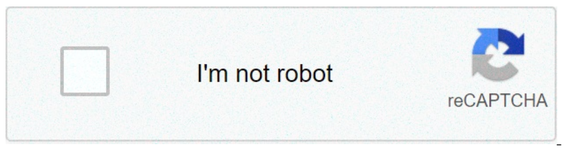

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49 processes of project management chart pdf

Sid Kemp is a business consultant and author of 10 books on project management and business success.What is PERT?PERT, the Project Evaluation and Review Technique, is a method for detailed project planning that includes these two components:The PERT Average: An accurate estimation technique for time and cost, using statistical averaging. The PERT Chart: a chart that allows detailed scheduling of all project activities. PERT was developed by NASA, but it isn't rocket science. The math is simple - addition and subtraction - and is done by any project management software program, anyway. The logic is simple, too.We estimate time for each task taking into account optimistic, likely, and pessimistic estimates. We lay out a planning calendar that includes all work activities and also considers the dependencies between activities, that is, which activities need to be done before others can be done. Let's look at each of these two elements of the PERT technique: PERT estimation, and the PERT chart. We will finish up by talking about how to turn a PERT chart into a real-world project schedule, called a Gantt Chart.Table of ContentsOptimistic and Pessimistic EstimatorsSome estimators are optimistic, some are pessimistic. Use PERT to get a realistic estimate from either one!Sid KempPERT EstimationWhen you ask someone, "how long will it take to do this job?" you usually get an answer with a bias. Some people are consistently pessimistic, figuring - or telling you - the job will take longer than it probably will. That way, they look good when they get it done sooner. Others are consistently optimistic, picturing themselves diving in and doing the work full of fresh energy, and not running into any problems. Their estimates are unrealistically low, because no one has good energy and good luck all the time.To make things more difficult, people don't know they do this. It is generally an unconscious habit.How, then, do we get a realistic estimate? We do it by asking three questions about each job to be done, and then performing a special calculation called a PERT average.What are we estimating?We want to estimate the time it will take to complete each small part of our project. PERT estimation and planning should be done at a detailed level, using the Activity List, which is created from the Work Breakdown Structure. PERT is not part of early estimation, before the WBS is created. It is part of detailed estimation, relying on the project scope plan with WBS being done at a detailed level, and the activity list being complete, as well. We estimate the effort (amount of work) needed to complete each task, and the number of people assigned to the task.It is best if each worker creates his or her own activity list and PERT estimate. As a project manager, you can teach each person on the team to do it. Or, if they are familiar with it already, they can work in pairs, asking each other the PERT estimation questions and also checking each others' work.The Three PERT QuestionsInstead of asking "How long will it take to do this job," ask three questions:If the job goes really smoothly, with no problems, how long will it take? (The Optimistic answer) If you're doing this when you are tired, and you run into problems, how long will this take? (The Pessimistic answer) Given those answers, how long is it likely to take? (The Likely answer) Ask the questions in this order, getting the likely answer last. That way, people, who are always habitually optimistic or pessimistic, will adjust, and give a realistic answer that is actually pretty realistic. With a little practice, anyone can get really good at this.We enter all three estimates in a spreadsheet, under the headings, "Pessimistic," "Likely" and "Optimistic," as shown in Table 1.Calculating the PERT AverageUsing three numbers as estimates for every detailed item would drive a scheduler crazy! We prevent this by resolving the three estimates into a single number, the PERT average. The logic is that the Likely time is more likely than either pessimistic or optimistic, but all three figures matter. Using O, L, and P for Optimistic, Likely, and Pessimistic, this is our equation: (O + (4xL) + P)/6 = PERT Estimated time. Likely is multiplied by four because we are saying that it is four times more likely that the actual time will match the likely time than that it will match either the Optimistic time or the Pessimistic time.Where the heck does the 6 come from? (Everyone asks that when I teach this in a class.) That's simple: We have a total of six data points: 4 Likelies, 1 Optimistic, and 1 Pessimistic. To get an average, we divide the total by the total number of data points. (See the sidebar about Many Types of Averages, and it will all make sense.)The PERT average is shown in right-hand column of Table #1.Many Types of AveragesSome people think that there is only one way to calculate an average: We add up all the items, and divide by the total number of items. In statistics, that is actually one of three common types of averages, and it is called the mean. There are also the median and the mode. Even people familiar with statistics may think that there are only three types of averages. But, actually, there are at least a dozen more.For example, in Olympic sports that are judged, the final score is calculated this way: Eliminate the highest and lowest scores, then take the mean average the rest of the scores. This eliminates bias coming from judges from one's home country and one's primary rival. That is a special type of average.The PERT average, which counts the likely score as four times more likely than the optimistic time or the pessimistic time, is another type of centering average. It is based on a simple idea, that the likely event is, indeed, more likely than the extreme events. Four times more likely was chosen based on statistical theory, working with the normal curve and standard deviation.Table #1: Calculating the PERT Average Time for a TaskFor each task, the worker provides 3 estimates: Optimistic, Likely, and Pessimistic. The spreadsheet calculates the PERT Average as (Optimistic + 4xLikely + Pessimistic)/6. In this case, (3 + 4x6 + 18)/6 = 45/6 = 7.5.TaskOptimisticLikelyPessimisticPERT AverageInstalling the Framistat36187.5Do you use PERT?Figure #1: A PERT Chart NodeThis is the format of a single node on a PERT chart. Each activity gets one node. In the old days, project managers used these to add up the project schedule - by hand!Sid KempThe PERT ChartOddly enough, the PERT chart is almost never seen any more, even though it is the central piece of every detailed project schedule.This section introduces several terms that are probably new to you. You might want to read it, then read the next section, Terms on the PERT Chart, then come back and read this section again. Give yourself a bit of time with this, and it will all make sense. It's also a good idea to refer to Figure #2: A Simplified PERT Chart, as you readThe PERT chart was developed as a calculation tool. Back in the 1970s, project managers would fill in all of the names of each activity and the PERT estimates for time. Each task on the project Activity List would get a box, called a node on the PERT chart. A sample node is shown in Figure #1.Then they would draw arrows indicating dependencies, such as when one task couldn't start until another one finished. Then they would do a forward pass, add up the time for all tasks going forwards, to calculate an early start schedule, including the Early Start and Late Start dates. If we follow the Early Start schedule, we start each project task as soon as possible. Then the project manager would add do a backwards pass , adding it all up backwards, from the end of the project, and calculating the last date each task could end (the Late Finish date) and the last date each task could start (the Late Start date).If, for example, Task 2 can't start until Task 1 is done, then Task 2 depends on Task 1. Say Task 1 is "Ship Framistat" and Task 2 is "Install Framistat." Clearly, we can't install the Framistat until after it has been shipped, and it arrives. Task 1 starts on Day 1 and takes 4 days. The Early Start date for Task 1 is Day 1, and the Duration is 4, so the Early Finish is Day 4. Task 2 can begin one day later, on Day 5. The forward pass allows us to calculate the timing of every task this way, determining the Early Start and Early Finish dates. The backward pass starts from the end of the project, and subtracts Duration from Late Finish to calculate the Late Start date for each task.For some tasks, the early start date and late start date are different. These tasks have float. In plain English, this means that you could start the task on a certain date, or you could let it float for a certain number of days, and start it any time up to the late start date. It won't matter, because the project will be done on the same day, either way.Other tasks have zero float. Their early start date is the same as their late start date. If one of these tasks starts a day late, it will end a day late, and push some other task late. This will go all the way to the end of the project, and the project will be delivered a day late. Tasks that have zero float are on the critical path. This means that we want to ensure each of these tasks is done on time. There's no float: Delay starting any task on the critical path will delay project delivery.The PERT chart is calculated without reference to a real calendar. Day 1 is the first date of the project, and the last date is determined by how long it will take to do all the tasks in the proper order.With all that information, they could build a Gantt chart, which is an easy-to-view calendar based on the PERT chart.Now, we use project management software. We enter the project start and end dates, then the PERT estimated times for each task. We go into cute graphics programs to create links, or dependencies, between tasks. We click a calculate button, and the Gantt chart, the project calendar appears, in full color, with milestones. Aren't you glad you've got a computer?If this didn't make sense to you, check out the list of PERT Schedule Terms below.You can view a PERT chart in any project management software, but no one does, because they're hard to read. And no one ever prints one out - except as giant wallpaper. Remember, every project task has a box of its own, like the box in Figure 1. And even a small project is likely to have dozens of tasks. Large projects have tens of thousands of tasks - or more.If no one uses a PERT chart any more, why learn about them? There are two very good reasons. First, all the terms on the PERT chart are essential to good project management. You need to know how to work with Critical Path Analysis and keep the schedule under control, or your project will be delivered late. Second, you might just want to get certified as a Project Management Professional, and PERT is sure to be on the test!Figure #2: A Simplified PERT ChartThis simplified PERT chart shows Tasks 1 - 5, each of which can't start until the prior task is complete, on the critical path, and Task 6, which must be done after Task 1 and before Task 5, with floatSid KempTerms on the PERT chartThe PERT chart needs its own glossary. Here we go!Dates on the PERT chart start with Day 1, the first day of the project, and end on the project end date, which is calculated when we do the forward pass. The PERT chart is not on a real-world calendar. That comes later, after PERT analysis is complete. A Dependency between two tasks says that these two tasks are linked. The most common kind of dependency is finish-to-start. This means that Task A must be finished before we can start Task B. For example, we must do the shopping and bring home the food before we can cook dinner. There are other types of dependencies, such as when tasks must start at the same time, or end at the same time. But 90% of all dependencies are finish-to-start, creating a chain of tasks needed to complete the project. Dependencies are also called links. Early Start is the earliest date on which a given task can start. The first task on a project has an early start date of one. But a task that is linked to that task can't start until the first task is done, and so forth. Duration is the number of days (or hours) it will take to complete a task. Early Finish is the earliest date that a task can be completed. For any one task, early finish = early start + duration. Forward Pass is a calculation performed on each task, determining its early start date and early finish date. The forward pass also determines the total project duration and the project completion date. Total Project Duration is the length of time the whole project will take, all tasks, start to finish, as calculated by the forward pass. It equals the length of the Critical Path. Project Finish Date is the number of the day the project will finish. A project always starts on day one. So a project with a duration of 50 days will end on Day 50, and that is it's project finish date. Backward Pass is a second calculation for each task on the project, starting on the project finish date, and working backwards to the first task. It calculates the late finish date and late start date of each task. Late Finish Date is the last date a task can finish without delaying the project. Late Start Date is the last date a task can start without delaying the project. Float is the number of days we can let a task float without starting it after the early start date. It can be calculated two ways. Float = Late Start Date - Early Start Date, and also Float = Late Finish Date - Early Finish Date. The Critical Path is all of the tasks that have zero float, that is, tasks that have the same early start date and late start date. Of course, their Early Finish date is the same as their Late Finish date, as well. Each of these tasks must start and finish on time for the project to finish on time. From the PERT Chart to the Real WorldOn a PERT chart, the project begins on Day 1 and ends on the Project finish date, which we calculated as we built the PERT chart in the forward pass. But when is Day 1? And when will the project be done? The answer to that comes with putting the PERT chart into a real-world calendar. That is harder than it sounds. Even after the PERT chart is complete, creating a real-world work schedule, or Gantt Chart, for our project, requires taking these things into account:The work calendar, including weekends and holidays when no work is done. Resolving resource conflicts. What if one employee with a particular skill is assigned to two tasks at the same time? Or what if one work location or piece of equipment, such as a meeting room or a bulldozer, is needed for two different tasks at the same time? These conflicts need to be worked out, and that may extend the schedule. Resource leveling. If a company is assigning a certain number of employees to the whole project, that may not match the project as planned on the PERT chart. The PERT chart may show that, one week, we need only 10 people, and the next week, we need 50. We can't pay 40 people to sit around and do nothing for the first week. Resource leveling adjusts the tasks so we use all the people we have available all the time, but it can also extend the length of the project. Choosing a start date or an end date. Management then chooses that the project will start on a certain date. Or it chooses that it will end on a certain date, and, therefore, must start by a certain date. This date is often affected by practical considerations, such as money being available for the project in a new fiscal year. And it has consequences for project duration. A two month project starting on September 15 is likely to finish by November 15. The same project starting on November 15 will probably not finish by January 15, as we have to consider the US Thanksgiving holiday, Christmas, and New Years. When we've put the project on a real-world calendar, we call it a Gantt chart. The Gantt chart is a management and reporting tool that will guide the project to success.Using PERT on Your ProjectWhen I teach project management classes, I find that anyone who has studied project management has learned PERT, but almost no one has ever used it. That is understandable - it seems like a real hassle to create three time estimates for each task and do all that thinking. It seems to make sense to just make a quick to-do list and jump in and get to work.It may seem that way, but that is not true at all. The reality is that PERT estimation and planning takes very little time, and is entirely worthwhile. In fact, PERT estimation and planning can save you a lot of time and hassle on every project.When I teach a project team do actually do the PERT estimations, they think it will be a hassle, but they end up enjoying it. They key is that they imagine doing the work, running into problems, and solving them. They seriously look at what is optimistic, realistic, and pessimistic. As a result, they get excited to sit down and do the work. And they also know what is ahead of them. Often, they see problems and make a note to tackle them early, to do a bit of research, and to check things out ahead of time.There are two results of having a team create a PERT chart. One is that management has a very real, reliable work plan and project schedule. The other is that each team member is clear, ready to go, and excited about the work. As work begins, the team runs like a well-oiled machine. Problems were foreseen, and the team worked through before the problems cause delay. The team often finds that it is working ahead of schedule, and everyone - the team, the managers, and the customer, are happy with the work and the results.This article is accurate and true to the best of the author’s knowledge. Content is for informational or entertainment purposes only and does not substitute for personal counsel or professional advice in business, financial, legal, or technical matters.Commentsqurban ali on December 14, 2016:Hello, I would like if you can explain me the use of PERT for the selection of one project out of three. For example we have three projects and we have to select one out of three. All the three projects have their optimistic, Pessimistic and most likely cost values. now to select the project we will calculate PERT or we will consider Most likely value. My mail ID is qab_1414@yahoo.comThanksDanson Wachira from Nairobi, Kenya on June 20, 2012:Opps! sorry, Gantt charts.Sid Kemp (author) from Boca Raton, Florida (near Miami and Palm Beach) on June 20, 2012:I picked up a book about time management from NASA when I was a kid - and never looked back!Sid Kemp (author) from Boca Raton, Florida (near Miami and Palm Beach) on June 20, 2012:Hi dwachira - thanks. I think you meant Gantt charts. Gnatt charts would be about irritating little insects! :) I'm glad you are teaching project management. Let's keep helping!Simone Haruko Smith from San Francisco on June 20, 2012:I had no idea that PERT was developed by NASA! How cool! This is a fabulous introduction to the evaluation process. I've learned so much from it.Thanks for putting together the fantastic reference guide.Danson Wachira from Nairobi, Kenya on June 20, 2012:Hi SidKemp, this is a great hub. I teach PERT and GNATT charts a lot to my Software Engineering students and i like it because it is an engaging topic. I will surely refer my students to this hub. Thanks for sharing.