



What we learned from 50 Years of Project Scheduling

Scheduling is Critical in Project Management

Scheduling is a critical business process in the management of projects because, only a schedule tells who will do what and when. And it is solely responsible for making sure that all the tasks are assigned the resources when needed; and all the projects meet the various milestones for them, including the start and finish dates. Finally, it enables the costing of the schedule.

Critical Path Method

In 1957, DuPont and Remington Rand Corporation developed a project management method designed to address the challenge of shutting down chemical plants for maintenance and then restarting the plant once the maintenance had been completed. They called it the Critical Path Method (CPM). It is based on the reality that in any project some tasks together control the duration of the whole project. Therefore, if any of these tasks are delayed, the whole project will be delayed. All other tasks have a float, which means that they can get delayed at least a little without affecting the duration of the whole project.

In 1958, the management consulting firm, Booz Allan Hamilton Inc., developed a similar technique, called Program Evaluation and Review Techniques (PERT) for US Department of Defense's US Navy Special Projects Office, as a part of the Polaris mobile submarine-launched ballistic missile project. This project was a direct response to the Sputnik crisis. This was in the middle of the arms race between the US and the then Soviet Union.

Both CPM and PERT produced the following benefits: Predicting the time required for the completion of the project and identifying the tasks that must be completed on time to meet the project completion date.

Since then, Critical Path became the way to manage projects. In the 80's the Critical Path was the basis of managing projects with computer systems. It enabled faster processing and an ease of data management but adding no significant additional capabilities.



Clevor Technologies Inc. 302-111 Research Drive, Saskatoon SK. S7N 3R2 Canada
Phone 306 955 5772



Matrix Management

During the 60s and the 70s, some of the largest US Companies, such as General Electric, were using Matrix management structures to better use specialized resources across product lines and across professional projects. This organizational structure is still used because of the benefits of sharing the resources as well as the deepening of the knowledge of the staff working on multiple projects.

Theory of Constraints

In the 80s, an Israeli physicist, Eli Goldratt, while helping a friend who was in the manufacturing business, realized that the production through any manufacturing facility (throughput) is controlled by one or more “bottleneck resources”. He suggested that the way to improve the throughput would be to make sure that these bottlenecks are fully used. Note that this focused mainly on increasing the throughput of the manufacturing facility. It did not deal with other complexities such as due dates of the different production orders, costs and ability of companies to use different machines for the same operations, just to name a few. These concepts were later developed into the Theory of Constraints (TOC) by him. It makes it clear that all the constraints must be taken into account when developing schedules. This is generally referred to as “finite resources” scheduling.

Clevor Schedule Optimizer

Each of these advances made an improvement. However, why is it that many, if not most projects are still late and over budget? The reason is that no one has tackled the real problem comprehensively until Clevor. Clevor has defined and solved the real problem comprehensively. Given all the complexities of real life constraints and costs involved in the management of projects, how can a company manage them so that it can best achieve its business objective? Clevor started with all the known insights but went further, much further. For example:

1. Yes, every schedule has a critical path, as DuPont found out. However, one can also build millions of different schedules for the same project. Each one of them is different in its characteristics, like total cost and duration. Therefore, using the best schedule (called the *optimized schedule*) and paying attention to the tasks on *its* critical path is much better than to pay attention to the critical path of any other schedule. They also calculate the total cost of each of these schedules to compare them, to identify the optimized schedule.
2. Yes, in every schedule some resources will be the bottlenecks. But it is almost always possible to get more resources, albeit you may have to pay for them. Therefore, it is necessary to consider these alternatives as one searches for the optimized schedule.



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3. Yes, Matrix organizations have major benefits. But, they are also complex and have major problems, especially in terms of the priorities of different projects and the resource planning and utilization. So, Clevor handles these issues in a rational way to minimize the frustration faced.
4. Clevor also handles the issue of usability. Although Clevor uses some of the most sophisticated mathematics, it has made sure that the system is easy to use both by the people managing the projects and the functional managers responsible for the care of their staff, who work on multiple projects. Finally, it can also give the information to higher management, who may want to know how a particular project is progressing or may want to know what the whole picture looks like. They do it by making the process *automatic* and with *one button optimization*.
5. Finally, they handle the issue of updates and recovery. It is well known that every project is dynamic and runs the risk of situations that cannot be fully controlled. Therefore, it is necessary to track the progress of each of the projects on a regular basis and update / re-optimize them so that the schedules and the projects can recover wherever possible.

Observed Types of Schedules

There are three types of schedules observed:

1. Non resource loaded schedules: These should not be called schedules because they cannot tell who will do what and when. Unfortunately, this is the most common way schedules are built. And, not surprisingly, they produce the worst results.
2. Resource loaded schedules: These schedules are detailed enough to show which resource will do what and when; and they also show that the resources would be available when needed. When working on one project at a time, they produce better results in terms of the due dates but not in terms of project durations and costs. When working with multiple projects with shared resources, they are very difficult to make and are seldom made.
3. Clevor optimized schedules: These are resource loaded and optimized. They yield the best results both for one project at a time and for multiple projects sharing resources, as shown in the table below:



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Critical Success Factors with Clevor Optimized Schedules

| | Details | With Clevor |
|-----------------------------|--|---------------------------------|
| Due date performance | Expected completion dates for each project is known when the schedule is built, except when the project scope is modified. | Always known |
| | Actual completion dates for each project is the same as the projected completion date. | Always |
| | Reduction in the duration of the projects. | 15% better than resource-loaded |
| Cost / Budgets | The expected total cost of each project is known when the schedule is built except, when the project scope is modified. | Always known |
| | Actual total cost of each project is same as projected. | 15% below resource-loaded |
| Resource management | Actual utilization of present resources | 15% better than resource-loaded |
| | Predicting the future needs of resources for all the projects. | Excellent |
| Updates / Recovery | Updates and recovery from unforeseen events is done easily and effectively. | Excellent |

In larger and more complex projects the results are better still. This is a real breakthrough in scheduling and in project management!

Results from Clevor's customers have been fantastic! Their technology is attracting the attention of some of the largest companies. If you are not using Clevor schedule optimizer, you are missing out.

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Phone 306 955 5772