TOCICO CONFERENCE 2009

Critical Chain:
Short-Duration Tasks

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CCPM Guidelines & Heuristics

- **Developed through collective experience of the TOC community**

- **E.g.,**

    - Do not apply PM solution when production solution is more appropriate

    - Avoid making schedule too detailed

    - Maintain a stable baseline schedule for as long as possible

    - Avoid running prioritization algorithm too frequently

Limiting Application of CCPM?

- **Guidelines & Heuristics proven robust & beneficial for many implementations**

- **However, they have implied / ruled out the application of Critical Chain to domains where the Guidelines/Heuristics are not all met**

- **Such domains include**

  - **Medical**

  - **Fast paced complex aircraft assembly**

CCPM Possible for such Domains?

- Believe it is worth considering

- Experimenting with theoretical and software issues in such non typical domains.

  - Looking at mainly projects:

    - executed in a short window of time

    - driven by short-duration activities

Definitions

- **Activities with durations less than a day**

- **Execution mode updates several times a day**

Rules of Thumb

- **Rule of thumb dividing Projects from Production is the duration of the tasks**

    - **A task that takes a week can have a 10% chance of being over three weeks.   But, in short duration tasks that takes an hour rarely exceeds two hours.**

    - **The Assumption is that anything that only takes an hour probably happens frequently enough that the variability is soon removed**

Assumption is not always valid

- Project work with many resources (space, cranes, tools, multiple limited resource skills, shifts, etc.) we can't ignore these small duration tasks

- Assembling a large complex machine with many steps and many shared resources over a long period (an Airplane) is one case where it is not

- The medical area is another

- There are short duration tasks that have just as much variability (or more) as long duration tasks.
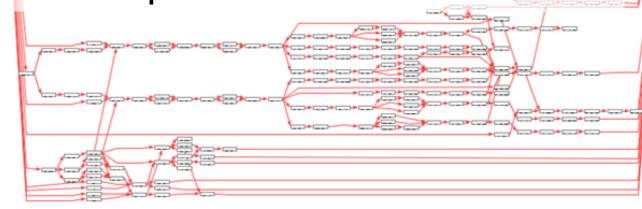
E.g., Medical Community

- When you can schedule short duration tasks which repeat many times a day, you can use DBR to schedule.

- **But**, when you are working on an ever changing activities that are intermingled and use many different resources in a multi-project environment, project management is the better fit.   Flow time is very close to touch time. Best to use CCPM.

- Using CCPM templates for, nurses, doctors, clinics, labs, patients, testing, maintenance and all can quickly be scheduled and the variation from activities and resource interactions be executed using Buffer Management.

Keep It As Simple As Possible

- **Always use TOC to avoid the need for much of what is discussed here if possible**

  - *entia non sunt multiplicanda praeter necessitatem*
    Occam's razor

- **Sometimes result is still complex**

  - **"Make everything as simple as possible, but not simpler"**
    Albert Einstein

  - **Critical Chain may need to be extended withOUT making the same mistakes as pre-TOC world**

PLANNING phase / EXECUTION phase

- Individual projects are planned by CCPM and then fixed.

- In the execution phase the first tasks in a chain are started when planned, but the rest will shift all over. We don't change the plan.

- Execute as planned adjusting for the changes in tasks during the project.

- Buffer Management directs management focus and PREDICTS what will happen if we don't act. Execution in CCPM is Buffer Management

Execution Issues (1)

- **The key here is that each new task assignment that is made should be made based on the most current Buffer Management information on the status of the project.**
  - **Irrespective if that update occurred one minute or one day ago.**

11

Execution Issues (2)

- **Report progress when a task starts (tracks each active task), when it completes, and each pre-determined update cycle (e.g., each shift end, each day)**

    - **what you get is the ability to smooth out the decision making process across time. Now the state of the buffers at any point in time tells the current health of the project.**

    - **By careful tracking of each open/active task, Buffer Management can correctly and efficiently shift the right resources to the right places before Project Buffer consumption gets out of hand.**

    - **Careful Tracking in a repetitive process (like Airplanes or Operating Rooms) is a fantastic "Look Back" tool for Industrial Engineers to determine how to really improve the system.**

12

Over Optimization? (1)

- Will "over optimization" (too tight a schedule) hurt CCPM when variation happens?

- No. We still follow the CCPM Plan.

- We just get earlier warning of Red Zone incursions (requiring action).

- When a task must coordinate with many resources (space limitation, tool availability, time window in schedule, various experts—such as hydraulic lines in a confined space or doctors in surgery), the absence of one element can shift the whole process dramatically to the right (late).

Over Optimization? (2)

- **By correct aggressive scheduling, aggressive Buffer Management, and Intelligent Scheduling; problems coordinating multiple resources are greatly reduced. These important resources become much more efficient (being at the right place at the right time).**

- **The CCPM plan does not change. The required sequences of tasks do not change. What changes is the Resources can all come together in a much better way.**

Requirements of Software

- The ability to quickly evaluate addition of new projects and to accommodate them.

- The ability to prioritize all the resources across all the project domains and resource pools.

- The ability to track "Time Remaining" or frequent task completions in a timely fashion.

- Ability to handle 24-hour calendars, and calendars that vary by resource (e.g., different types of staff have different work shifts)

- Many of the other issues discussed

Anytime Buffer Management

- **Option to perform Buffer Management at anytime**
  - Use latest available information
  - Buffer management on an as needed basis relying on whatever information you have; and be right for the moment

- **Fever Chart updated on demand**

- **PDA approach of individuals viewing their active tasks and "soon to become active tasks"**
  - E.g., A physician examining a patient sees he will be late for the next event and reports "time remaining". This shifts the expectations for all resources involved allowing them to be locally efficient and still meet important events.

16

Multi-project

- **Priorities to keep projects pipelined**

- **Decisions to start or not start new work are key to effective CCPM flow. Too many starts bogs down the system with bad multi tasking.**

- **Too few starts robs the system of its effectiveness.**

- **Aggressive Buffer Management, when monitored over time, gives a much clearer picture of when new work should be released.**

- **Opportunity to utilize resources on lower priority projects (if desired) if no negative effect to highest priority project**

Work Assignments

- **CCPM is a primarily a scheduling tool, not a day-to-day / minute by minute work assignment tool.**
  - **It's a tool that sequences tasks and buffers them.**

- **Human still receives Prioritized Task List and determines next assignments**
  - **May need to inquire about latest time remaining estimates**

- **But, in highly interactive cases, blending the many resource types, timing and variation, this decision becomes a difficult one. Having intelligent scheduling software to reduce the decision space beneficial to the human assigner.**

Handling New Tasks / Projects

- **How do we handle short-duration projects that also include the injection of new tasks / projects?**

  - **E.g., medical offices / hospitals**

- **Need to be able to change priority of entire projects to handle emergencies**

  - **Aggressive Buffer Management yields a much improved Triage approach. Currently, if an emergency happens, everything stops work to help with the emergency. With Aggressive Buffer Management, resources are diverted to the emergency only as needed / when needed.**

- **Need to be able to perform what-if scenarios to determine how best to handle new tasks / projects.**

19

Resource Determination (RD)

- One way in which the medical field is different from many multi-project environments is that the staffing level is not fixed.

- The resource management model relies on ability to match the load curve almost precisely by the use of a mixture of base capacity and contingent capacity that can be activated with very little advanced notice
  - bring in additional staff or extend shift for individuals.

RD: Questions

1. How should we model this capacity in CCPM?

2. How should determine a drum schedule for such an operation?

3. How should we determine how many people to have on staff or

4. When should we activate another unit of resource capacity?

RD: Tentative Direction

1. Need to have control over the 24 hour clock in order to modify capacity levels near continuously

2. Need to set max capacity limits on critical assets but allow customer selected due dates within max capacity

3. Need the ability to first build up the demand schedule and then determine the appropriate staffing levels

4. Need to be able to test buffer consumption sensitivity to specific resource shortages and provide warning

Prioritization

- **Refinement beyond Red, Yellow, Green**
  - In short duration tasks, there are many more dependencies per unit of time. And, the priorities for what is most important (or what is not important at all right now) changes quickly (sub-day timeframe).

- **It is possible to have a person move between projects (and tasks) very quickly and confidently in accordance with what is most valuable for the system as a whole.**

Medical Field:
How BM Could Be Applied (1)

- Since CCPM focuses on completing active tasks, these changes happen without causing bad multi-tasking or excessive set-ups.

- How medical task interruptions are handled:

  - Only happens on a small number of occasions - to keep a particular stay from getting excessive

  - "Fireman Model" – 90+% of the job is teaching and practicing fire prevention.

  - A task that is in the Green or Yellow, would not cause another task to be interrupted.

  - A Red task would be evaluated for potential benefit from the interruption of a lower priority task

Medical Field:
How BM Could Be Applied (2)

- **Potential Benefit**

  – Little to no need for re-generating individual schedules

  – Higher than normal predictability in Length of Stay

  – Less chaos in the daily operations

  – Decisions are still being made by the individuals in charge

- **Decision makers have more effective measure to gauge impact of decisions**

Presenters

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