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Phone: (818) 831-0404 FAX: (818) 366-1769

The 11 Basic Steps of Project Management

A HyperProject, Inc. Technical Note by Donald T. Kasper

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The Use of PERT Modeling

There are 11 basic steps in planning and running a project. This technical note provides a quick overview of the steps, in the order that they would typically occur in a project. Some specific details as to how they would be conducted using the Macintosh project management program HyperProject™ are explained.

HyperProject™ uses the Program Evaluation and Review Technique (PERT) method of diagramming to describe projects. The PERT window is the primary design window type for the program. The project database is stored here. From this database, other window views can be created to support data entry and reporting, including spreadsheets, Gantt views, and histograms. What will be discussed here is work occurring primarily in the PERT window.

It only takes the following understanding to begin working with PERT modeling: (1) All projects consist of activities; (2) these activities have relationships to be modeled; (3) A PERT model represents these activities and activity relationships (constraints), and (4) a Critical Path can be calculated from this information, predicting the final completion of the project from the information supplied. Calculating the Critical Path is our primary goal. Let's see how to get that information.

Activity Name	
Activity Id	
ES Date	EF Date
LS Date	LF Date
Duration	Activity Type

ES : Earliest Start

EF : Earliest Finish

LS : Latest Start

LF : Latest Finish

1. Determine the important activities with the project (or at least enough to get you started).

In the PERT convention used by HyperProject™, activities are represented by boxes. Some of the most important data for each activity is shown inside each activity box. The data shown is under user control; the data shown for each activity is

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individually customizable.

The first step is to identify the activities of interest that will be followed in the project. Tasks involving from one to three people and lasting one week to one month in duration are recommended. Shorter tasks will tend to involve less people.

It is not necessary to know every project activity before you start laying out a PERT diagram. Start with modeling those you do know. It is entirely possible to begin a project where the entire schedule is not planned in advance. This is a "leading edge" approach where project management is involved only in the planning of the next month or so of work for the project team to perform. The project isn't scheduled in detail to completion, rather management tracks overall progress with time in achieving some development goal. Here, the rate of progress is measured by management. This is all that may be practical in highly technical projects where all of the technical answers are not known in advance.

It is also possible to lay out a basic PERT schedule then successively refine the schedule as the project progresses. This is quite typical since it is rarely possible to know every activity of interest in advance. Contingencies arise and work changes, requiring changes to the PERT model. In this approach, the basic project activities are put in place first; others are added as the project progresses. What management tracks in this case is just the time of the project completion. The amount and type of activities used to achieve the target date is often of no real concern to them, unless it leads to a significant increase in project cost.

2. Determine the order of activity occurrence, basically an analysis of what-activities-follow-what.

In a PERT diagram, lines are drawn between pairs of activities to show their order of occurrence. These lines are called "constraints" to indicate that a specific relationship is being modeled. Their actual representation in a PERT varies by the diagramming convention being used. HyperProject™ uses a unique convention where the actual type of activity constraint is shown. There is one constraint representation for each of the four possible constraints.

A combination of activities and activity constraints are all that are required to provide a basic description of any project being modeled.

PERT modeling has very few design rules. A PERT modeling program is really looking at activity start and end dates, durations, and activity constraints. It doesn't know anything about what the activity names mean, or what the activities mean to the project.

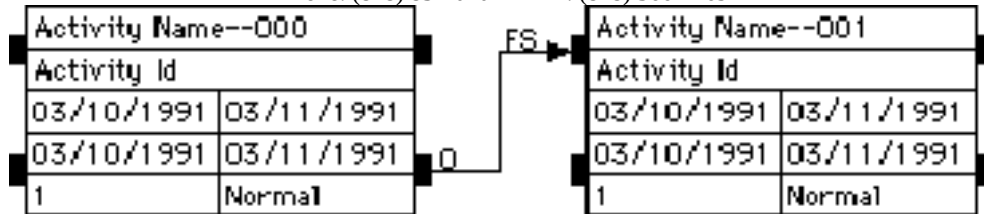
One useful approach to follow in the design of projects is the layout of "technology tracks". A technology track approach is one where activities that a team of people will work on in succession or similar set of resources will be applied are placed in logical sequence in a PERT. These tracks are set up to operate in parallel to other tracks that are being conducted by other teams at the same time. At appropriate places in the PERT they are connected with milestones which represent the completion of some significant subunit or component of the project being undertaken.

This approach is quite different from the layout of a PERT where the activities are placed in logical sequence but different

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people or resources are applied to each succeeding activity. Not only does a random placement approach make the project difficult to understand, it also ignores the human aspect in designing projects. People are more productive, identify with the project better, and make cohesive teams better if their work occurs in a logical sequence where each task has a specific technical relationship to the work they just finished. They are also much more at ease in working on a project when they have a clear view of what will follow next. Performing some tasks requires advanced planning and training that is readily achievable in this approach.

The technology track approach may not be as important for the teams if the work is being subcontracted, that is, the teams form to complete a task and are then dissolved. Even in this situation, it is still easier for project management to control the project using technology tracks.



3. Lay out the activities and activity constraints in the PERT view.

PERT modeling assumes that time increases to the right. The HyperProject™ Critical Path modeler makes this assumption as well, calculating the start and finish dates for activities from the left to the right. If two succeeding activities are vertically aligned, the scheduler operates in a top to bottom order. Although time increases to the right, a strict timeline scale is not applied. Two activities, one above the other, can have different start and end dates.

The placement of activities in the PERT view does matter whenever two activities are connected. Connecting two activities implies that an activity constraint exists that the Critical Path modeler will use in computing the Critical Path. Remember, with any pair of activities, the activity to the left occurs before the activity to the right, by default. You must explicitly override this to change this relationship. By clicking on activities and dragging them in HyperProject™, you can change the order of occurrence of the two activities.

Placement of activities matters when they are connected, so a number of layout and design features are built into HyperProject™ to assist you in your design work. In this sense, PERT modeling is really very similar to drawing something with a CAD design program--you have all the different parts drawn in some assembly and you also describe how they are related to each other. The major difference is that a CAD program models spatial relationships. A PERT program models temporal relationships.

4. Set the project start date, if different from the current date.

In HyperProject™, set the project start date using the *Project/Edit Project Summary* dialog if you want the project to start on some day other than today. In that dialog, change the Time Now Date. "Time Now" is a term that specifies the current date. By default it is today's date. It can be set to any other value to look at a project status in the past or future.

An alternative is to declare a Must Start Date for the starting activity or activities in the project. This can be set by double-clicking on an activity symbol, selecting the Must Start Date data type, and entering a value. The Must Start Date can also be found in the Activity Spreadsheet. Any newly created activity will be assigned the Time Now date unless this is overridden by the Must Start Date.

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5. Enter the Planned Durations for all activities.

There are two ways to change the activity Planned Durations: (1) double click on each activity symbol, or (2) use an Activity Spreadsheet view.

The exception to this are Milestones. The assumed duration for a Milestone is zero duration by HyperProject™. Be aware that this varies between different project management programs; some allow Milestones to have durations like activities.

In addition to that, if there are any delays that occur between activities, enter that duration in the lag of the constraint residing between them. Lag values can also be used to account for time spent in rework of previous activities.

6. Set the project calendar.

By default, HyperProject assumes a five-day work week (Monday through Friday), and the 10 Federal holidays apply. If your project is different, set the menu items: *Options/Set Workdays/Set Workweek*, *Options/Set Workdays/Set Holidays*, or *Options/Set Workdays/Set Vacations* dialogs. The workweek information set in these dialogs control all activities in the project.

7. Calculate the Critical Path and project finish date.

Just what is the critical path? "Critical Path" refers to the set of activities that control the final completion of the project. Any delay in the completion of an activity on the Critical Path will delay the entire project. The Float time is the amount of time an activity can be delayed before it too becomes a critical activity. Critical activities have zero float. Non-critical activities have some non-zero amount of float.

The management of a project is primarily involved with the finding of the Critical Path, and the focus of project resources on those activities.

The *Project/Calculate Critical Path/Calculate Now* menu item initiates the calculation of the Critical Path. Activity start and finish dates, slack time, and a number of other status items are updated at the same time. This includes:

Earliest Start Date
Earliest Finish Date
Latest Start Date
Latest Finish Date
Start Path Float
Finish Path Float
Earned Value

The command-F key is a shortcut for initiating the calculation of the Critical Path in HyperProject.

The program initially starts in Calculate Now operation which means that the user must select the Calculate Now menu option or press the command-F key to initiate a Critical Path operation. To have the program automatically calculate the

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Critical Path when changes are made to the schedule that may change the Critical Path, set the Auto-Calculate menu option.

The reason why the program is not initially in Auto-Calculate mode is based on the assumption that the user may be in the process of making a large number of edits. Each edit itself could cause the Critical Path to be calculated, resulting in a time delay while it is being performed. Since the network results are invalid (all desired changes are not in), the time delay to perform the calculations is unnecessary. In either mode of operation, a Calculate Now is automatically performed whenever a Gantt window, spreadsheet window, or histogram window is created.

8. Enter other relevant activity information.

Other activity information that can be tracked with activities should be entered at this point. Typically, costs, people, and materials to be applied will be entered. There are also five user-defined fields to add information not modeled by HyperProject™.

9. Add milestones at useful project check points, to remind yourself about project status reviews.

If not entered already, be sure to enter project milestones from which project status will be tracked. They represent significant events in a project for project review and status purposes. Milestones are appropriate at approximately monthly intervals, when subsystems are completed, when subcontractor work is due, and when project deliverables or status reports are due customers.

10. Assign the resources and materials that will be used in performing the project.

Resources can be tracked as user-defined fields in HyperProject™, or by converting them to their cost value and assigning them to activities. Notes can be used to track other activity and project information.

11. Generate other window views as appropriate.

General rules of thumb might be the following:

Spreadsheets: For bulk data entry and updating of project actuals. Spreadsheet templates can be recalled to produce standard reports.

Gantt charts: For high level management reporting.

Histograms: To look at costs and project work with time.

Any of these three window views can be generated with the current (topmost) PERT window view. If one or more activities are selected, only their data will be shown in these three window views. An unlimited number of window views of each type can be generated from the PERT window activities.

Epilogue: Update status information as the project progresses.

The key distinction between data tracked in HyperProject™ is planned and actual durations, costs, and activity status. As activities are completed, this data should be entered into the modeler. The actual activity durations will be used by the modeler in its Critical Path calculations.

HyperProject™ Symbology Explained

HyperProject™ uses a unique symbology for representing activities and activity constraints. Each activity has four "buttons". The top two indicate the start of an activity. The bottom two indicate the end of an activity. An activity constraint is shown as a connecting line between one of the start or end

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buttons of one activity to one of the start or end buttons of another activity. Four possible connections can be made representing the four activity relationships that can be described. For example, an activity constraint from the finish button of one activity to the start button of another activity represents a finish-to-start relationship that indicates that the predecessor activity must finish before the successor activity can start. This type of symbology is unique to HyperProject™, As opposed to other styles of activity and activity constraint diagramming in that it shows at-a-glance the exact type of activity relationship being described.

The question is often asked: Why don't the two buttons on the left represent the start of an activity and the two on the right represent the finish? The answer lies in having two activities with a finish-to-start constraint where the successor activity is directly underneath the predecessor activity. The HyperProject™ style of diagramming allows a simple connector drawn from the top activity left to the bottom activity left, while the alternate method would require a zip-zag connection from the

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right of the top activity (its finish in this case) back and around to the left of the lower, successor activity. The HyperProject style of diagramming allows simple top-down and left-right method activity constraint lines, while the alternative requires elaborate zig-zag connections with a mixture of left-right and right-left flows.

About the Author

Donald Kasper has been involved with computers since 1977, and has been involved with Project Management and the Macintosh since 1987. For the past 16 years he has specialized in the study of computer graphics in various disciplines covering the spectrum from 2-D and 3-D computer cartography for oil exploration, real-time display, and computer simulation, to advanced flight simulator design, and the implementation of the computer-based, first flight manuals for the B2 bomber. He holds an MS in Computer Information Systems from Claremont Graduate School, specializing in large scale software development and Project Management.

