is a 50% chance of completing the task on or before the median time.
Completeness – the diagram should reflect the views of the key players participating in the project.

Injection 3

Critical Chain is determined through resolving resource conflicts

What – Sorting out Resource Contention.

In order to ensure that the project plan is realistic, we must identify and address resource contention: situations which occur when the plan requires the same resource to perform more than one task simultaneously.
The CCPM solution is to sequence the tasks by creating additional dependencies between tasks due to availability of resources – this is the Critical Chain approach.

The Critical Chain is the longest chain of dependent events – one that takes into consideration ALL dependencies (including task and resource dependencies). Given finite resources for the project, the Critical Chain reflects the minimum time it will take the project to be completed. Under the project structure captured in Injection 2 there is no way to further compress the time. Given that the objective is to finish the project to get the expected throughput, the Critical Chain is a true presentation of the project constraint that determines the performance level of the project.

Let's demonstrate the creation of the Critical Chain on the dependency diagram presented below in Figure 8. Every task contains the following data: task number, the resource for performing this task and the estimated duration in days. The traditional approach looks for the Critical Path – the longest chain of content dependent tasks. In this example, the Critical Path is 56 days.

However, if there is only one available resource M needed to perform Task 3 and Task 5 that are practically parallel, there is a potential resource contention in the plan. Solving the contention is done by creating dependency between these two tasks that need resource M. There are two options for creating the resource dependency: Task 3 → Task 5 or Task 5 → Task 3. Each one of them can resolve the conflict.

In this example the critical chain tasks are: 4-W16→5-M16→3-M16→6-C20. Total length of the Critical Chain is 68 days. This is more realistic than the 56 days suggested by the Critical Path.

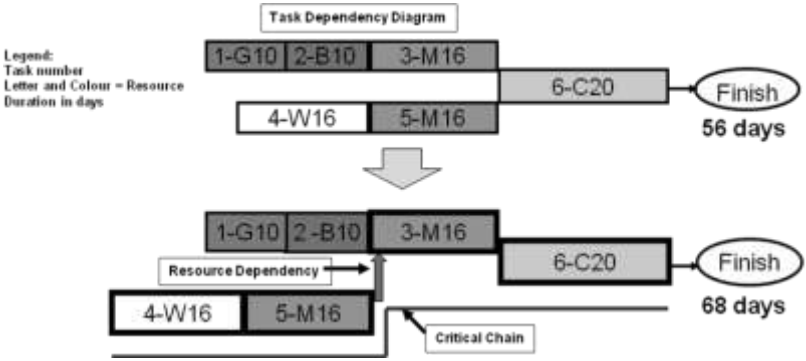

Figure 8: Creating the Critical Chain

Please note:
If there is no resource contention, then the Critical Chain is identical to the Critical Path.

The choice of the name CCPM highlights the departure from the approach of the Critical Path. Yet, the direction of the solution is dictated by the way we address and manage uncertainty. This is done through planning the buffers and using them to manage the execution.

Injection 4

Buffers are inserted in strategic points

What – The Critical Chain of each project is protected by the placing of sufficient time buffers at strategic points within the flow of tasks:

Project Completion Buffer (PB)
Feeding Buffers (FB)

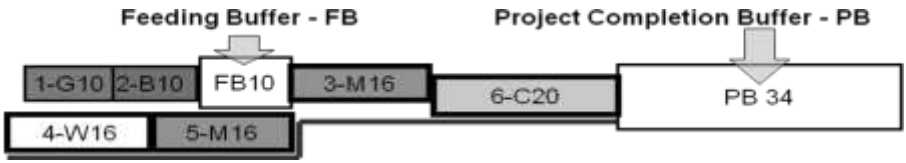

Figure 9: Critical Chain with buffers

The Project Buffer (PB) is there to protect the project from the fluctuations of the Critical Chain. Every task is subject to statistical fluctuation and so are the tasks of the Critical Chain. There is high probability that the accumulation of all the fluctuations will exceed the time that was planned for the Critical Chain. Therefore, we have to allow some more time to absorb its fluctuation. The additional time is there to protect the completion date of the project and hence it is called a "Buffer".

The Feeding Buffer (FB) is to protect the Critical Chain from fluctuations in the feeding leg. The suggested size of the Feeding Buffer is 50% of the duration of the feeding leg.

How – all CCPM software packages have the feature to calculate and insert the buffers. Technically the process of inserting the buffers is simple. After inserting the buffers, we get a predicted date for completing the project. This date may differ from the date that the project customer wants. If this date is later than requested or promised to the customer, we have to go through another iteration of performing injections 2,3 and 4 to review the Critical Chain and check for ideas on how to break some dependencies.

The managerial procedures for Injection 4 should clearly define:

- The acceptance process of a predicted delivery date;
- The escalation process, when the project manager cannot find an agreed way to meet the delivery date as required by the customer; and

- A clear process to finalize the delivery date without compromising on the planning requirements (such as cutting project buffers or forcing totally unrealistic task durations).

By the end of this group of injections, 2, 3 and 4, we have a tangible deliverable: a good project plan which is realistic, buffered against fluctuations, and with a projected date that is accepted by the customer. Now we can move to execution control.

Execution Control

Every project has an official starting date. It is usually called, a project kick-off.
After the kick-off, the project moves from the planning mode into the execution mode.

The reality of the project execution is – Delays!

Delays are caused primarily by tasks that take longer than planned and tasks that cannot start when they should. The delays are legitimate as they are natural consequences of the inherent nature of performing tasks in an uncertain environment. TOC handles the uncertainty though the use of buffers in the planning phase and in the control of the execution phase.

The CCPM solution mechanism to compensate for the delays is by protecting them with time from the corresponding buffer. Any delay in the Critical Chain consumes time from the PB, Project Completion Buffer. Any delay on the feeders consumes time from the FB, Feeding Buffer, of the specific feeder (every feeder has its own FB). Penetration of the Project Completion Buffer prevents the expected completion of the whole project, assuming that the rest of the tasks on the Critical Chain will behave precisely according to the estimated time. The role of the Feeding Buffer is to protect the Critical Chain from fluctuations of the feeding tasks. However, when the accumulative fluctuations consume all the FB, further fluctuations will be passed to the Critical Chain and will cause penetration of the PB.

Managing projects the TOC way means – managing through the buffers!

The penetration of the buffer states the amount of days consumed from the buffer.
The level of consumption of the buffer is called the Buffer Status.

The level of consumption of the buffer signals to the manager the risk to the on-time completion of the project. TOC uses the color system to prompt management attention and action. Green means the project is moving OK – do not interfere. When it is Yellow – it signals "get ready" to take extra actions to ensure that the project will be on time because the situation is becoming risky. When it is on the RED – managers must interfere and take corrective actions to restore the level of protection the project needs.

The color Black usually denotes that the project is already past the due date. Most CCPM software packages do not use the black buffer status.

This is why the colors should be "tilted". They should be assigned according to the progress of the project. At the beginning of the project most of the buffer is colored red even if the buffer is still full, and a bit is colored yellow. The green is introduced as the project progresses. This is done to have a better control over the initial phase of the project. Most of the CCPM software packages support this feature.

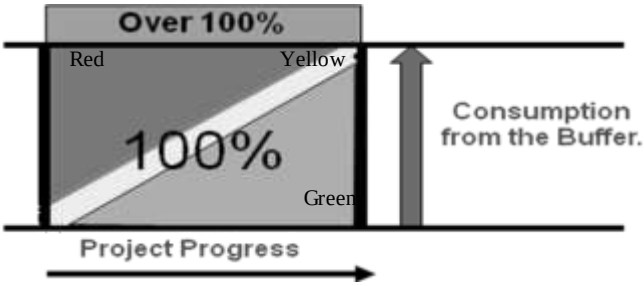

Figure 10: Buffer status in relation to the progress of the project

Buffer status is used for self-expediting, assigning priority of resources, and for prompting management actions and decisions.

Execution Control Injections:

The next 5 injections provide management with the ability to effectively manage the execution.

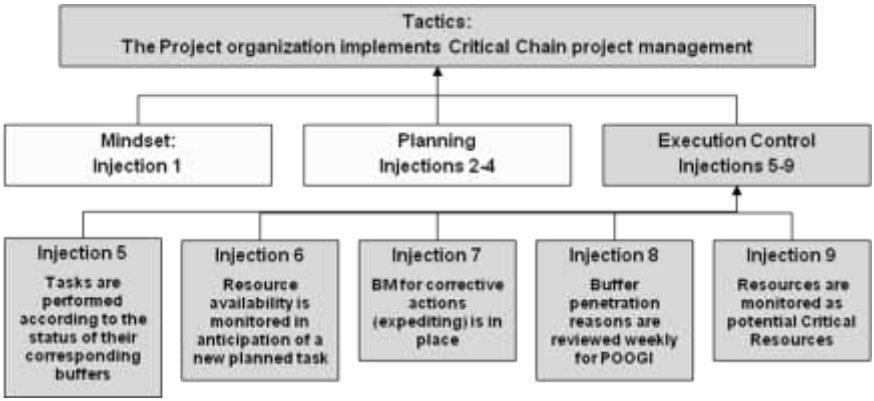

Figure 11: CCPM injection for Execution Control

Injection 5

Tasks are performed according to the status of their corresponding buffers

What – Due to the DELAYS management experience demands on resources to perform different tasks within the same project or on different projects within the same period of time. Management has to make the important decisions of allocating resources to tasks.

Injection 5 provides a simple and practical mechanism.

Every task that is about to be performed is" Colored" with the same color as the Buffer it belongs to. The color and the level of penetration give the tasks priority in getting the needed resources.

Priority:

Black (past due date) is higher in priority than red, red than yellow, yellow than green. Internal priority within the same color is shown according to the percentage of penetration into the Buffers.

Reporting task progress – In order to estimate the level of penetration into the buffers, there is a need to get a frequent (daily) report from the task performers or their direct managers. In the reporting method used in conventional projects, people are asked to report how much of the task they have they completed. Usually, the report is about the percentage of the task completed. CCPM calls for a different progress report. It asks the task performer **to estimate the remaining duration**. Once the work on a task has started, daily reporting on the amount of time that is predicted to be needed to complete the task is expected. At this point, the performer of the task has a better idea about the real time required. Based on this report, the buffer penetration is calculated.

Injection 6

Resource Availability is monitored in anticipation of a new planned task

What – The project manager keeps track of the progress of the project. Special attention is paid to the Critical Chain. When a task on the Critical Chain is about to be completed, the project manager (or the task manager) is prompted to check the current status of the resource needed for the next task and its level of readiness. The same applies to tasks on feeders.

How – This procedure can be called "Resource wake-up call".
The new procedure signals to the project leader/task manager, or to the project control room, that a resource will soon be needed for the next task.

If necessary, actions have to be taken to guarantee their availability, especially for the tasks on the Critical Chain.

In the following example the Critical Chain is the sequence of the following tasks:
4-W8 → 5-M8 → 3-M8 → 6-C10
"A wake-up call" is set to be 4 days in advance of the estimated time the resource will be needed to perform the next task on the Critical Chain.

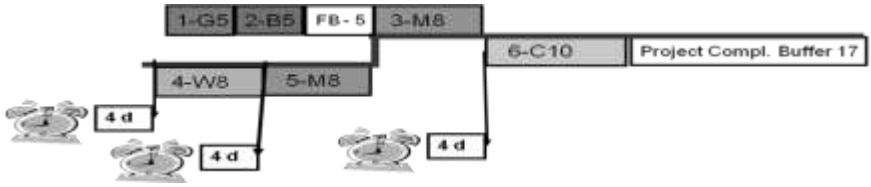

Figure 12: An example of wake-up calls as per Injection 6

Injection 7

Buffer Management (BM) for corrective actions (expediting) is in place

What – Based on the frequent reporting of the task managers (or the task performers), the project manager knows the status of the task completion with the most updated estimation of the remaining duration for this task. Through the mechanics of Injection 5, the new completion date is calculated and, with it, the Project Completion Buffer penetration.

The amount of time that the new date of completing the Critical Chain exceeds the initially planned date of its completion (without the buffer) determines the amount of time penetration into the project completion buffer.

When the penetration gets into the red, it indicates that on-time completion of the whole project is at risk. When the penetration is deep, there is a need

to assess the risk and, if necessary, take special actions beyond just the immediate allocation of resources, to recover the loss of buffer.

It is expected that the key people will come with suggestions for actions that will cut the time for the rest of the critical chain. Not every penetration to the red demands immediate reaction. It is recommended that a review meeting is conducted and project managers report on the progress of the projects in Red. When the situation is recognized as too risky, a resolution is made to take special corrective actions. Please note that any structural change to the project design and, especially, tampering with the Critical Chain may cause disruption and instability. The tangible deliverable of such actions is the reduction in buffer penetration.

Injection 7 is under the responsibility and the leadership of the project managers. They are expected to come with ideas such as off-loading to non critical resources, parallel processing, etc. Any idea that will reduce the level of penetration is welcome. The organization is expected to capture the collective knowledge and ideas of corrective actions for the benefit of all future projects.

Injection 8

Buffer penetration reasons are reviewed periodically for POOGI – Process of Ongoing Improvement

What – There is a value in analyzing the reasons for buffer penetrations on an on-going base. Some of the delays and deviations are specific to the project, but some are more permanent.

Dr. Deming stated that quality is not about finding the defective part but about correcting the process that creates the defective part. We want to employ the same concept in the project environment.

Through the use of buffer management statistics, the management can find areas that need an improvement initiative under the heading of continuous improvement (POOGI). Even though that improvement will not necessarily

impact the performance of the current project, the initiative will help the organization to improve as a whole and create better grounds for the projects to come.

Injection 8 covers: collecting the reasons for buffer penetration from buffer management, systematically analyzing them, and suggesting improvement initiatives to eliminate or reduce the causes.

Injection 9

Resources are monitored as potential CR – Critical Resources

What – It may be revealed through the buffer management statistics that some (few) resources tend to lack capacity and cannot satisfy the work content required within the planned time. The critical resource may be needed in several tasks within the project and across several projects. This may cause project managers to fight for securing the resource for their project.

The purpose of Injection 9 is to identify a possible critical resource and manage it in a way that the potential damage to the project and to the entire system is reduced.

Please note that in reality there is pressure to dedicate resources to projects. This stems from the demand for resources to be available when needed (as per the evolution of the original plan). Nevertheless, resources can be used in more than one leg of the project and can become critical. Even though the Critical Chain mechanism ensures that there are no resource conflicts and contentions in the plan, the unfolding reality can cause resource contention, and highly utilized resources can cause delays and penetrations to the buffer.

Another potential candidate for critical resource is a resource that participates in more than one project. Even though this article deals with single projects, we cannot ignore the fact that the reality of project environments calls for shared resources. The resource contention can also

be caused by the resource having day-to-day responsibilities such as services to completed projects, rework, support etc.

Injection 9 provides the natural bridge from single project to a multi-project environment. We recommend some intermediate steps that can provide a temporary solution until a proper move is made to the TOC solution for a multi-project environment.

Injection 9 is under the ownership and the responsibility of top management. The decision to release projects is done by top management. Many times top management decides to start more projects while using the existing resources. This is under the assumptions that not all the resources are busy all the time and that there is some excess capacity to perform more projects. However, some of the shared resources may not be able to cope with the increased load and will be subject to the fight of project managers to secure the resources to perform their projects. This leads to delays in several projects due to non-availability of resources.

Top management has a critical role in setting the number of open projects, their priorities, and in addressing shared critical resources.They should have a snapshot view of the status of all the open projects. This can be presented on a project portfolio status like the one in the following figure. Every dot on the graph presents the status of a project. It shows the consumption of the project buffer versus the progress in the completion of the critical chain.

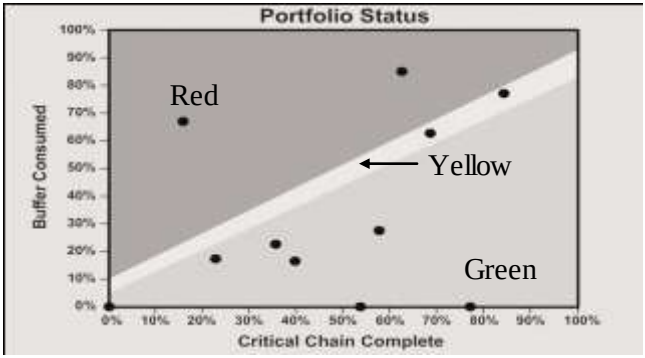

Figure 13: A portfolio status diagram

Conclusion

By now we have outlined the nine injections of the CCPM solution for managing a single project. Project managers who want to improve their ability to manage projects, to increase the probability of completing projects on time within budget and to the original specifications, should consider implementing these injections in their reality. They should make their own experiments and prove to themselves that the injections do produce the expected results. Injections 2-4 cover the planning processes and injections 5-9 cover the suggested way of managing the execution of the project plan.

The most important is Injection 1 – having the right mindset.
This is a reflection of the determination to be a professional project manager. It lays the foundation for career progression by becoming a reliable project manager who demonstrates the commitment to deliver promises. The CCPM provides managers with the way to achieve that.
The next part of this article is aimed at the readers who want to know about the TOC methodology that was used to capture and organize the relevant knowledge of CCPM.