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Are All Those  
Project Management  
Tools Really  
Needed?

# Are All Those Project Management Tools Really Needed?

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## Introduction

There are a number of tools useful in the execution of a project that are listed in *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*—Fifth Edition. Are all those tools always necessary and is your project at risk if you don't have them? We are going to examine some of the major tools listed in the *PMBOK® Guide*, find out how and where they're used, and see what it will take you, the project manager (PM), to learn how to use the tools.

## The Work Breakdown Structure

According to the Project Management Institute (PMI), the work package supposed to take between eight and 80 hours of discrete effort to complete it. The idea in setting up a work breakdown structure is that all of the effort for a project can be described with a work breakdown structure. A work breakdown structure (WBS) is simply a pictorial representation of all the work needed to fulfill the goal of the project. An example is shown below.

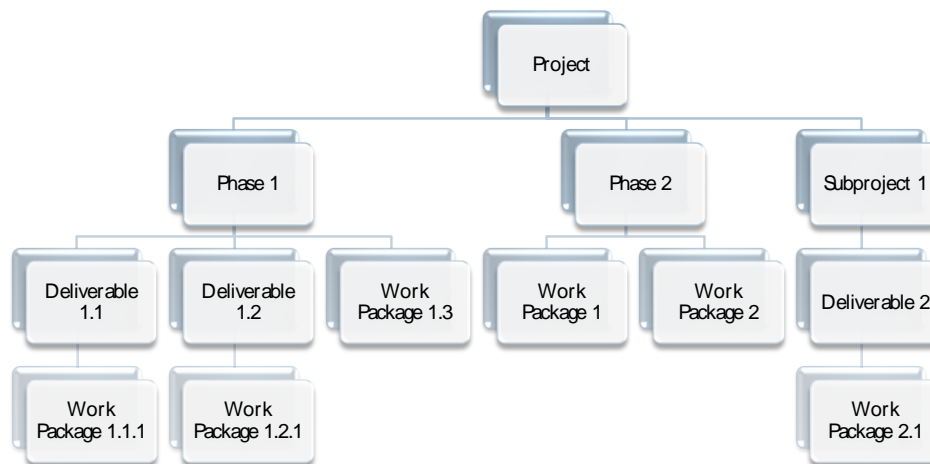


Figure 1: Work Breakdown Structure Example

You will notice the following about the WBS:

- It looks like an organizational chart, not a timeline.
- Cross-functional dependencies are not shown in the chart. If cross-functional dependencies between work packages were to be shown, the viewer would see a veritable rat's nest of wires crisscrossing the page.
- For every numbered work package, there is a corresponding "work breakdown structure dictionary page" (i.e., a detailed description of what goes into the work package, who is doing the work, etc.).

How necessary is this tool? Let's put it this way—setting up a work breakdown structure is the equivalent of creating blueprints for a construction project. If you've never done this before do not worry; the newest version of Visio contains a function for creating a WBS. Additionally, Microsoft Project has an add-in called WBS Pro that easily creates a WBS. Getting up to speed on this tool is just a matter of practice—the more you practice the better you'll be.

## The Precedence Diagram

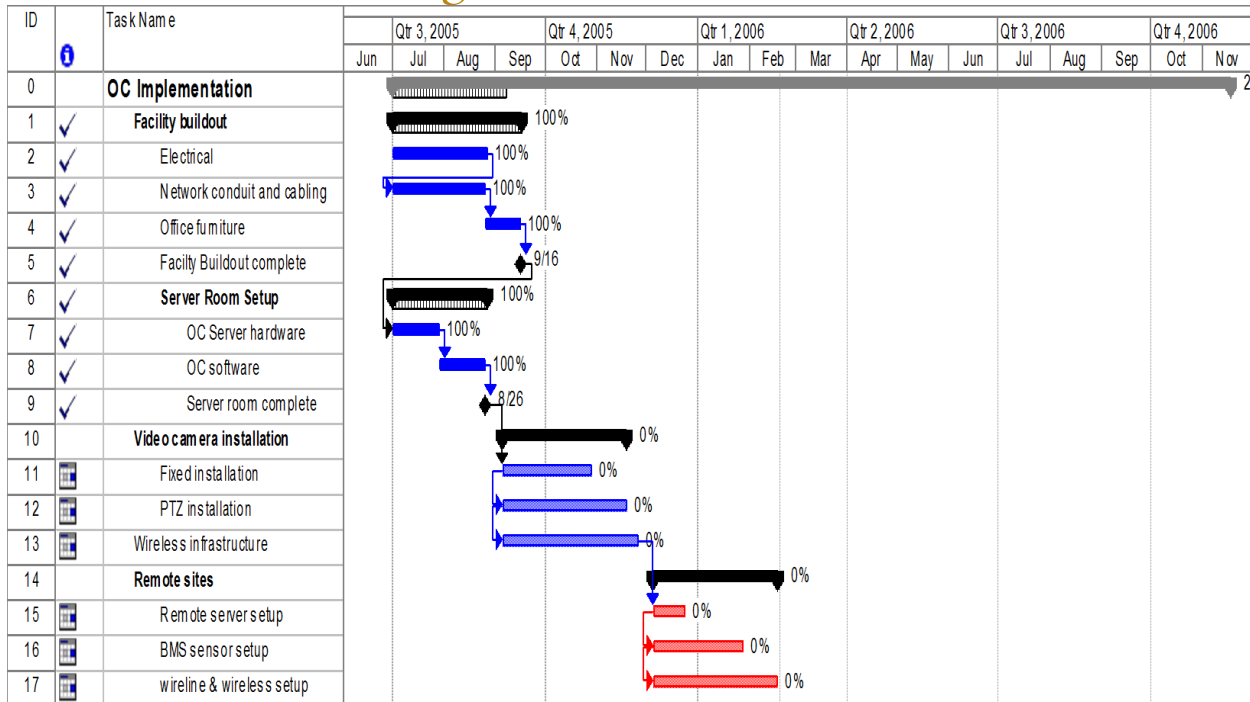


Figure 2: Precedence Diagram with Logical Relationships

As Figure 2 shows, we are looking at a network diagram with logical relationships. While the *PMBOK® Guide* puts an emphasis on performing the precedence relationship manually, there are a number of automated tools such as Primavera and Microsoft Project that enable the creation of precedence diagrams easily.

How necessary are these tools? If the project plan is only 20 or 30 lines, you can probably get away with using Microsoft Excel as a project planning tool. However, if the project plan is a few hundred to several thousand lines (for example, a project plan of several hundred thousand lines might require a Primavera Master Scheduler), you may need a software tool to keep track of project elements. Creating a diagram (like the one shown above) in Microsoft Project might take the user a weekend's worth of preparation but it is well worth the effort. This is useful for a construction project (or a project similar to a construction project) where the product is fundamentally plan-driven. For agile or adaptive projects, it is recommended that an adaptive tool is used such as VersionOne.

In either case, it will take a few days of instruction or about a week's worth of individual effort to get up to speed tool like Microsoft Project or VersionOne.

## Critical Chain Project Management

Critical chain project management (CCPM) is somewhat counterintuitive, so hang on to your hat... The outstanding feature of CCPM is that multitasking is not used in the process. It is been proven over a score of times that multitasking is the worst way to meet multiple corporate objectives, and yet it hangs on in

corporations despite proof that it does not work. The National Academy of Sciences did the definitive study on multitasking in 2011 and *proved* that multitasking temporarily reduced IQ by 10 points—in other words, multitasking makes you stupid.

CCPM focuses on the fact that you have scarce resources, and so you want to make them count. As the picture below shows, if you remove the contingency from each task or activity, each activity is then reduced by about 50%. Then you add a buffer to the end of the schedule that equals half of the new schedule and voilà! Your schedule is automatically reduced by 25%.

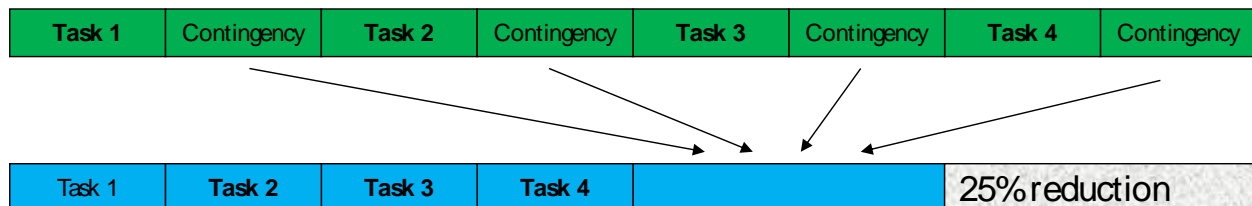


Figure 3: Critical Chain Example

You can go to the Goldratt Institute to get training on CCPM, and I would recommend that you do so. CCPM requires some training and practice in order to get good, and the results are nothing short of outstanding. Two companies in Chicago are using CCPM and have their PMs under non-disclosure agreements (NDA) because they are realizing a competitive advantage using CCPM as a project management methodology.

## Earned Value Management

Once again, PMI puts an emphasis on manually ascertaining earned value on a project. What is earned value? Very simply, an earned value calculation can tell you at any point whether you are ahead of or behind schedule, and whether you're over or under budget. Usually, organizations will have spreadsheets already populated with earned value calculations so that all the PM has to do is enter in the data. The earned value calculations including cost performance index (CPI) and schedule performance index (SPI) will automatically be filled in by the form.

How important is earned value management (EVM) for the PM? If you're working for an organization that doesn't believe in financial controls of projects, then earned value studies are a waste of time. If you're like most companies however, an understanding of EVM is essential for the PM. As the PM, spend at least a weekend to get familiar with earned value terms and the formulas.

## The Seven Ishikawa Tools

The seven Ishikawa tools were introduced in the *PMBOK® Guide*. They are, in no particular order, the following:

- Ishikawa diagrams (also known as cause-and-effect diagrams or Fishbone diagrams)
- Flowcharts
- Check sheets
- Histograms
- Pareto charts
- Control charts
- Scatter diagrams

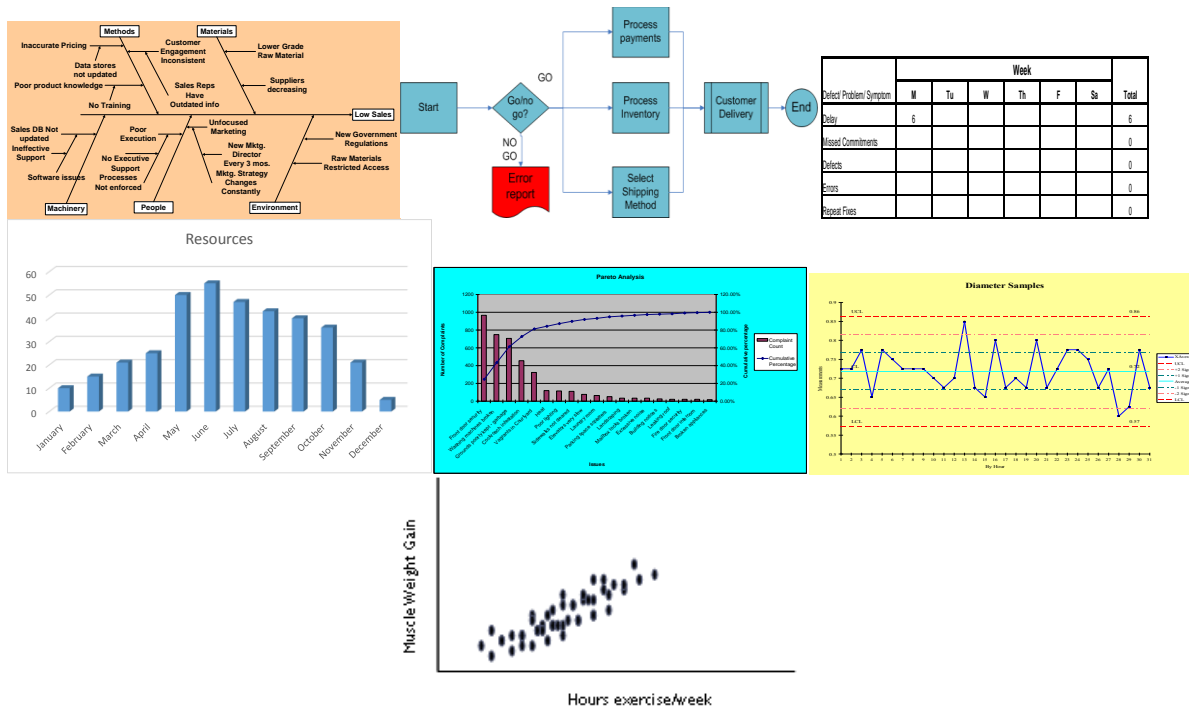


Figure 4: The Seven Ishikawa Quality Tools

Kaoru Ishikawa, a professor of engineering at Tokyo University, stated in his original 1968 publication of these tools that any worker in learning how to correctly use these tools could solve 95% of the problems in their work area. With the advent of spreadsheet programs like Excel, producing any one of these diagrams is easy thing to do. For example, the QI Macros, an Excel add-in, can easily produce the seven Ishikawa tools and will deliver any control chart in the Six Sigma Toolkit. Getting up to speed using a tool like the QI Macros will take a few days but is well worth the effort.

## The Seven Management Tools

Theses seven management tools were introduced in the *PMBOK® Guide*:

- Affinity diagrams
- Process Decision Program Charts (PDPC)
- Interrelationship digraphs
- Tree diagrams
- Prioritization matrices
- Network diagrams
- Matrix diagrams

These tools are lifted directly from the Six Sigma Toolkit, so any Six Sigma Green Belt training will get you up to speed on these tools. It will take about a week of self-study or a week in a Six Sigma Green Belt class. Once again, the use of these tools depends on the project that you're doing; sometimes you'll use one of the tools, and other times you will use all seven. Your job as the PM is to determine which tool is most useful under which situation.

## Decision Tree Diagrams

Once again, PMI wants the PM to be able to compute decision tree diagrams manually for the PMI exam; however, there are tools that automate the decision tree process rather easily. Decision trees are essentially a predictive analysis tool—they can be used for either build-or-buy scenarios, or for return on investment (ROI)

scenarios. They are generally used when a lot of factors have to be considered simultaneously in a risk analysis. An example of a build-or-buy scenario is shown below:

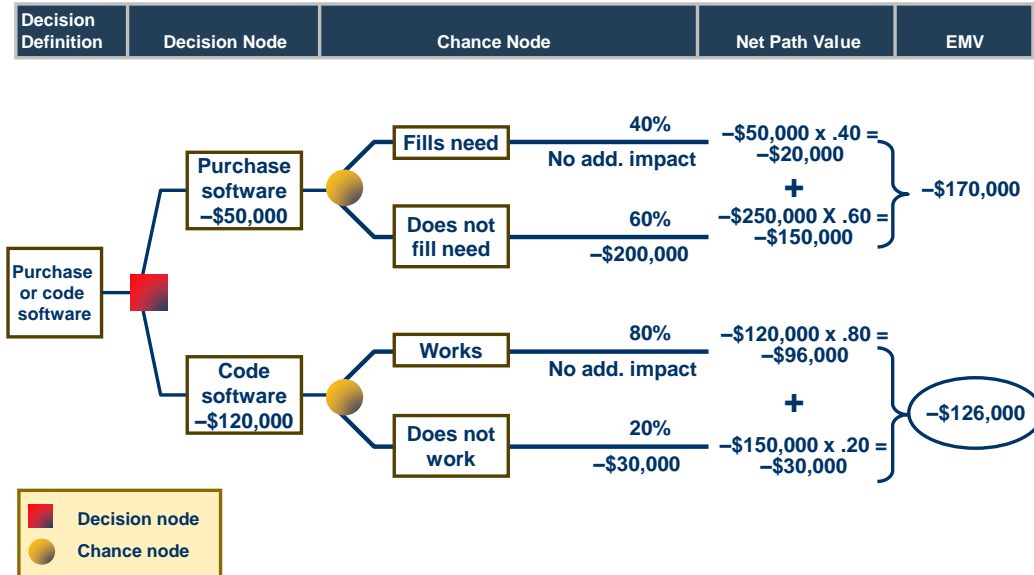


Figure 5: Decision Tree Example

For a simple decision tree with just a few factors, the average business user can get up to speed in about an hour, learning how to create a decision tree manually. For a decision tree with multiple decision factors and even more uncertainty factors, it is generally best to let an automated tool handle that. Learning how to use an automated decision tree will take about an hour of user practice and time.

How useful is the decision tree? If you're doing a project with a lot of predictive analysis required, the decision tree might be a great choice.

## The Monte Carlo Analysis

The Monte Carlo analysis is a true risk analysis tool. As such, it is a nontrivial process that requires training. However, if you are project risk manager, then a deep understanding of the Monte Carlo analysis might be in order. Essentially, the Monte Carlo analysis lets the PM run the "what if" scenario in as many different permutations and combinations as desired. On a risky project, this gives the PM an idea of where the project may end in terms of timeline, budget, or other imposed project constraints. A tabular version of the Monte Carlo is shown next; however, this can also be shown as an "S" curve if so desired:

Monte Carlo Estimates for Major Components													
numbers for the PERT in columns B5	PROBABILITY (Confidence Factor)												
	Deliverable	Optimistic	Most Likely	Pessimistic	PERT	20%	30%	40%	50%	60%	70%	80%	90%
Component 1	15	30	45	30.0	21.3	24.2	27.1	30.0	32.8	35.7	38.6	41.5	
Component 2	20	32	50	33.0	26.2	29.1	32.0	34.9	37.8	40.7	43.6	46.5	
Component 3	14	21	65	27.2	24.3	29.2	34.1	39.1	44.0	48.9	53.9	58.8	
Component 4	10	20	35	20.8	15.2	17.6	20.0	22.4	24.8	27.2	29.7	32.1	
Component 5	30	45	65	45.8	37.3	40.6	44.0	47.4	50.8	54.2	57.5	60.9	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total PERT	89	148	260	156.8	124.2	140.7	157.2	173.8	190.3	206.8	223.3	239.8	
Probability columns show the percent 'Confidence Factor'. e.g. for Component 1, the PERT													

Figure 6: Tabular Monte Carlo Analysis

With the example above, the Monte Carlo percentages are compared with the Program (or project) Evaluation and Review Technique (PERT) numbers. You'll notice that in areas where the pessimistic estimate is high, the Monte Carlo and the PERT percentages are significantly different. For example, with Component 3, the pessimistic estimate is 65 days. The PERT estimate is 27.2 days while the Monte Carlo percentage for that estimate is less than 30 percent as a confidence factor. Notice that when the Monte Carlo analysis is 50 percent, the likelihood of hitting that percentage is 39.1 days.

## The Sender and Receiver Model

The sender-receiver model, introduced by Claude Shannon and Warren Weaver in their 1948 book, *The Mathematical Theory of Communication*, is still the standard when describing communications between two or more entities. It addresses something that Claude Shannon called "information entropy" which measures the uncertainty in a message. The model is well documented in the *PMBOK® Guide—Fifth Edition*.

Since this is the predominant method of communication, the PM would do well to review and understand this model, which takes about an hour to complete. The model is not difficult to understand, however, its understanding is crucial to the success of the project, so pay close attention to its parts and pieces:

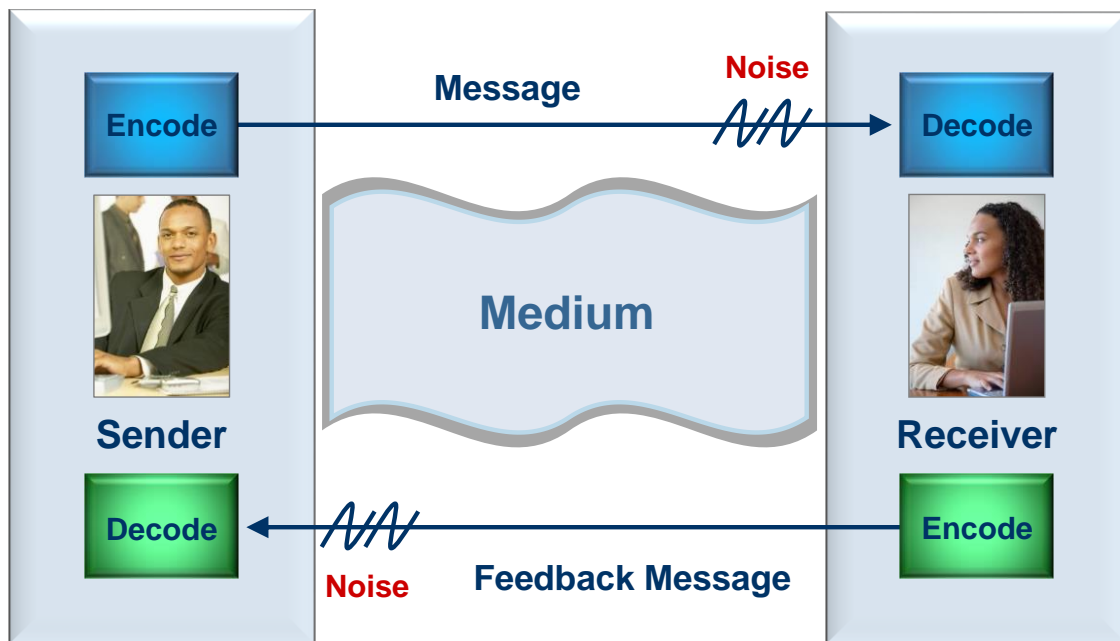


Figure 7: Sender-Receiver Model

## Conclusion

The tools described in this white paper are essential PM tools. Tools that will best be used, regardless of the project, are the WBS, communication model, and the precedence diagram. The other tools will be needed depending on the project.

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## About the Author

Richard J Perrin has worked in the aerospace, finance/brokerage, healthcare, energy, telecommunications, and insurance industries as well as state and federal government for over 30 years.

Working primarily for Fortune 100 and Global 10 companies as a program/project manager, he has managed multi-million dollar, international infrastructure deployments, consulted in the creation of PMOs, functioned as proposal manager, developed workflows and business process focusing on the implementation of lean business process and quality practices for the publishing and telecom industries, as well as the public sector. For the last four years he has devoted his efforts to delivering coaching and training on Agile/Scrum processes across the United States. His book, *Real World Project Management* was published by John Wiley & Sons and released in January 2008. Most recently, he was selected by the Project Management Institute as an internal reviewer/contributor for *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*—Fifth Edition.