

# Managing the Project Budget

**Project Skills**

Paul Newton

[www.free-management-ebooks.com](http://www.free-management-ebooks.com)

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## Preface

This eBook describes the process of managing the project budget and its associated costs. The first task is to set the budget based on cost estimates and the second is to manage the costs so that they remain within the budget that has been set. Managing a project budget can be both specialized and complex and the aim of this eBook is to give you a general understanding of what is involved so that you know what should be done, even if you don't have the skills needed to actually do it.

You will learn:

- How to approximate the monetary cost of a project.
- How a project budget is arrived at based on these figures.
- How the spend is monitored and changes to the cost baseline are managed.
- How Earned Value Management (EVM) is used in projects.
- The importance of managing cash flow throughout the project.
- Why a structured approach to buying in products and services is essential.
- How to apply standards and procedures to improve your effectiveness.
- The benefit you can attain by treating procurement management as a discrete area.

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## Introduction

When you think about it, all of business is about cost management. After all, if the revenues don't add up to be more than the expenses at the end of the day (or the end of the year), what is the point of being in business in the first place? The ability to control costs and maximize revenues is the name of the game in any for-profit organization.

With that in mind, it only makes sense that an individual project would retain many of the same key elements. If you are able to control project costs successfully, that project will stand a much better chance of being deemed a winner in the end.



Finishing the project with the desired outcome is only going to be viewed positively if costs are managed and kept within the project's approved budget. Project [cost management](#) is the process of bringing as much predictability and control as possible to the expenses of a project. Surprise expenses are the enemy of any organization, so being able to accurately forecast the costs of a project ahead of time is a key skill to possess.

A talented and experienced project manager will be able to analyze the goals of an upcoming project and work through a series of steps to make sure that project is delivered in as cost-effective a manner as possible. There are generally four steps that are used in the project cost management process. Understanding the purpose of each of these phases will help you get a better idea of what project cost management can do.

### Planning Costs

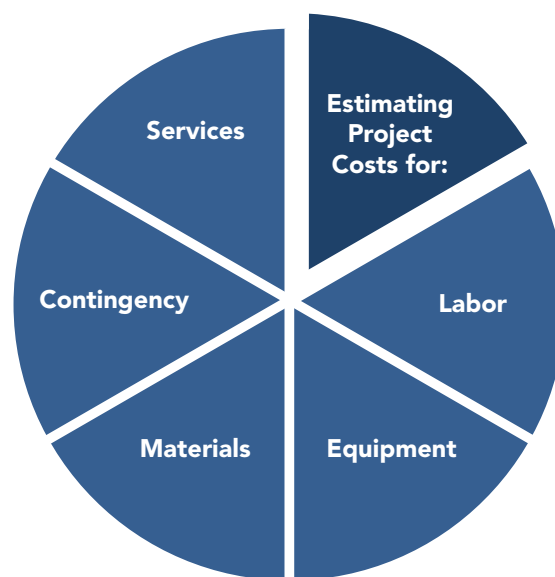
When the project is in the initially planning stages, the expected costs should be estimated in order to begin developing an outline of what the overall expense will be. It is important at this point to do a thorough job of anticipating costs that can relate to the project from a variety of areas.



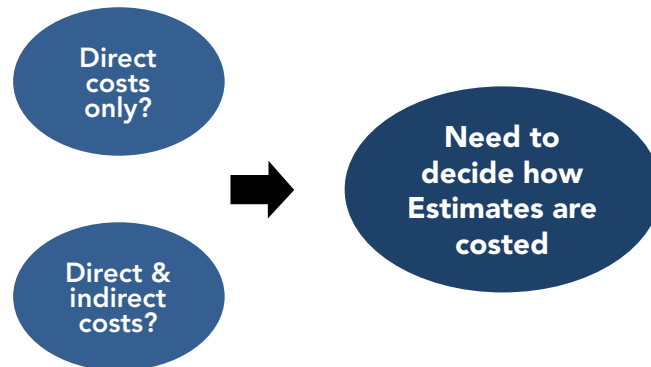
Some of the costs that you incur will be obvious and easy to calculate, but others may be a little harder to put your finger on. One important consideration when planning costs is the method that will be used to finance these costs. Each project will use a variety of finance options and the final selection will vary between projects and organizations.

**Estimating Costs**

One of the obvious costs associated with any project is the people that will be working on the task. Payroll or contractor expenses are usually among the biggest costs for any project. So it is essential to do a good job of estimating the total hours of work needed—and the cost of those hours—to get your final estimate as correct as possible. Also, expenses associated with raw materials and equipment are other common outlays that should be anticipated.



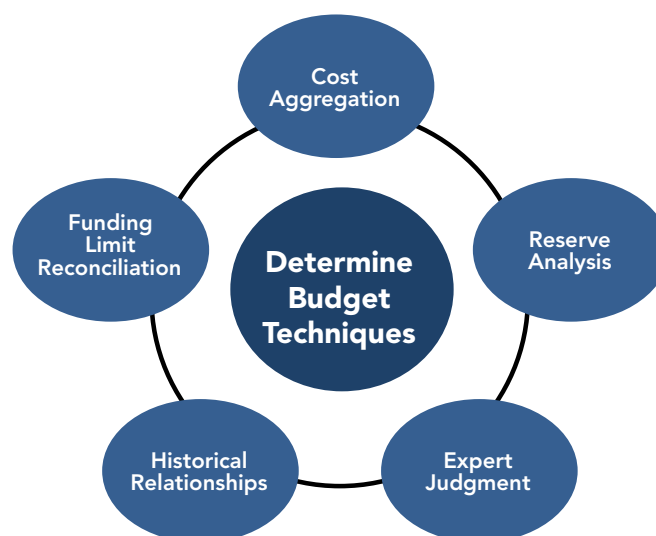
The 'hidden' and indirect costs that you will need to plan for are obviously harder to deal with, and will vary wildly from organization to organization depending on the task at hand. This is where you can lean on a detailed project plan that has been created right from the outset.



Look carefully at the scope of the project itself to find anything that might not already be included in your estimated costs. It might take some time and effort to locate all of the costs that will end up relating to the project, but this is a necessary step to take.

**Determining the Budget**

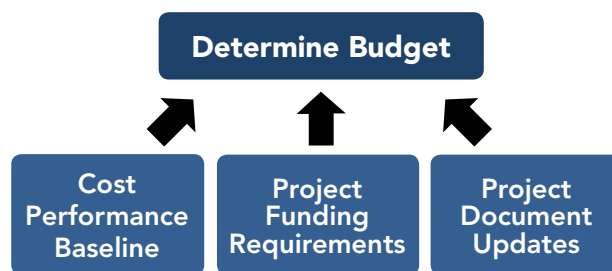
Creating a budget for your project is the formalization of the work you have done in estimating the costs. Now that you have a good idea of what the various inputs will cost throughout the project, you can develop a proper budget that outlines those expenses and creates a target for you to aim for once the project gets underway.





Not only is the project budget a helpful planning tool, but it also may be necessary before getting permission to start the project. Just as with any other business activity, having an accurate budget helps all parties involved to understand the parameters of the work and what assets they have available to them.

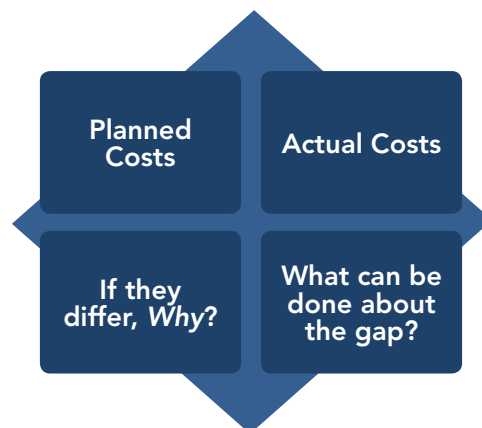
The obvious need for a project budget stems from making sure there is enough money available to get the project completed as intended. You don't want to make it part way through a project only to realize that the money you need isn't going to be available on time—or at all.



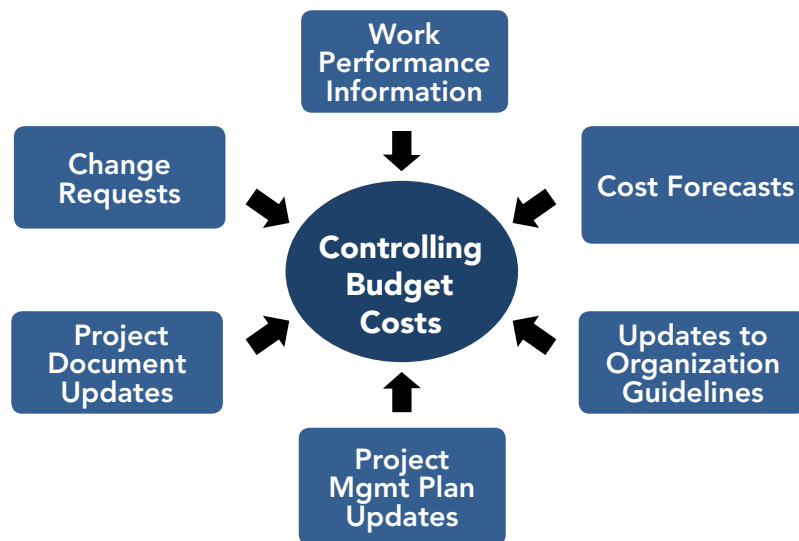
Knowing the costs up front means you can build the project into the overall budget of the organization as a whole and be sure funds are ready as required.

### Controlling Costs

Costs need to be controlled carefully throughout the process to make sure the budget doesn't get out of control and end up overrunning your plans. Also, just because you have budgeted for a certain amount doesn't mean that total amount needs to be spent. Finishing a project on time and on budget is great, but finishing the project on time and under budget is even better.



Any project manager knows that things never go exactly according to plan, so planning in an element of contingency or saving could help when unexpected expenses pop-up in other parts of the project. If one area of the project is going to end up over budget, it will be a great help if another portion of the task comes in below the estimate that you had laid out.



Project [cost management](#) is one of the top skills and that a good project manager should have and want to develop. The diagram above shows the various outputs that come out of the process used to control project costs. As a leader within your organization, watching the bottom line is something you should always have in the back of your mind.

It is easy to let costs run wild, especially with big projects that have many different departments and individuals involved. Building a realistic budget, and then keeping to that budget as closely as possible, will put your projects on a track toward a positive conclusion.

## Managing Project Costs

Managing project costs involves defining the total cost of the project, securing a budget and then making sure that it is delivered within that approved budget. It relies on other planning processes like [scope management](#) and [resource allocation](#) being done effectively.

The first step in managing project costs is to answer the questions:

*'How much will the project cost?' and 'How accurate is this estimate?'*

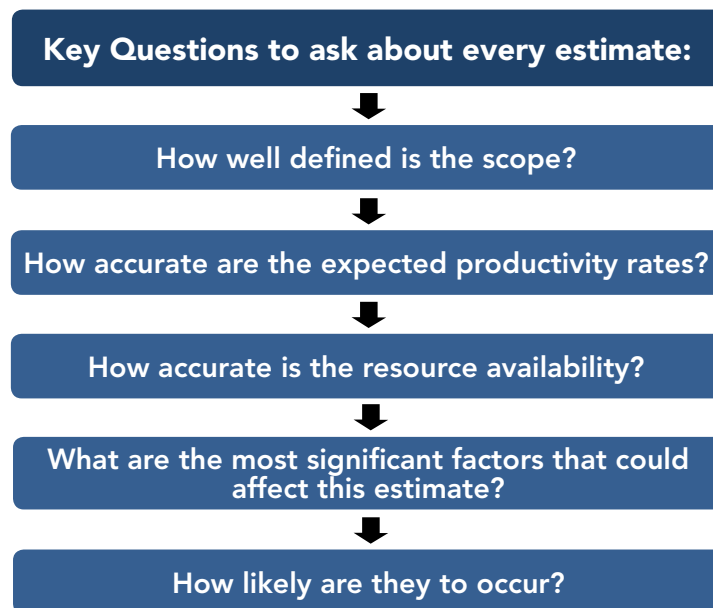
Project managers make many of their day-to-day decisions based on estimates and the accuracy of these can have a big influence on the outcome of the project. Experience suggests that projects launched without an accurate initial estimate are far more likely to experience serious problems than those where sound estimates were made. One of the keys to successful project completion is an accurate cost estimate and a realistic [risk](#) assessment.

In addition, in some project environments, the project manager may have a legal responsibility for ensuring that cost estimates are prepared properly. Even where this is not the case the project manager should document all of the supporting information that went into the cost estimates in order to justify their decisions if these are challenged later on.

In common with many of the processes in project management, cost estimation is an iterative process and the more work that is done and the more experience that is gained the more accurate the estimates of future work will become.

Even projects with acceptable initial estimates are doomed to overrun cost and schedule budgets if they are not guided by rules of thumb and rigorous estimates-to-complete. There are five questions project managers should ask about every estimate as they define and manage their projects:

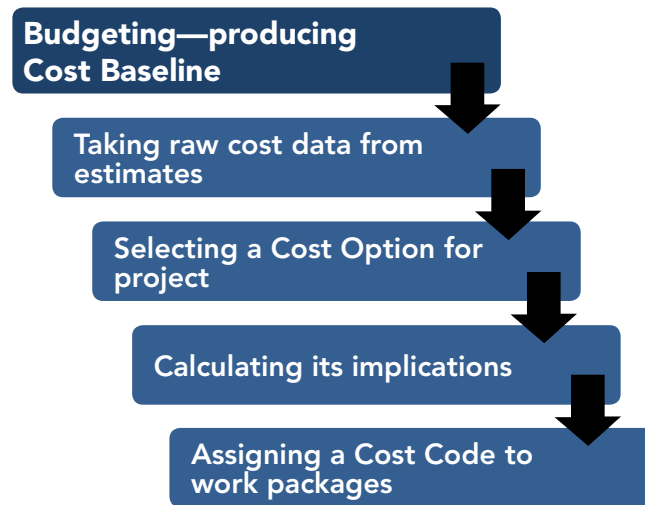
1. How well defined is the scope?
2. How accurate are the expected productivity rates?
3. How accurate is the resource availability assumption?
4. What are the most significant factors that could affect this estimate?
5. How likely are they to occur?



There is no point in working out costs to the nearest dollar if you are not clear about these things. In fact, providing very specific cost estimates to the sponsor can hide the fact that you are basing them on scope, resource and productivity figures that are themselves likely to be revised in the light of experience.

On the subject of accuracy, you will need to decide just how accurate the estimates need to be. For example, an initial estimate may suggest a figure of between \$50,000 and \$75,000 for a particular part of the project. The benefit gained from narrowing this down needs to be factored against the additional time (and cost) it would take to do so. If the project sponsor is happy to accept this initial estimate, then why bother? The key word here is 'initial', you should be able to narrow this down without too much effort when you have more experience and more data to work with.

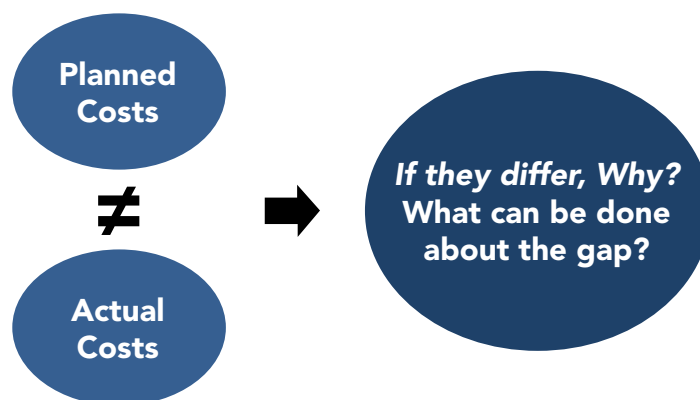
Whilst cost estimating operates at the level of activities, cost budgeting aggregates these figures at the project level to produce a cost baseline and the project funding requirements. The process of aggregation involves more than simply adding the figures from the estimating process to produce totals.



Budgeting involves taking the raw cost data from the estimating step, deciding which cost options to use, calculating their implication, and finally assigning cost codes to work packages. The [project cost plan](#) will also need to be structured in a way that is compatible with how the funds are being disbursed and it will need to be compatible with the organization’s own accounting system.

Cost control is concerned with answering the questions:

1. Is the project on track in terms of cost to date?
2. Does it look as if this will continue?
3. If not, what action can be taken to remedy the situation?



To answer these, you need to know four things:

1. The planned costs
2. The actual costs
3. Why they differ (assuming they do)
4. What you can do about it

The process of determining the difference between the planned costs and the actual costs is fairly straightforward and there are several tools that can be used to quantify any 'variance'. A project manager is expected to be able to report exactly where a project is in terms of costs against the planned budget. You will normally be expected to produce a variance report to the project sponsor detailing these figures.

The real skill of project management is to be able to identify problems and to address them as soon as possible, before they become too big to fix.

The [cost plan](#) clearly defines how the costs on a project will be managed throughout the project's lifecycle. It sets the format and standards by which the project costs are measured, reported and controlled. This plan identifies who is responsible for managing costs and who has the authority to approve changes to the project or its budget. It also specifies how cost performance is quantitatively measured and details report formats, frequency and to whom they are presented.

The [work breakdown structure \(WBS\)](#) is the basis for the cost plan because the costs are totaled or "rolled up" from the costs for the individual work packages in the WBS. You can check out the complete range of [project management pdf](#) eBooks free from the website.

Developing the cost plan may involve choosing strategic options to fund the project such as:

- Self-funding,
- Funding with equity, or
- Funding with debt.

The cost plan may also detail ways to finance project resources such as making, purchasing, renting, or leasing. These decisions, like other financial decisions affecting the project, may affect project schedule and/or risks.



Organizational policies and procedures may influence which financial techniques are employed in these decisions. Techniques may include (but are not limited to): payback period, return on investment, internal rate of return, discounted cash flow, and net present value.

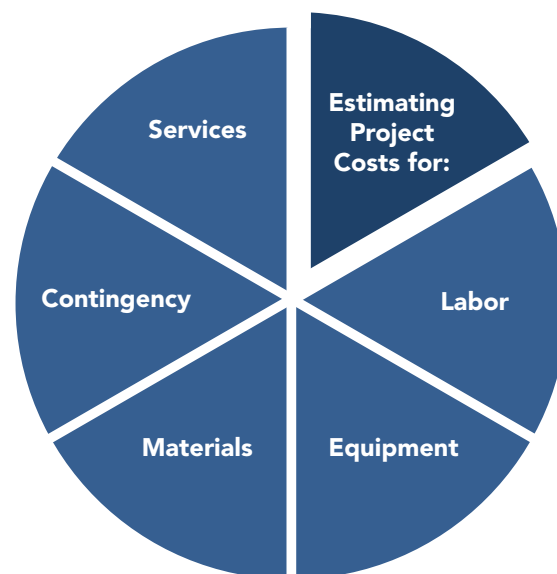
## KEY POINTS

- ✓ Project managers make many of their day-to-day decisions based on estimates and the accuracy of these can have a big influence on the outcome of the project.
- ✓ Accurate cost estimation can only be achieved by hard work backed by experience and sound judgment.
- ✓ There are five questions a project managers should ask about every estimate:
  - ✓ How well defined is the scope?
  - ✓ How accurate are the expected productivity rates?
  - ✓ How accurate is the resource availability assumption?
  - ✓ What are the most significant factors that could affect this estimate?
  - ✓ How likely are they to occur?
- ✓ Always avoid giving estimates that are too specific as this hides the fact that they are based on resource and productivity figures that are themselves likely to be revised.

- ✓ The cost plan clearly defines: how the costs on a project will be managed, the format and standards by which the project costs are measured, reported and controlled, who is responsible for managing costs and who has the authority to approve changes to the project or its budget.
  - ✓ It also specifies how cost performance is quantitatively measured and details report formats, frequency and to whom they are presented.
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## Estimating Project Costs

This step involves estimating the costs of all of the resources that will be charged to the project including: labor, equipment, materials, services, and any contingency costs.

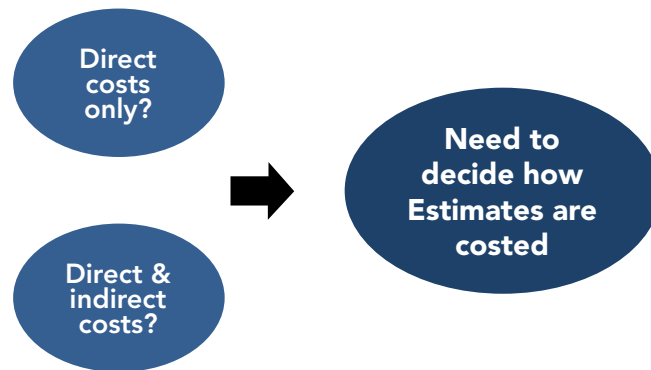


In the early days of a project, estimating costs can be difficult particularly if there is little or no historical data from previous projects of a similar nature. There are various tools and techniques that can help with this but there is no substitute for experience. As the project progresses, more information becomes available and the degree of uncertainty naturally falls.

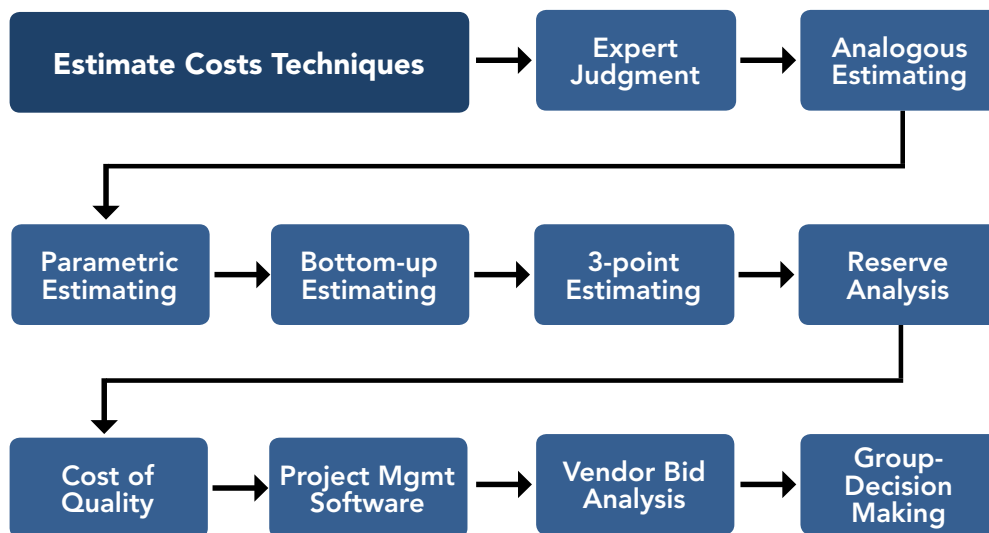
One basic assumption that needs to be made when estimating project costs is whether the estimates will be limited to direct project costs only or whether the estimates will also include indirect costs. Indirect costs are those costs that cannot be directly traced to



a specific project and therefore will be accumulated and allocated equitably over multiple projects by some approved and documented accounting procedure.



Cost estimates are influenced by numerous variables such as labor rates, material costs, inflation, [risk factors](#), and other variables. Expert judgment, guided by historical information, provides valuable insight about the environment and information from prior similar projects. Expert judgment can also be used to determine whether to combine methods of estimating and how to reconcile differences between them.



### Analogous Estimating

Analogous estimating uses the values of [scope](#), [cost](#), budget, and duration or measures of scale such as size, weight, and complexity, from a previous, similar project as the basis for estimating the same parameter for this project. It is most often used in the early stages of a project when there is little else to base the cost estimates on. It is a relatively quick and straightforward method but is less accurate than bottom-up estimation.

The accuracy of the estimate depends upon how similar the activities are and whether the team member who will perform the activity has the same level of expertise and experience as the team member from the previous project.

Analogous estimating is typically a form of expert judgment that is most reliable when the previous activities are similar to the current activity and when the team members preparing the estimates have the necessary experience.

### Parametric Estimating

Another technique that can be used is parametric estimating, this is used to calculate the cost when the productivity rate of the resource performing the activity is available. You can use the following formula:

$$\text{Activity cost} = \text{Units of work in the activity} / \text{Productivity rate of the resources.}$$

For example, if a contractor charges \$5000 to build 100 yards of security fence, the cost calculation can be performed as follows:

$$\begin{array}{|c|} \hline \text{Activity Cost} \\ \hline \$17,500 \\ \hline \end{array} = \begin{array}{|c|} \hline \text{Units of work} \\ \text{in activity} \\ \hline 350\text{yds fence} \\ \hline \end{array} \div \begin{array}{|c|} \hline \text{Productivity} \\ \text{rate of} \\ \text{resources} \\ \hline (100\text{yds}/\$5000) \\ \hline \end{array}$$

This technique relies on the statistical relationship that exists between a series of historical data and the variables in question. When this data is being drawn from a large body of historical data taken from similar projects, then it can yield accurate estimates.

It provides several advantages as an estimating technique for example:

- It allows estimates to be prepared in much less time than required by more detailed techniques.
- It requires quantitative inputs that are linked to algorithms providing quantitative outputs. This means that all costs are traceable.
- If two estimators input the same values for parameters, they will get the same resulting cost. Parametric models also provide a consistent estimate format and estimate documentation.
- Parametric models provide costs for a range of input values, extrapolating to derive costs for projects of a different size or nature than you may have history for.
- The models highlight the design parameters used, and can provide key statistical relationships and metrics for comparison with other projects.

The disadvantages of this method are:

- Models will not exist for activities until there is a sufficiently large experience base for the activity. Basing estimates on work that is only vaguely comparable will yield inaccurate estimates.
- Physical parameters, for example 'number of bricks laid', 'area of trees cleared' or 'number of widgets produced' are far more meaningful than non-physical parameters for example, the 'number of lines of code' in a software project.
- Improved technology or working practices may make the historical data obsolete. As well as increased computing power this could include things like new plant and equipment or a completely new way of doing the job.

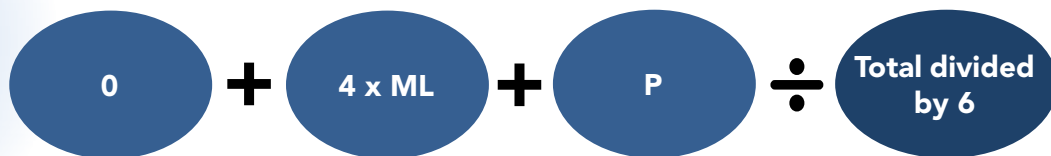
### **Three-point Estimating**

Three-point Estimates address the issue of uncertainty in estimating the activity duration. This uncertainty can be calculated by making a three-point estimate in which each point corresponds to one of the following estimate types:

***Most Likely Scenario (ML)***—the activity duration is calculated in most practical terms by factoring in resources likely to be assigned, realistic expectations of the resources, dependencies, and interruptions.

**Optimistic Scenario (O)**—this is the best-case version of the situation described in the most likely scenario.

**Pessimistic Scenario (P)**—this is the worst-case version of the situation described in the most likely scenario. We then find the average, but we first weight the Most Likely estimate by 4.



The formula is  $(O + (4 \times ML) + P) / 6$ . We must divide by six because we in effect have six different estimates (although three of these estimates are the same number). We are averaging  $(O + ML + ML + ML + ML + P) / 6$ .

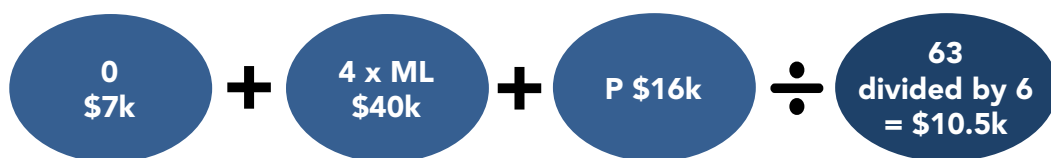
Here's an example.

*A roofing contractor is replacing all of the tiles on the roof of a house. He estimates that the job cost \$10,000 based on the expectation that they will need to replace some of the underlying timbers. This is his **Most Likely Estimate**.*

*If none of the timbers need replacing then the job will cost \$7,000, this represents his **Optimistic estimate**.*

*If most of the timbers need replacing then the job will cost \$16,000, this represents his **Pessimistic estimate**.*

Putting these numbers into the formula gives:

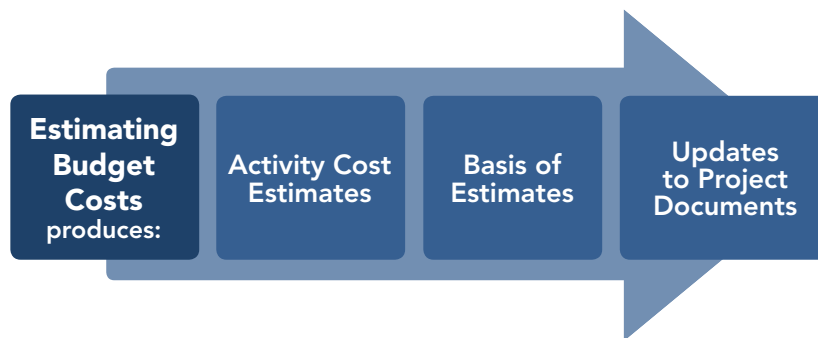


This formula is most useful in estimating the cost of activities for projects that are especially unique, such as in research and development where there are many unknowns.

### Reserve Analysis

Cost estimates may include contingency reserves (sometimes called contingency allowances) to account for cost uncertainty. The contingency reserve may be a percentage of the estimated cost, a fixed number, or may be developed by using quantitative analysis methods.

One method of calculating the contingency reserve is to take a percentage of the original activity cost estimate, although it can also be estimated by using quantitative analysis methods. When more information about the project becomes available, the contingency reserve can be reduced or eliminated. Contingency should be clearly identified in cost documentation.



Cost estimating methods may include analysis of what the project should cost, based on the responsive bids from qualified vendors. Where projects are awarded to a vendor under competitive processes, additional cost estimating work can be required of the project team to examine the price of individual deliverables and to derive a cost that supports the final total project cost.

Activity Cost Estimates are quantitative assessments of the probable costs required to complete project work. They are estimated for all resources that are applied to the activity cost estimate including, direct labor, materials, equipment, services, facilities, information technology, and special categories such as an inflation allowance or a cost contingency reserve.

They should also provide a clear and complete understanding of how the cost estimate was derived including: the basis of the estimate, all assumptions made, any known constraints, indication of the range of possible estimates, and the confidence level of the final estimate.

## KEY POINTS

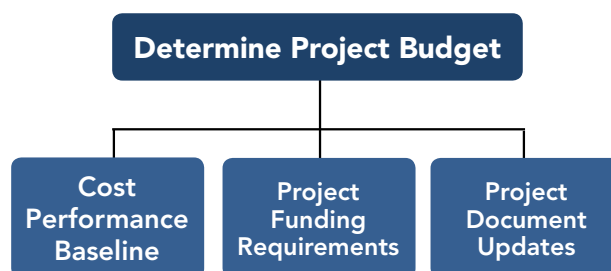
- ✓ Estimating project costs involves estimating the costs of all of the resources that will be charged to the project including: labor, equipment, materials, services, and any contingency costs.
- ✓ Estimating costs can be difficult particularly if there is little or no historical data from previous projects of a similar nature.
- ✓ There are various techniques that can be used including: analogous estimating, parametric estimating, and three-point estimates.
- ✓ Cost estimates may include contingency reserves to account for cost uncertainty. This may be a percentage of the estimated cost, a fixed number, or may be developed by using quantitative analysis methods.

## Calculating the Total Project Budget

This is the process of aggregating the estimated costs of individual activities or [work packages](#) to establish a cost baseline. This baseline includes all authorized budgets, but excludes management reserves.

Cost aggregation of the work packages produces the cost estimate of the project. Adding the cost of [risk responses](#) and contingency reserves produces the cost baseline. Adding the management reserves, which are not controlled by the project manager but by management, to the cost baseline, provides the cost budget.

If the funding for the whole project is incremental, then care must be taken to ensure that the project does not run out of money as a result of getting too far ahead of the schedule.



The cost performance baseline specifies what costs will be incurred and when. This matters because most projects will not receive their funding as a lump sum at the beginning but will be financed according to a monthly or quarterly budget. This means that the project manager will need to indicate when funds need to be available.

The simplest way to produce a cost baseline would be to aggregate all of the anticipated costs of the project and assume that they would be needed in proportion to the planned timescale.

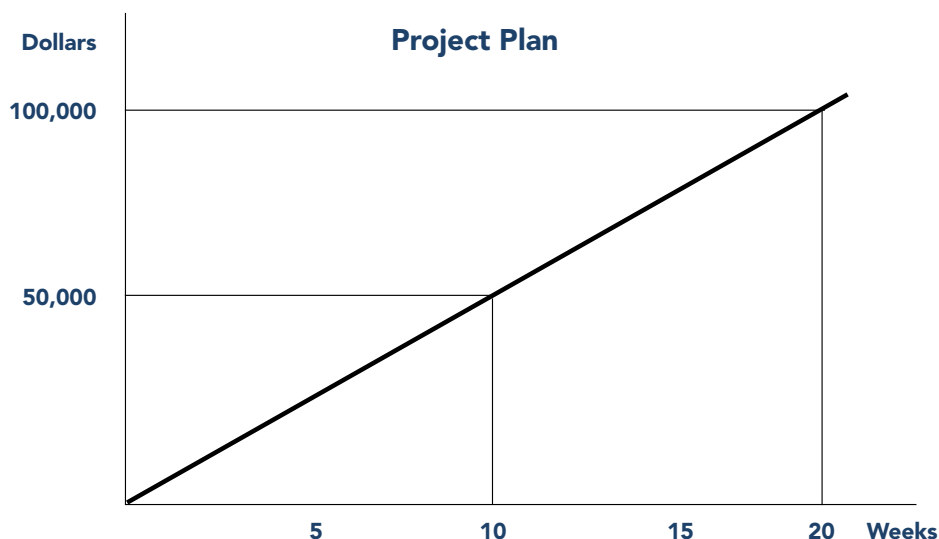
For example,

*Project Total cost was \$100,000*

*Project planned to take 20 weeks*

Then a simple cost graph could be produced with the vertical axis calibrated in dollars and the horizontal axis calibrated in weeks.

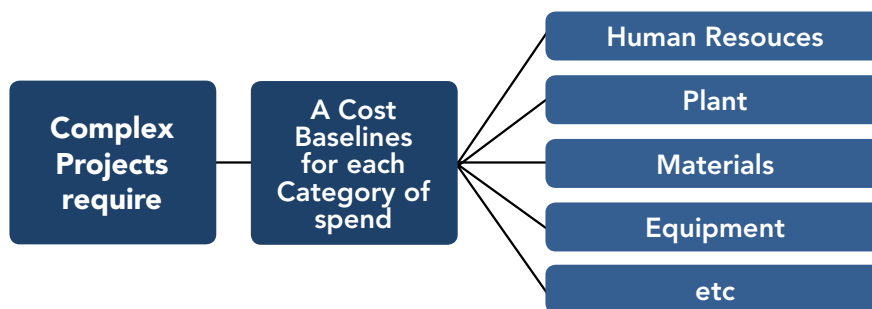
You could produce a simple cost graph by assuming that the planned cost per day was linear, that is as a straight line coming from the origin to a point that is aligned to \$100,000 on the vertical axis and 20 weeks on the horizontal axis as shown:



We have just created the cost performance baseline for that project as it takes the estimated project expenditures and aligns them with dates on the calendar. This allows

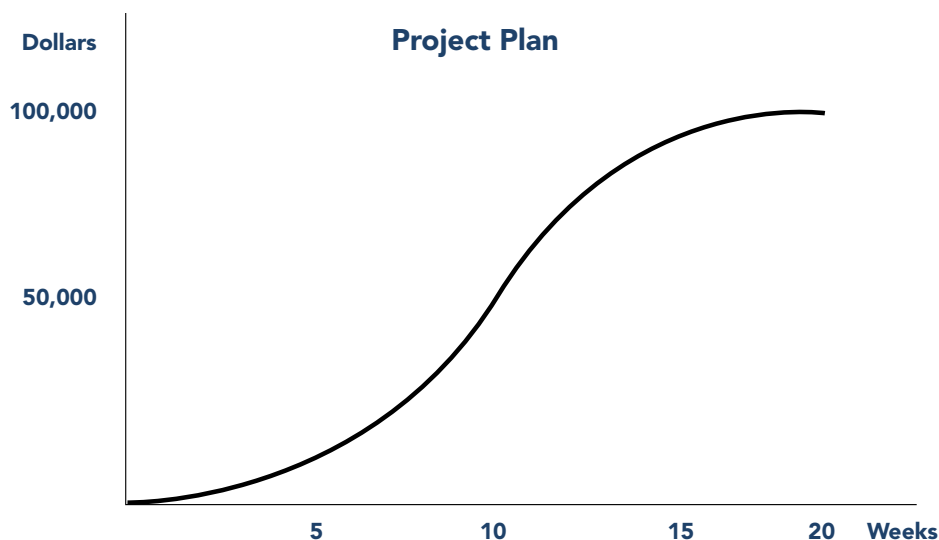
the organization to plan for cash flow and to make suitable arrangements in advance so that the funds are available when needed and not before.

This might be accurate enough for a very simple project where both the labor and material costs were fairly constant from day-to-day. But for projects with any degree of complexity it is necessary to produce separate cost baselines for different categories of expenditure, such as [human resources](#) at different labor rates, plant, materials and other equipment.



For this reason the cost performance baseline may consist of several sub-baselines, which can be aggregated to produce totals. In most projects the rate of expenditure is not linear but follows an 'S' shaped curve as shown.

The reason for this is that the rate of spent at the beginning and end of the project is typically lower than that during the execution phase.





## KEY POINTS

- ✓ The total project budget can be calculated by aggregating the estimated costs of individual activities or work packages to establish a cost baseline that specifies what costs will be incurred and when.
  - ✓ Most projects will not receive their funding as a lump sum at the beginning but will be financed according to a monthly or quarterly budget, so care must be taken to ensure that the project does not run out of money as a result of getting too far ahead of the schedule.
  - ✓ Knowing what funds need to be available would be easy if labor and material costs were fairly constant from day-to-day, but this is seldom true.
  - ✓ For this reason the cost performance baseline may consist of several sub-baselines, which can be aggregated to produce totals. In most projects the rate of expenditure is not linear but follows an 'S' shaped curve.
- 

## Monitoring & Controlling Project Expenditure

This is the process of monitoring the status of the project to update the project budget and managing changes to the cost baseline. It involves taking the cost baseline and performance data about what has actually been done in order to determine the work accomplished against the amount spent.

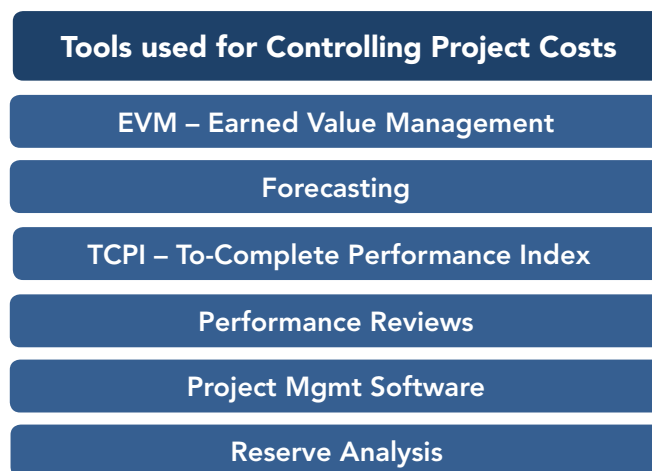
Monitoring the expenditure of funds without regard to the value of work being accomplished for such expenditures has little value to the project other than to allow the project team to stay within the authorized funding. The key to effective cost control is the management of the approved cost performance baseline and the changes to that baseline.

For those projects that are funded at various stages during the project, funding requirements will need to be taken into account so that the project doesn't get to the point that funding is temporarily unavailable.

Earned value management (EVM), forecasting, the TCPI (To-Complete Performance Index), and performance reviews are the main techniques used, along with the project

management software. Earned value management takes a snapshot of the present moment to see how the project is doing.

The techniques of forecasting and TCPI shows how the future of the project will evolve given how the project is doing now. The performance reviews compare the past performance with the present performance to see how the project has evolved up until the present moment.



Reserve analysis takes into account the 'extra layers' on top of the cost estimates, the contingency reserves (which are added to the cost estimates to get the cost baseline) and the management reserves (which are added to the cost baseline to get the project budget). It should be decided whether any unused reserves are going to be left in the project budget, or whether they will be taken out.

Not every organization uses EVM and even if yours does not, it is still worth taking the time to understand it because it can help you to determine for yourself how a project is progressing in circumstances where you need to provide objective figures to your senior management or other [stakeholders](#).

The rationale behind this method is to compare the planned cost data with the actual costs and independently with the progress made. It works like this:

*Planned costs to date were \$150k*

*ONLY \$130 had actually been spent.*

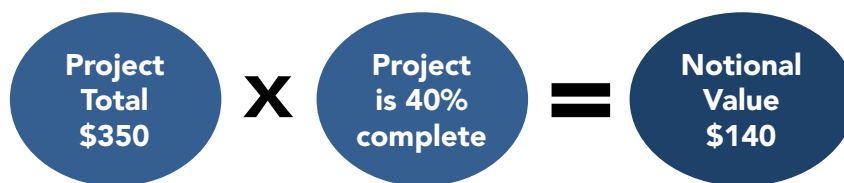
This could indicate that the project was under budget BUT only if all of the planned work has actually been completed. EVM introduces a third-dimension by taking account of the percentage of the work accomplished.

In the example,

*Project Total budget is \$350*

*Project is reported 40% complete*

*Notional value of the project would be  $\$350 \times 0.4 = \$140$*



The earned value compares the money spent (\$130k) with what should have been spent (\$150k). This means that:

*Work to the notional value of \$140k has been done but,*

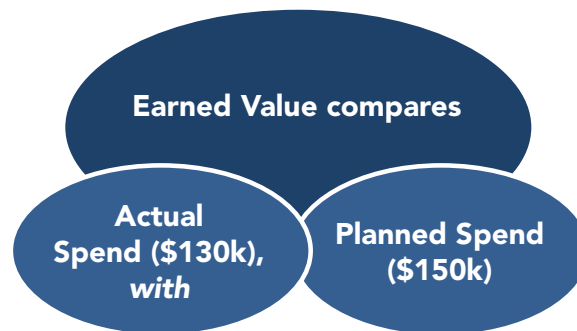
*\$130k has actually been spent.*

*Therefore, the project is \$10k under its planned cost at this point.*

Also the project has only completed \$140k of work as opposed to the \$150k that was planned.

*This means that the project is \$10k behind schedule.*

It may seem strange to express time in dollars but the reason it makes sense is because 'time is money'.



As the project progresses, the project team can develop a forecast for the estimate at completion that may differ from the budget at completion based on the project performance. Earned Value Management method works well in conjunction with manual forecasts of the required estimate at completion costs. The most common approach is a manual, bottom-up summation by the project manager and project team.

If either the work performance information or the cost forecasts indicate that there is a variance in either the cost or schedule performance of the project that needs correcting, then a [change request](#) may be recommended.

1. Corrective action aims to reduce the variance
2. Preventive action aims to prevent the variance from growing larger in the future.

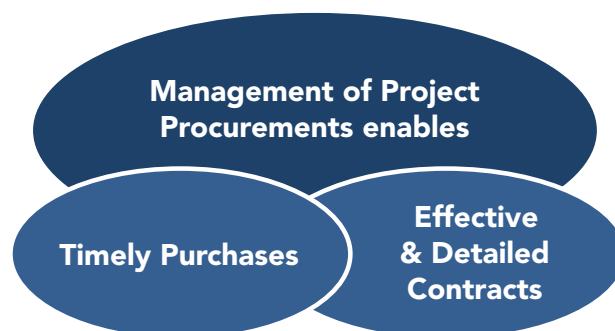
It may happen, however, that the variance is so large that the cost baseline is determined to be unrealistic, in which case it may be suggested that the cost baseline itself is changed.

## KEY POINTS

- ✓ Monitoring the expenditure of funds without regard to the value of work being accomplished for such expenditures has little value to the project other than to allow the project team to stay within the authorized funding.
- ✓ The key to effective cost control is the management of the approved cost performance baseline and the changes to that baseline.

## Buying-in Goods & Services

Buying-in or procuring goods and services is a concept that is familiar to just about anyone who has worked in the business environment. Practically every organization has to look outside itself at some point for goods or services. Some organizations have ongoing purchasing requirements that make up a large part of their daily operations, while others only need to procure specific items on a periodic basis.

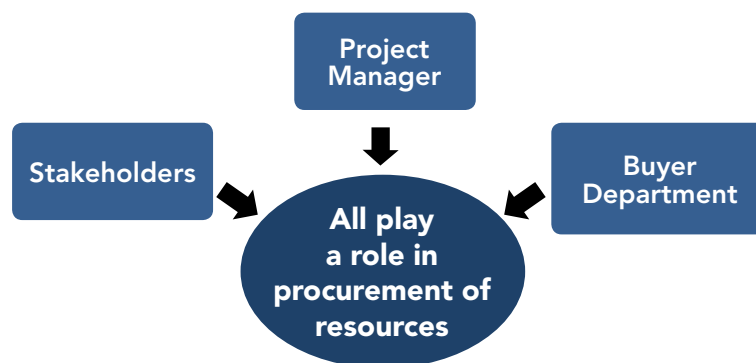


However, when a project is being conducted, the need for procurement is very often a major element of the overall process. Procurement management is the process of ensuring that everything required from outside the organization is in place when it is needed so the project can proceed successfully. Failing to plan the procurement process is one of the most-costly mistakes that can be made because the entire project can be brought to a halt if products or materials aren't available when needed.



Successful projects required detailed [scheduling](#) and excellent timing to maximize efficiency. The project manager will need to oversee the buying-in process to ensure that a purchasing failure isn't responsible for harming the project as a whole.

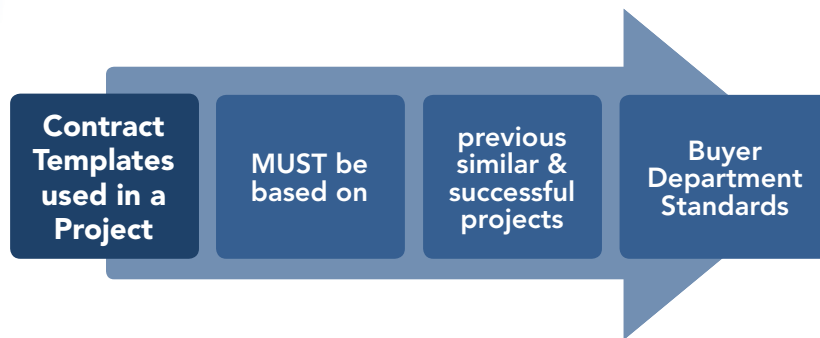
Prior to beginning a project, there should be a careful analysis of what items will need to be purchased from outside the organization to allow the project to reach a successful conclusion. As long as there is a detailed plan in place for the project itself, the procurement planning should be a relatively simple endeavor. After all, it won't take long to determine what is available from within the organization and what will need to be brought in from the outside.



Procurement is often thought of in terms of raw materials, but it can actually cover a wide range of items that could be used to complete a project. Even services that will be needed as part of the work would be included under the umbrella of procurement. Knowing what is going to be needed, and when it will be needed, is a crucial first step toward getting this part of project management done correctly.

### **Pricing and Receiving Bids**

Obviously it is important to know how much the goods or services are going to cost the organization as part of the project. In the case of projects where there is a heavy purchasing requirement, the cost of these items could make up a majority of the overall [project budget](#). Naturally, it will be a goal to minimize the total costs while still getting exactly what is needed.



Frequently companies will use a bidding process to make sure a competitive and fair price is received. Once it is known what will be needed, you can ‘bid out’ the order to several different suppliers and compare their prices and terms. The use of contract templates from earlier projects and from within the organization plays a valued role in this process.

Whilst one may be tempted to accept the lowest price it is also important that the supplier is able to meet your schedule for the project. If you need more product than they can supply by a given date, for example, it won’t matter what the price is—that supplier won’t be able to meet your needs.

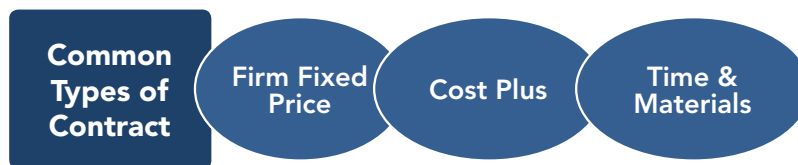
After the bidding process, all of the eligible bids can be reviewed and considered carefully. Choosing bids is an important step because you are essentially making these suppliers part of your overall project team. If they were to let you down at some stage along the way, it would be no different than having a failing from within your organization.



You are not only buying product from a supplier, but you are bringing them into your process in a way—so researching the supplier and making sure they can be trusted with that responsibility is also important. You will also need to have access to specialists who have current knowledge of contracts, service level agreements and legal agreements.

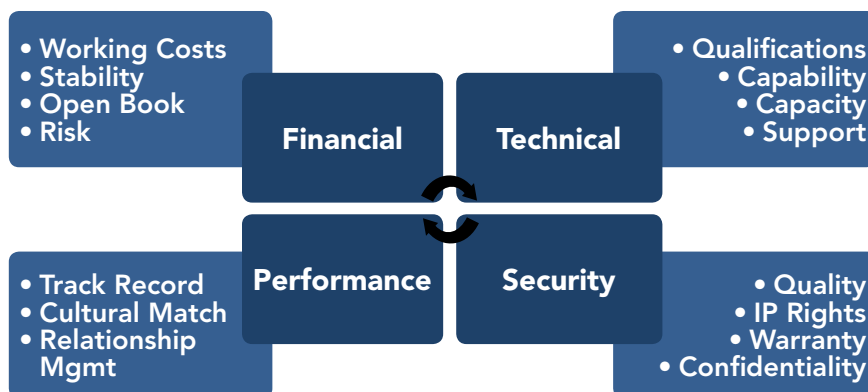
### Establishing of Contracts

Nothing in business should be done without a contract, especially when it comes to a purchase agreement between two organizations. If you are going to trust a supplier to become part of your project team, you will want a contract in place that outlines their responsibilities and the price you have agreed to pay.



Even if you are dealing with people whom you feel like you can trust, there is no excuse for not having the legal documentation in place to protect your interests at every turn. There are three basic forms of contract—firm fixed price, cost plus, finally time and materials.

Putting procurement contracts in place can often be considered one of the last steps before a project gets started. At this point, you will have committed to buying a certain level of whatever goods or services you need to undertake the project, so the wheels are now in motion to get it going. The [procurement plan](#) defines the process of selection and the sources of information used in this decision as shown in the diagram below.



Timing is an important element of this whole process, so bringing together the formalization of contracts in concert with the start of the project itself is something to pay attention to. It may take a little bit of back and forth between the organizations (and



their lawyers) before the contracts are satisfactory to all involved, so make sure to build negotiating time into the schedule.

The formal nature of purchasing contracts also points out just how important it is that any project be as well-planned and organized as possible right up front. When things change down the line during the course of a project, it can have ripple effects that can be expensive when they require contracts to be changed or broken.

Most projects involve a great number of moving parts that have to be brought together just right in order to keep everything moving toward a common goal. Procurement is one of those parts, and it is an important one since it often involves signing contracts that commit the organization to spending money in pursuit of successfully completing the task.

Once the contracts are in place one of the most important roles of the project manager is to ensure that these contractual relationships are properly controlled and delivers their commitments in a timely fashion and to the agreed quality standards.



Even though procurement is an area of business all its own, it is something that any project manager should be comfortable and familiar with. Whether the project manager directly does the purchasing or simply oversees a specialist in that area, understanding how procurement plays together with the rest of the project management puzzle is an important skill to possess.

## KEY POINTS

- ✓ Procurement management is the process of ensuring that everything required from outside the organization is in place when it is needed so the project can proceed successfully.
- ✓ Frequently companies will use a bidding process to make sure a competitive and fair price is received.
- ✓ If you are going to trust a supplier to become part of your project team, you will want a contract in place that outlines their responsibilities and the price you have agreed to pay.

## Managing Project Suppliers

Many projects will require some external resources, services or products to be able to meet their objective. Those that cannot be provided internally will need to be purchased from an external source. The more complex a project is the more likelihood it will need outside specialists to meet its objective.

Outsourcing has become one of the most popular and efficient ways to procure these additional and specialist resources. The nature of traditional fixed price contracts is not always suitable to the project environment where creative input from suppliers and partners is required as the contract scope evolves.



Buying-in services, products and resources involves the need for legal contracts and each organization will have their own policies and procedures that must be followed when making any purchases on their behalf. Such specialist knowledge often requires a person ('the customer') to be included on the project team.

Projects can rarely be resourced completely from internal expertise and personnel, so external resources need to be found. Once the [requirements](#) have been defined, suppliers are invited to bid for the work and from these responses a supplier must be chosen to provide the service, product or result.

Throughout this process, the project manager will call upon experts in the purchasing department to assist and where necessary assigned to the project team. Decisions as to whether to outsource and whom are made by the relevant [stakeholders](#) with the assistance of the project manager.



When dealing with suppliers, there will inevitably be a legally binding contract involved that represents a mutually binding agreement. This obligates the supplier to provide the specified products, services, or results, and obligates the customer to provide payment in return.

These contractual obligations are the way in which risks the project faces can be alleviated or transferred to the provider. Knowing how to identify, assess and minimize risks is covered in our ['Project Risk Management'](#) eBook.

The legally binding nature of a contract means that it needs to be subjected to an approval process. This ensures that it not only describes the products, services, or results that will satisfy the identified project need but that it complies with organizational procurement policies.

Most organizations will have documented policies and procedures describing who has authority to sign and administer such agreements on behalf of the organization. In addition, the project management team may be required to take advice from the organization's legal representatives.



All contracts have a lifecycle in which the supplier is first viewed as a bidder, then as the selected provider, and finally as the contracted supplier. By actively managing this lifecycle and carefully wording the terms and conditions of the contract, some identifiable project risks can be avoided, mitigated, or transferred to the supplier.

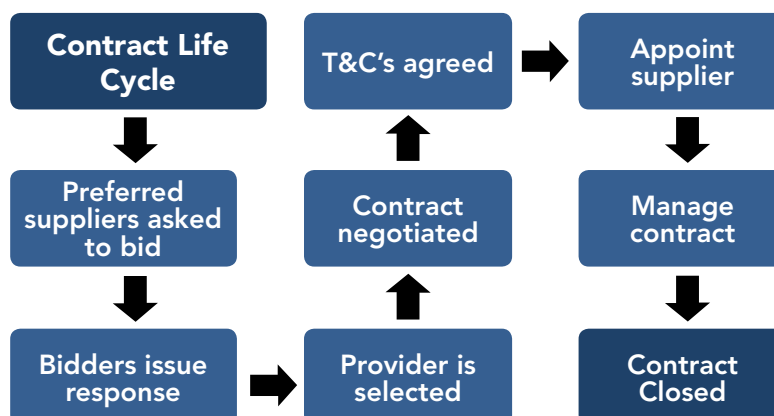
This website discusses procurement in terms of a customer/supplier relationship where the customer is part of the project management team and the supplier is an external organization. However, most of the information is equally applicable to non-contractual work, entered into with other departments within the performing organization.

In order to keep things simple, it refers to the parties involved in procurement as the customer and the seller/supplier. The customer is the party who are purchasing or procuring the goods or services, the seller or supplier is the party that provides or delivers the products or services to the customer. This is the case even where no money is involved or where the parties are part of the same performing organization.



Contract management processes should ensure that you retain control of any project purchases and that they are timely with effective and detailed contracts. They also enable you to create a good working relationship with the organization’s customers gaining first-hand knowledge of their skills, expertise and abilities.

A key role for the project manager is liaising with and getting a final decision from the relevant stakeholder(s) for each project purchase. You must have a clear understanding of the risks associated with each purchase and the other options available to you.



Getting the necessary contracts signed is only part of your responsibility. Once this has been completed you use the contracts, service level agreements (SLA's) plus their terms and conditions to monitor and manage the service, product or resource supplied. Your final responsibility is to ensure proper closure is brought to each contract protecting the legal interests of all parties.

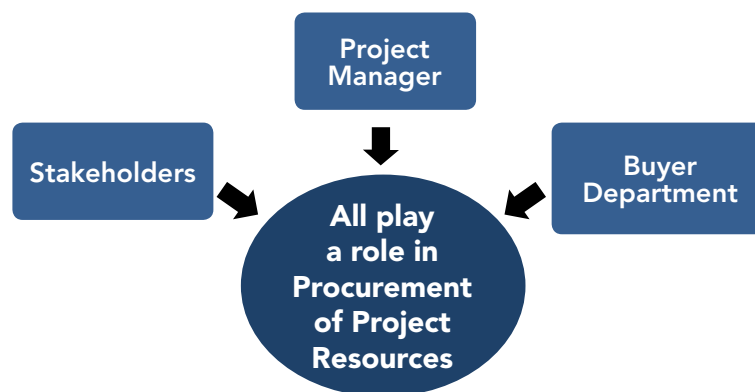
Day-to-day purchases should be left to the procurement department. Your role as project manager is to ensure that sufficient time is planned and scheduled for these processes.

### KEY POINTS

- ✓ Projects can rarely be resourced completely from internal expertise and personnel, so external resources need to be found.
  - ✓ Procurement of services, products and resources involves the need for legal contracts and each organization will have their own policies and procedures that must be followed when making any purchases on their behalf.
  - ✓ All contracts have a lifecycle in which the supplier is first viewed as a bidder, then as the selected provider, and finally as the contracted supplier.
  - ✓ By actively managing this lifecycle and carefully wording the terms and conditions of the contract, some identifiable project risks can be avoided, mitigated, or transferred to the supplier.
-

## Planning Contract Management

Contract management involves determining which products or services a project will need to procure from an external source and what types of contracts that need to be used on the project.



The decision being made here is either to 'make or buy', and the requirements of the [project schedule](#) and consideration of the resources available will both have an influence on this. Part of these decision-making processes involves the project manager liaising with the relevant [stakeholders](#) for each potential purchase.

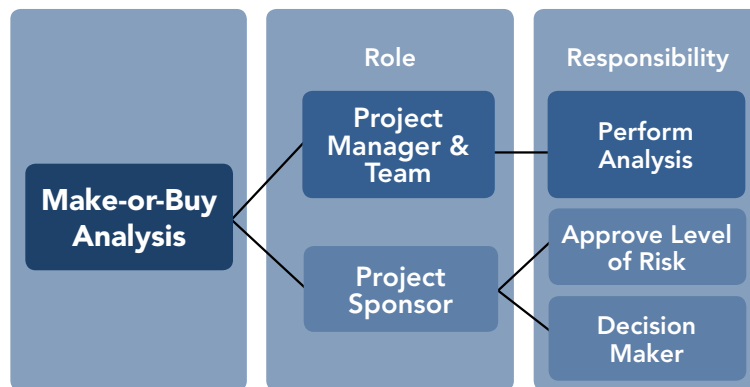
The questions that need to be answered as part of this process include:

1. What products or services is it best to buy in?
2. How could this best be done?
3. How much is needed?
4. When does this need to be done?

This process includes consideration of the risks involved with each 'make-or-buy' decision. It also includes reviewing the type of contract planned to be used with respect to mitigating risks, sometimes transferring risks to the seller. (To learn more about understanding how to manage risks associated with a project download our free '[Project Risk Management](#)' eBook.

A 'make or buy' decision will need to be taken where the option exists to do the work in-house as part of the project or to purchase some products or services from outside

suppliers. The most important thing to note about these decisions is that the project manager should not be the one to take them.



It is the project manager’s responsibility (along with the project management team) to perform the analysis in each case, but the actual decision must be taken by the project sponsor and documented as such. The reason why this is so important is because of the potential risk involved in passing work to a third party over whom the project manager has no direct control. This ‘make or buy’ analysis weighs the many factors that could influence the decision including: cost, risk factors, in-house skills, knowledge or experience, and sharing of confidential information & other security matters.

Sometimes a capability may exist within the project organization, but may be already committed to working on other projects, in which case the project may need to outsource the work in order to meet its schedule commitments.





The analysis should consider all related costs; both direct costs as well as indirect support costs. For example, the buy-side of the analysis includes both the actual out-of-pocket costs to purchase the product, as well as the indirect costs of supporting the purchasing process.

The procurement plan is a part of the [project plan](#) and describes how all of the other buying-in processes are to be carried out. It describes in detail:

1. What will be procured for the project
2. Type of contract used
3. How they will be selected & managed
4. How their performance will be measured
5. How the risks associated with buying-in resources are to be managed.

The [scope of the project](#) will have already being defined at this point in time, and this will be used to prepare procurement statements of work. Each [statement of work \(SOW\)](#) describes and explains the appropriate section of the project scope for use by potential sellers. It should be in sufficient detail so that such sellers can make an informed choice about whether they are able to, or want to bid for the work.



Sufficient detail can vary based on the nature of the item, the needs of the buyer, or the expected contract form. Information included in a SOW can include specifications, quantity desired, quality levels, performance data, period of performance, work location, and other requirements. The purchasing SOW can be revised and refined as required as it moves through the buying-in process until incorporated into a signed contract award.

Procurement documents are used to solicit proposals from prospective sellers and may include:

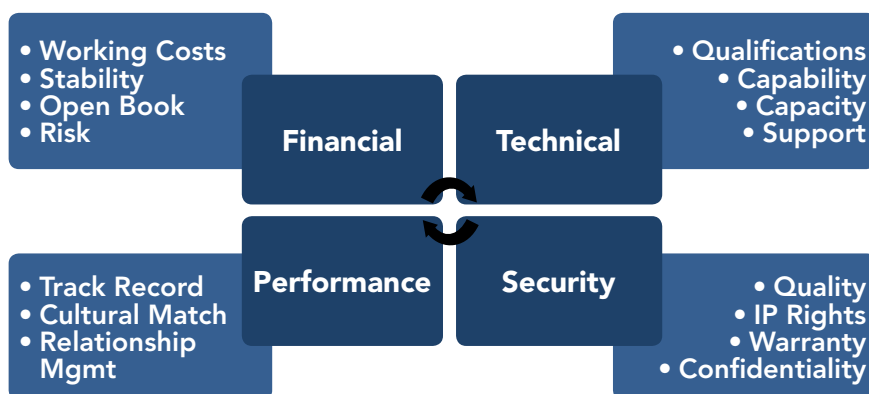
- Requests for Information (RFI)
- Invitations for Bids (IFB)

- Requests for Proposals (RFP)
- Requests for quotations (RFQ)
- Tender notices
- Invitations for negotiation,
- Invitations for seller's initial response.

The important thing is that these documents tell the seller exactly what is required of them. They must be detailed enough to ensure consistent, appropriate responses, but flexible enough to allow consideration of any seller suggestions for better ways to satisfy the same requirements. In addition, the complexity and level of detail should be consistent with the value of, and risks associated with, the planned procurement.

It is common practice to limit the number of suppliers invited to bid so that you have sufficient time to read and understand each suppliers offering within the assigned timescales of the project plan. Generally organizations' will only engage between three to five suppliers in more in-depth discussion and negotiation.

Selection criteria must be defined before the work is outsourced and fits into four broad areas—financial, technical, security and performance. Although it could be something as simple as purchase price or delivery dates if the item being procured is readily available from a range of suppliers. In more complex scenarios there are other factors that could be considered within each area.



### **Financial**

It is important to know how financially stable any organization is that you are considering working with. Using the financial statements—balance sheet, cash flow analysis and income statement—will enable you to calculate the solvency, performance and profitability for each of your potential suppliers. To learn more about these financial calculations, see our free [finance skills eBooks](#).

Many organizations now use open-book accounting when working with partners and this offers total financial disclosure between the parties. Anyone looking at these accounts would be able to discern the cost of materials and operations. It enables the project manager to make a detailed analysis of how much a working partnership would cost.

Knowing the financial capacity of your supplier helps you assess the level of risk involved in such a relationship. You can determine how financially able they are to meet the promises they have made contractually. It may mean that you stipulate the size and type of business of potential suppliers in order to reduce the level of risk associated with outsourcing the SOW and to make price comparisons.

### **Technical**

The technical capabilities of any potential supplier are critical part of the selection process. Your short-list of suppliers (usually two or three) must be able to illustrate that they have the right level of technical competency, skills and knowledge required by the project.

This should include a thorough understanding of the methodologies that they will be use, plus an assessment of how compatible their procedures are with yours. The closer the match the lower your level of technical exposure will be.

Another aspect of technical selection criteria concerns the supplier's ability to 'make' the quantities of the product, to the required quality standard needed for the project. For some projects another the criteria supplier need to demonstrate is their technical ability to respond to potential future requirements that arise as a result of approved [change requests](#).

### **Security**

This area of your supplier selection is quite broad, going from physical security of the product and place of production to intellectual property (IP) rights. It is vital that you understand how much control the potential provider has over its supply chain. This may

include understanding how the seller enforces its terms of the reliability and quality of the supplies it buys in for the project needs, for example, warranty coverage, quality standards, length guarantees etc.

An essential aspect of checking your potential suppliers' security is their commitment to quality.

1. How well does their product or service match up to its sales claims?
2. How do they ensure and monitor quality?
3. Do such claims match or exceed your project requirements?
4. Any provider should be able to demonstrate their adherence to a recognized quality standard, such as, ISO9001, QS9000, ASTM, DIN, EN, IEC etc.

Making sure that you clearly define what exactly constitutes your intellectual property is essential. It is imperative to ask suppliers if they want to retain certain IP rights. This can be in terms of the work processes or in the services they provide as part of the project.

### **Performance**

Any supplier you short-list must be able to demonstrate their ability to deliver their contractual obligations in their track record and by supplying references. These will give insight into how well each supplier met their contractual obligations and managed their supplier relationship (SRM) throughout the project lifecycle.

This helps the project manager assess each supplier's ability to keep to costs and schedules. It also signifies how well they managed communications giving an indication of how well the cultural fit is between your two organizations'. The actual bid a supplier submits to your organization will reflect how well they have understood the project requirements and reveal the type of relationship they want to create.

The most effective style of SRM is the collaborative approach where both sides work as one team fully sharing information. This type of relationship is not always possible due to strategic and competitive nature of many projects so a co-operative supplier relationship management style is adopted.

## KEY POINTS

- ✓ A 'make or buy' decision will need to be taken where the option exists to do the work in-house as part of the project or to purchase some products or services from outside suppliers.
  - ✓ The procurement plan is a part of the project plan and describes how all of the other buying-in processes are to be carried out.
  - ✓ It describes in detail: what will be procured for the project, type of contract used, how they will be selected and managed, how their performance will be measured, and how supplier risk is to be managed.
  - ✓ Documents are used to solicit proposals from prospective sellers and should tell the seller exactly what is required of them.
  - ✓ They must be detailed enough to ensure consistent, appropriate responses, but flexible enough to allow consideration of suggestions for better ways to satisfy the same requirements.
  - ✓ Selection criteria must be defined before the work is outsourced and fits into four broad areas: financial, technical, security and performance.
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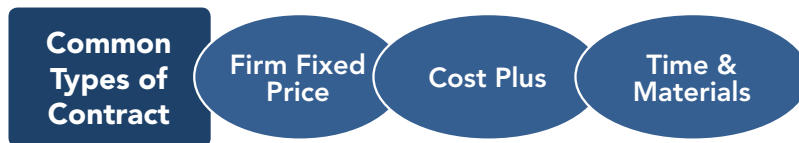
## Understanding Different Contract Options

This is the process of obtaining supplier responses, selecting a supplier, and awarding a contract. It may need to occur multiple times if there are multiple contracts and for each instance it will include issuing the bid package to potential supplier, evaluating potential supplier proposals and finally selecting the winning supplier proposal.

For major procurement items, a short list of qualified supplier can be established based on a preliminary proposal before a more detailed evaluation is conducted based on a more specific and comprehensive requirements document requested from the supplier on the short list.

There are several different types of contract that can be used, although the most common is the fixed-price type, which involves setting a fixed total price for a precisely defined product or service to be provided. Changes in scope can be accommodated, but generally

at an increase in the contract price. Sellers under fixed-price contracts are legally obligated to complete such contracts, with possible financial damages if they do not.



This type of contract has three variants:

- 1) *Firm Fixed Price (FFP)*
- 2) *Cost Reimbursable or Cost Plus*
- 3) *Time & Material Contracts (T&M)*

The FFP is the most commonly used contract type and the three most popular variants of this type of contract are: Firm Fixed Price (FFP), Fixed Price Incentive Fee (FPIF), and Fixed Price with Economic Price Adjustment (FP-EPA).

**Firm Fixed Price (FFP)**

Fixed price is favored by most organizations because the price is set and is not subject to change unless the scope of work changes. Any cost increases due to adverse performance would be the responsibility of the supplier.

**Fixed Price Incentive Fee (FPIF)**

A FPIF contract gives the customer and supplier some flexibility in that it allows for deviation from performance, with a financial incentive for achieving certain metrics. Generally the incentives are related to cost, schedule, or the technical performance of the supplier. A price ceiling is set and any costs above that ceiling are the responsibility of the supplier.



### Fixed Price with Economic Price Adjustment (FP-EPA)

FP-EPA contracts are used for long-term contracts and they allow for pre-defined adjustments to the contract price due to changed conditions. This could include inflation changes or increased or decreased costs for specific commodities.

The contract is intended to protect both the customer and supplier from external conditions over which they have no control. This is often used where interest rates or exchange rates may affect the project, and this contract types will describe such economic adjustments based on some form of indices such as interest or currency exchange rates.

Although the firm-fixed-price type of contractual arrangement is typically the preferred type that is encouraged and often demanded by most organizations, there are times when another contract form may be in the best interests of the project. If a contract type other than fixed-price is intended, it is incumbent on the project team to justify its use. The type of contract to be used and the specific contract terms and conditions fix the degree of risk being assumed by the customer and supplier.

### Cost Reimbursable or Cost Plus



This type of contract involves payment to the supplier for supplier’s actual costs, plus a fee typically representing seller profit. Cost-reimbursable contracts place more risk on the customer. As part of the contract negotiations the supplier is able to be reimbursed for costs that have been incurred by them that have been defined as ‘reasonable’ in such a contract. These costs must be incurred as a result of performing the agreed contract.

Typically a ‘ceiling’ is set that cannot be exceeded by the supplier. This type of contract is favored in situations where costs estimates are vague due to uncertainties relating to the performance of the contract, for example aircraft development. Three common types:

**Cost Plus Fixed Fee (CPFF)**

In a CPFF contract the supplier is reimbursed for allowable costs for performing the work and also receives a fixed fee payment that is calculated as a percentage of the initial estimated project costs.



The fee amount would only change if there were a change to the project scope.

**Cost Plus Incentive Fee (CPIF)**

In a CPIF contract the supplier is reimbursed for allowable costs and the supplier receives an incentive fee based on achieving certain performance objectives.



If the final costs differ from the original estimated costs, then both the customer and supplier share costs based upon a pre-negotiated formula (such as 60/40). Generally the first number in the split refers to the customer's portion, the second number to the supplier's portion.

**Cost Plus Award Fee (CPAF)**

In a CPAF contract the seller is reimbursed for allowable costs. The majority of the fee is only earned based on the satisfaction of identified broad subjective performance criteria.

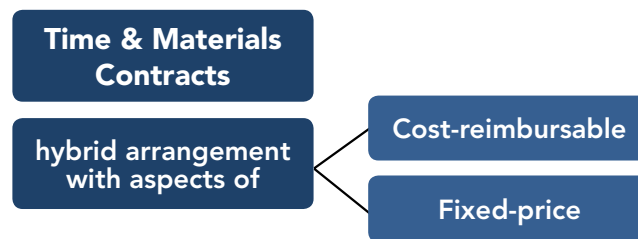




The performance criteria is defined and included in the contract and the fee determination is based solely on the determination of seller performance by the customer and is usually not subject to appeals.

### **Time and Material Contracts (T&M)**

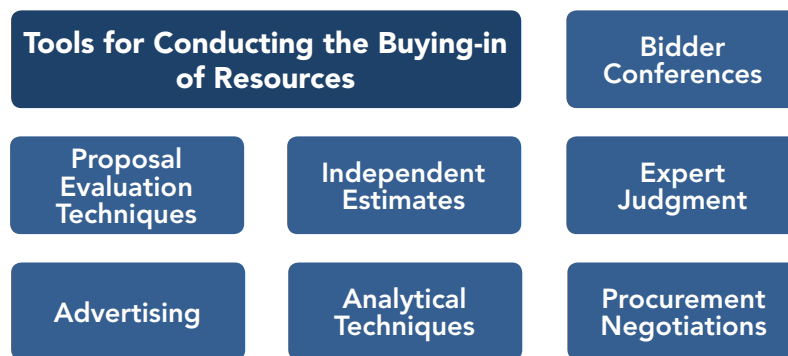
Time and material contracts are a hybrid type of contractual arrangement that contain aspects of both cost-reimbursable and fixed-price contracts. They are often used for staff augmentation, acquisition of experts, and any outside support when a precise statement of work cannot be quickly prescribed.



These types of contracts resemble cost-reimbursable contracts in that they can be left open ended and may be subject to a cost increase for the customer. The customer may not define the full value of the agreement and the exact quantity of items to be delivered at the time of the contract award.

Thus, T&M contracts can increase in contract value as if they were cost-reimbursable contracts. Many organizations require not-to-exceed values and time limits placed in all T&M contracts to prevent unlimited cost growth.

Conversely, T&M contracts can also resemble fixed unit price arrangements when certain parameters are specified in the contract. Unit labor or material rates can be preset by the customer and supplier, including supplier profit, when both parties agree on the values for specific resource categories, such as senior engineers at specified rates per hour, or categories of materials at specified rates per unit.



Where public money is being used, for example on government or local authority projects, it is vital that no bidders receive preferential treatment. A bidder conference provides equal information to all potential suppliers including answers to questions posed by one bidder that are then shared with all of the others.

These can be known by various other names, and are held by a customer for all of the suppliers to whom the customer has sent a request for proposal (RFP) or a request for bid (RFB). These conferences, which may be discretionary or mandatory, provide an opportunity for bidders to meet the project management team, receive detailed instructions and ask proposal-related questions.

On complex procurements, where source selection will be made based on supplier responses to previously defined weighted criteria, a formal evaluation review process will be defined by the customer's procurement policies. The evaluation committee will make their selection for approval by management prior to the award.

The customer may ask an independent group to prepare an estimate that is used as an objective source of information. Such estimates are often called 'should cost' estimates. These can be used as a benchmark against which to measure bids. Where there are significant differences, this can indicate that the prospective suppliers misunderstood the procurement [statement of work](#) or that it was in some way unclear what was required. Decisions can include expertise from functional disciplines such as:

- Contracting
- Legal
- Finance
- Accounting
- Engineering & Design

- Research & Development
- Sales
- Manufacturing.

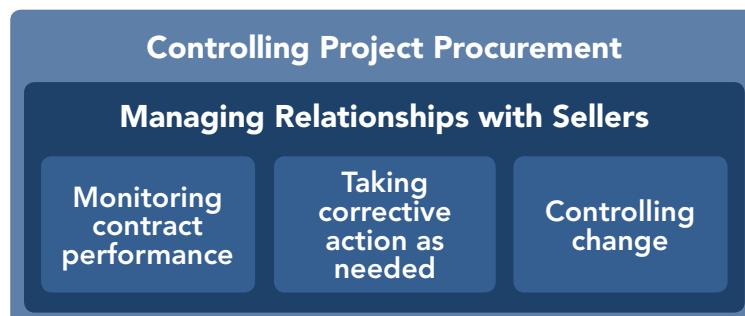
The objective is to evaluate supplier proposals to make sure that the brief has been understood and that the cost and time estimates are realistic.

### KEY POINTS

- ✓ There are several different types of contract that can be used, although the most common is the fixed-price type, which involves setting a fixed total price for a precisely defined product or service to be provided.
- ✓ All legal contractual relationships generally fall into one of the two types described, either fixed-price or cost reimbursable.
- ✓ On complex procurements, where source selection will be made based on supplier responses to previously defined weighted criteria, a formal evaluation review process will be defined by the customer's procurement policies.

## Managing Supplier Relationships

This step involves managing relationships with suppliers, monitoring contract performance, taking corrective actions if required, and controlling change. This is the most time consuming of the supplier management processes as far as the project management team is concerned as it covers monitoring the supplier's performance against the terms specified in the contract.



The project management team needs to keep in mind the legal implications of any actions they take when dealing with the supplier. If any changes are required to the work the supplier is doing then this may not be covered under the contract terms and conditions, or the [statement of work \(SOW\)](#). If this is the case then the contract may need to be renegotiated.

Any changes, whether or not they require the contract to be amended need to go through to the project change control process and incorporated into the [project plan](#). During this process, the project manager needs to monitor progress against the [procurement plan](#):

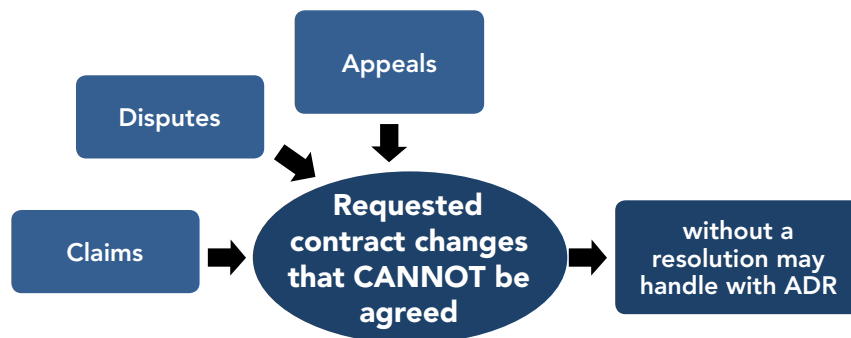
1. Are the goods or services being delivered on time?
2. Is the quality as specified in the contract?
3. Are the conditions of the contract being met?
4. Is the relationship being properly managed?

If the organization has a purchasing department then it may be a good idea to have someone seconded from it to the project, specifically to handle contract administration, particularly if the project is dealing with multiple suppliers.



You will need a contract change control system for processing contract [change requests](#) in cases where the contract needs to be modified to reflect the evolving needs of the project. It includes a description of the process and information about how changes will be recorded and disputes resolved as well as specifying the authority levels necessary for authorizing changes.

Requested changes to the contract that cannot be agreed are called claims, disputes, or appeals. These are documented, processed, monitored, and managed throughout the contract life cycle, usually in accordance with the terms of the contract.



If the parties themselves do not resolve a claim, it may have to be handled in accordance with alternative dispute resolution (ADR) typically following procedures established in the contract.

Procurement documentation also includes any supplier-developed technical documentation and other work performance information such as: deliverables, supplier performance reports, warranties, financial documents including invoices & payment records, and results of contract-related inspections.

Seller performance evaluation documentation rates how well the supplier has performed and can be used as input to decisions about performance bonuses and penalties, as well as whether or not to use their services again on future projects.

Requirements for formal closure are usually defined in the terms and conditions of the contract and are included in the [procurement plan](#). This output is simply the formal notification from the customer that the contract has been completed.

The closure of a contract can occur in any phase of a multi-phase project if its the term is only be applicable to a given phase. Contracts that are applicable to a specific phase will have their particular procedures for contract closure included in the contract terms and conditions. If at the closure of a contract there are unresolved claims the buying-in process will detail when and how litigation will be handled.

In some instances closure of a contract may have to be earlier than planned. Any project contract or agreement needs to specify in a terminations clause the parties' responsibilities and rights in the event of early termination. This special type of procurement closure can occur from: mutual agreement of both parties, default of one party, or for convenience of the customer (as long as provision is made in the contract).

Early termination can be for the whole contract or just a particular section. It is common practice that the purchaser will have to compensate the supplier as defined in the contract for any work-in-progress (WIP) that has been undertaken.

This is especially important if the project is using teaming agreements where two or more organizations form a partnership or joint venture for the contract. Within the contract there are clear definitions of customer-supplier roles and responsibilities for each party. Many outsourcing specialists will have their own teaming agreement templates.

### KEY POINTS

- ✓ Managing supplier relationships involves managing relationships with suppliers, monitoring contract performance, taking corrective actions if required, and controlling change.
  - ✓ If any changes are required to the work the supplier is doing then this may not be covered under the contract terms and conditions—something that may have legal implications.
  - ✓ If the project is dealing with multiple suppliers then it is a good idea to have someone seconded from the purchasing department to handle contract administration.
  - ✓ You will need a contract change control system for processing contract change requests in cases where the contract needs to be modified to reflect the evolving needs of the project.
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## Summary

Project management is a complex activity that requires a structure, procedures and processes that are appropriate to your project. This will enable you to manage the inevitable changes that occur throughout a project's lifespan in a professional manner to ensure success. Each project function describes the expertise, skills and tools needed for your project.

So much work is now run as projects and so few people have the necessary skills to manage them properly that there is a huge demand for good project managers and that demand is increasing all the time.

The other project management skills eBooks available from [www.free-management-ebooks.com/skills-project.htm](http://www.free-management-ebooks.com/skills-project.htm) provide you with an opportunity to read a more in-depth description of each functional area.

- Principles of Project Management
- Project Management Processes
- Managing a Project Team
- Managing the Project Scope
- Managing the Project Schedule
- Managing Project Quality
- Managing Project Risk

## Other Free Resources

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