

PERT:

Project management can be understood as a systematic way of planning, scheduling, executing, monitoring, controlling the different aspects of the project, so as to attain the goal made at the time of project formulation. PERT and CPM are the two network-based project management techniques, which exhibit the flow and sequence of the activities and events. **Program (Project) Management and Review Technique (PERT)** is appropriate for the projects where the time needed to complete different activities are not known.

On the other hand, **the Critical Path Method** or **CPM** is apt for the projects which are recurring in nature.

The two scheduling methods use a common approach for designing the network and for ascertaining its critical path. They are used in the successful completion of a project and hence used in conjunction with each other. Nevertheless, the truth is that CPM is different from PERT in a way that the latter concentrates on time while the former stresses on the time-cost trade-off. In the same manner, there are many differences between PERT and CPM, which we are going to discuss in this article.

Comparison Chart

BASIS FOR COMPARISON	PERT	CPM
Meaning	PERT is a project management technique, used to manage uncertain activities of a project.	CPM is a statistical technique of project management that manages well defined activities of a project.
What is it?	A technique of planning and control of time.	A method to control cost and time.
Orientation	Event-oriented	Activity-oriented
Evolution	Evolved as Research & Development project	Evolved as Construction project
Model	Probabilistic Model	Deterministic Model
Focuses on	Time	Time-cost trade-off
Estimates	Three time estimates	One time estimate
Appropriate for	High precision time estimate	Reasonable time estimate
Management of	Unpredictable Activities	Predictable activities
Nature of jobs	Non-repetitive nature	Repetitive nature
Critical and Non-critical activities	No differentiation	Differentiated
Suitable for	Research and Development Project	Non-research projects like civil construction, ship building etc.
Crashing concept	Not Applicable	Applicable

Definition of PERT

PERT is an acronym for Program (Project) Evaluation and Review Technique, in which planning, scheduling, organizing, coordinating and controlling uncertain activities take place. The technique studies and represents the tasks undertaken to complete a project, to identify the least time for completing a task

and the minimum time required to complete the whole project. It was developed in the late 1950s. It is aimed to reduce the time and cost of the project.

PERT uses time as a variable which represents the planned resource application along with performance specification. In this technique, first of all, the project is divided into activities and events. After that proper sequence is ascertained, and a network is constructed. After that time needed in each activity is calculated and the critical path (longest path connecting all the events) is determined.

Definition of CPM

Developed in the late 1950s, Critical Path Method or CPM is an algorithm used for planning, scheduling, coordination and control of activities in a project. Here, it is assumed that the activity duration is fixed and certain. CPM is used to compute the earliest and latest possible start time for each activity.

The process differentiates the critical and non-critical activities to reduce the time and avoid the queue generation in the process. The reason for the identification of critical activities is that, if any activity is delayed, it will cause the whole process to suffer. That is why it is named as Critical Path Method.

In this method, first of all, a list is prepared consisting of all the activities needed to complete a project, followed by the computation of time required to complete each activity. After that, the dependency between the activities is determined. Here, 'path' is defined as a sequence of activities in a network. The critical path is the path with the highest length.

Key Differences Between PERT and CPM

The most important differences between PERT and CPM are provided below:

1. PERT is a project management technique, whereby planning, scheduling, organising, coordinating and controlling uncertain activities are done. CPM is a statistical technique of project management in which planning, scheduling, organising, coordination and control of well-defined activities take place.
2. PERT is a technique of planning and control of time. Unlike CPM, which is a method to control costs and time.
3. While PERT is evolved as a research and development project, CPM evolved as a construction project.
4. PERT is set according to events while CPM is aligned towards activities.
5. A deterministic model is used in CPM. Conversely, PERT uses a probabilistic model.
6. There are three times estimates in PERT, i.e. optimistic time (t_o), most likely time t_M , pessimistic time (t_p). On the other hand, there is only one estimate in CPM.
7. PERT technique is best suited for a high precision time estimate, whereas CPM is appropriate for a reasonable time estimate.
8. PERT deals with unpredictable activities, but CPM deals with predictable activities.
9. PERT is used where the nature of the job is non-repetitive. In contrast to, CPM involves the job of repetitive nature.

10. There is a demarcation between critical and non-critical activities in CPM, which is not in the case of PERT.
11. PERT is best for research and development projects, but CPM is for non-research projects like construction projects.
12. Crashing is a compression technique applied to CPM, to shorten the project duration, along with the least additional cost. The crashing concept is not applicable to PERT.

Conclusion

The difference between these two project management tools is getting blurred as the techniques are merged with the passage of time. That is why, in most projects, they are being used as a single project. The primary point that distinguishes PERT from CPM is that the former gives the extreme importance of time, i.e. if the time is minimized, consequently the cost will also be reduced. However, cost optimization is the basic element, in the latter.

A PERT chart is a tool that can help project managers schedule, organize and coordinate tasks in their projects. It's a graphic representation of the timeline of a project, which gives project managers the tools they need to breakdown each of the project's tasks for analysis.

There are milestones for the project indicated on the PERT chart by triangles. Circles represent the individual tasks and are connected by lines to show the duration of that task from start to finish. These are called nodes.

Why Use a PERT Chart?

The PERT chart is used by project managers to estimate the minimum amount of time that will be needed to close a project. This is done by examining the breakdown of the project and the connections there are between tasks, which also helps determine the amount of risk inherent in the project.

One of the purposes of a PERT chart is to help project managers get a handle on complex projects. The nature of the PERT chart and its breakdown structure help to take the complexity of a project and its many parts and visualize the dependencies between each step in the process.

History of PERT Charts

PERT in project management has been around for a while, but it in fact was developed in the U.S. Navy. In 1957, its Special Projects Office created the PERT chart to assist in its Polaris nuclear submarine project.

Since then, it's found a home in all manner of industries, even the 1968 Winter Olympics in Grenoble.

PERT diagrams and the [critical path method](#) came about at roughly the same time, growing from the scientific management founded by Frederick Taylor, also called Taylorism, which was later refined by Henry Ford. But the use of the term critical path comes from DuPont, which developed the method also in the late 1950s.

The problems that a PERT chart has evolved to solve are myriad. They help plan realistic timetables for projects and identify the critical path. They also help project managers see which tasks can be done at the same time. If the project schedule is shortened, the PERT chart points to tasks that can be compressed, and it helps to show tasks that are not critical.

Creating a PERT Chart

When creating a PERT chart tasks, or activities, are represented as arrows on the diagram. The dates of [project milestones](#) are represented as nodes, or circles.

A PERT event is a point that marks the start of completion of one or more activities.

There are also predecessor events, which occur immediately before some events, and a successor event, which naturally occurs afterwards.

PERT has four definitions for the time required to accomplish an activity:

1. **Optimistic Time:** The least amount of time to accomplish a task or activity.
2. **Pessimistic Time:** The maximum amount of time to accomplish a task or activity.
3. **Most Likely Time:** The best estimate of how long it will take to accomplish the task or activity, assuming there are no problems.
4. **Expected Time:** The best estimate of how long it will take to accomplish the task or activity, assuming there will be problems.

Terms Related to Using a PERT Chart

- **Nodes:** These are the symbols used to visualize milestones and project tasks.
- **Arrows:** Visual representation of the sequence of a task, diverging arrows indicate tasks that can be completed at the same time.
- **PERT Event:** The start or end of a task.
- **Slack:** The amount of time a task can be delayed without causing an overall delay to the project or other tasks.
- **Critical Path:** Charts the longest path from beginning to the end of a task or event.
- **Critical Path Activity:** An activity with no slack.
- **Lead Time:** How much time you should complete a task or activity without impacting the following ones.
- **Lag Time:** The earliest time in which to a task can follow another.
- **Fast Tracking:** Working tasks or activities at the same time.
- **Crashing Critical Path:** Shortening the time of a task.

Steps to Implementing a PERT Chart

1. Begin by identifying the project milestones and then break those down into individual tasks.
2. Then figure out the sequence of the tasks.
3. Make the PERT diagram.
4. Do an estimate for each task and the time it will take to complete it.
5. Calculate the critical path and identify any possible slack.
6. Finally, the PERT chart is a living document that must be returned to and revived as needed when the project is in progress.

PERT Chart vs. Gantt Chart

While both PERT charts and [Gantt charts](#) are visual tools used by project managers to control tasks scheduling, they are not exactly the same thing.

PERT charts, as detailed above, were developed to simplify planning and scheduling larger and complex projects. A Gantt chart is also a graphical depiction for planning and scheduling a project, which breakdowns works down into tasks that populate a timeline. A Gantt chart can set task dependencies and shows the duration of each task.

Project Management Information System (PMIS)

Project Management Information System (PMIS) are [system](#) tools and techniques used in project management to deliver information. Project managers use the techniques and tools to collect, combine and distribute information through electronic and manual means. Project Management Information System (PMIS) is used by upper and lower management to communicate with each other. Project Management Information System (PMIS) help plan, [execute](#) and [close project](#) management goals. During the planning [process](#), project managers use PMIS for [budget](#) framework such as estimating [costs](#). The Project Management Information System is also used to create a specific schedule and define the scope baseline. At the [execution](#) of the project management goals, the project management team collects information into one database. The PMIS is used to compare the [baseline](#) with the actual accomplishment of each [activity](#), manage materials, collect financial data, and keep a record for reporting purposes. During the close of the project, the Project Management Information System is used to review the goals to check if the tasks were accomplished. Then, it is used to create a final report of the project close. To conclude, the project management information system (PMIS) is used to plan schedules, budget and execute work to be accomplished in project management.

The components of a project management information system are:

- Scheduling
- Estimating
- Resources
- Project documents and data
- Portals and dashboards
- Collaborative work management tools
- Social media
- Project control

Procurement Management

Procurement management follows a logical order. First, you plan what you need to contract; then you plan how you'll do it. Next, you send out your contract requirements to sellers. They bid for the chance to work with you. You pick the best one, and then you sign the contract with them.

Once the work begins, you monitor it to make sure that the contract is being followed. When the work is done, you close out the contract and fill out all the paperwork.

You need to start with a plan for the whole project. Before doing anything else, you need to think about all of the work that you will contract out for your project. You will want to plan for any purchases and acquisitions. Here's where you take a close look at your needs to be sure that contracting is necessary. You figure out what kinds of contracts make sense for your project, and you try to define all of the parts of the project that will be contracted out.

Contract planning is where you plan out each individual contract for the project work. You work out how you'll manage the contract, what metrics it will need to meet to be considered successful, how you'll pick a seller, and how you'll administer the contract once the work is happening.

The procurement management plan details how the procurement process will be managed. It includes the following information:

- The types of contracts you plan to use and any metrics that will be used to measure the contractors' performance
- The planned delivery dates for the work or products you are contracting
- The company's standard documents you will use
- The number of vendors or contractors involved and how they will be managed
- How purchasing may impact the constraints and assumptions of the project plan
- The coordination of purchasing lead times with the development of the project schedule
- The identification of prequalified sellers (if known)

The procurement management plan, like all other management plans, becomes a subsidiary of the project management plan. Some tools and techniques you may use during the procurement planning stage include make-or-buy analysis and definition of the contract type.

Make-or-Buy Analysis

This means figuring out whether or not you should be contracting the work or doing it yourself. It could also mean deciding whether to build a solution to your problem or buy one that is already available. Most of the same factors that help you make every other major project decision will help you with this one. How much does it cost to build it as opposed to buying it? How will this decision affect the scope of your project? How will it affect the project schedule? Do you have time to do the work and still meet your commitments? As you plan out what you will and won't contract, you need to think through your reasoning very carefully.

There are some resources (like heavy equipment) that your company can buy, rent, or lease depending on the situation. You'll need to examine leasing-versus-buying costs and determine the best way to go forward.

Contract Types

You should know a little bit about the major kinds of contracts available to you (the client) so that you choose the one that creates the most fair and workable deal for you and the contractor. Some contracts are fixed price: no matter how much time or effort goes into them, the client always pay the same. In Figure 13.1 the cost to the client stays the same, but as more effort is exerted the profit to the contractor goes down. Some are cost reimbursable also called cost plus. This is where the seller charges you for the cost of doing the work plus some fee or rate. Table 13.1 illustrates this by showing that as efforts increase, costs to the client go up but the contractor's profits stay the same. The third major kind of contract is time and materials. That's where the client pays a rate for the time spent working on the project and also pays for all the materials used to do the work. Figure 13.2 shows that as costs to the client go up, so does the profit for the contractor.

Fixed-Price Contracts

The **fixed-price contract** is a legal agreement between the project organization and an entity (person or company) to provide goods or services to the project at an agreed-on price. The contract usually details the quality of the goods or services, the timing needed to support the project, and the price for delivering goods or services. There are several variations of the fixed-price contract. For commodities and goods and services where the scope of work is very clear and not likely to change, the fixed-price contract offers a predictable cost. The responsibility for managing the work to meet the needs of the project is focused on the contractor. The project team tracks the quality and schedule progress to ensure the contractors will meet the project needs. The risks associated with fixed-price contracts are the costs associated with project change. If a change occurs on the project that requires a change order from the contractor, the price of the change is typically very high. Even when the price for changes is included in the original contract, changes on a fixed-price contract will create higher total project costs than other forms of contracts because the majority of the cost risk is transferred to the contractor, and most contractors will add a contingency to the contract to cover their additional risk.

Fixed-price contracts require the availability of at least two or more suppliers that have the qualifications and performance histories that ensure the needs of the project can be met. The other requirement is a scope of work that is most likely not going to change. Developing a clear scope of work based on good information, creating a list of highly qualified bidders, and developing a clear contract that reflects that scope of work are critical aspects of a good fixed-priced contract.

If the service provider is responsible for incorporating all costs, including profit, into the agreed-on price, it is a **fixed-total-cost contract**. The contractor assumes the risks for unexpected increases in labour and materials that are needed to provide the service or materials and in the materials and timeliness needed.

The **fixed-price contract with price adjustment** is used for unusually long projects that span years. The most common use of this type of contract is the inflation-adjusted price. In some

countries, the value of its local currency can vary greatly in a few months, which affects the cost of local materials and labour. In periods of high inflation, the client assumes the risk of higher costs due to inflation, and the contract price is adjusted based on an inflation index. The volatility of certain commodities can also be accounted for in a price-adjustment contract. For example, if the price of oil significantly affects the costs of the project, the client can accept the oil price volatility risk and include a provision in the contract that would allow the contract price adjustment based on a change in the price of oil.

The **fixed-price contract with incentive fee** provides an incentive for performing on the project above the established baseline in the contract. The contract might include an incentive for completing the work on an important milestone for the project. Often contracts have a penalty clause if the work is not performed according to the contract. For example, if the new software is not completed in time to support the implementation of the training, the contract might penalize the software company a daily amount of money for every day the software is late. This type of penalty is often used when the software is critical to the project and the delay will cost the project significant money.

If the service or materials can be measured in standard units, but the amount needed is not known accurately, the price per unit can be fixed—a **fixed-unit-price contract**. The project team assumes the responsibility of estimating the number of units used. If the estimate is not accurate, the contract does not need to be changed, but the project will exceed the budgeted cost.

Type	Known Scope	Share of Risk	Incentive for Meeting Milestones	Predictability of Cost
Fixed total cost	Very High	All contractor	Low	Very high
Fixed unit price	High	Mostly project	Low	High
Fixed price with incentive fee	High	Mostly project	High	Medium-high
Fixed fee with price adjustment	High	Mostly project	Low	Medium

Cost-Reimbursable Contracts

In a **cost-reimbursable contract**, the organization agrees to pay the contractor for the cost of performing the service or providing the goods. Cost-reimbursable contracts are also known as **cost-plus contracts**. Cost-reimbursable contracts are most often used when the scope of work or the costs for performing the work are not well known. The project uses a cost-reimbursable contract to pay the contractor for allowable expenses related to performing the work. Since the cost of the project is reimbursable, the contractor has much less risk associated with cost increases. When the costs of the work are not well known, a cost-reimbursable contract reduces the amount of money the bidders place in the bid to account for the risk associated with potential increases in costs. The contractor is also less motivated to find ways to reduce the cost of the project unless there are incentives for supporting the accomplishment of project goals.

In a cost-reimbursable or cost-plus contract, the contractor is guaranteed a fee, but the client's costs can increase based on effort.

Cost-reimbursable contracts require good documentation of the costs that occurred on the project to ensure that the contractor gets paid for all the work performed and to ensure that the organization is not paying for something that was not completed. The contractor is also paid an additional amount above the costs. There are several ways to compensate the contractor.

- A **cost-reimbursable contract with a fixed fee** provides the contractor with a fee, or profit amount, that is determined at the beginning of the contract and does not change.
- A **cost-reimbursable contract with a percentage fee** pays the contractor for costs plus a percentage of the costs, such as 5% of total allowable costs. The contractor is reimbursed for allowable costs and is paid a fee.
- A **cost-reimbursable contract with an incentive fee** is used to encourage performance in areas critical to the project. Often the contract attempts to motivate contractors to save or reduce project costs. The use of the cost reimbursable contract with an incentive fee is one way to motivate cost-reduction behaviours.
- A **cost-reimbursable contract with award fee** reimburses the contractor for all allowable costs plus a fee that is based on performance criteria. The fee is typically based on goals or objectives that are more subjective. An amount of money is set aside for the contractor to earn through excellent performance, and the decision on how much to pay the contractor is left to the judgment of the project team. The amount is sufficient to motivate excellent performance.

On small activities that have a high uncertainty, the contractor might charge an hourly rate for labour, plus the cost of materials, plus a percentage of the total costs. This type of contract is called **time and materials (T&M)**. Time is usually contracted on an hourly rate basis and the contractor usually submits time sheets and receipts for items purchased on the project. The project reimburses the contractor for the time spent based on the agreed-on rate and the actual cost of the materials. The fee is typically a percentage of the total cost.

In a time-and-materials contract, the profit to the contractor increases with increased effort, as does the costs to the client.

T&M contracts are used on projects for work that is smaller in scope and has uncertainty or risk. The project, rather than the contractor, assumes the risk. Since the contractor will most likely include contingency in the price of other types of contracts to cover the high risk, T&M contracts provide lower total cost to the project.

Cost Reimbursable (CR)	Known Scope	Share of Risk	Incentive for Meeting Milestones	Predictability of Cost
CR with fixed fee	Medium	Mostly project	Low	Medium-high
CR with percentage fee	Medium	Mostly project	Low	Medium-high
CR with incentive fee	Medium	Mostly project	High	Medium

CR with award fee	Medium	Mostly project	High	Medium
Time and Materials	Low	All project	Low	Low

To minimize the risk to the project, the contractor typically includes a not-to-exceed amount, which means the contract can only charge up to the agreed amount. The T&M contract allows the project to make adjustments as more information is available. The final cost of the work is not known until sufficient information is available to complete a more accurate estimate.

Progress Payments and Change Management

Vendors and suppliers usually require payments during the life of the contract. On contracts that last several months, the contractor will incur significant cost and will want the project to pay for these costs as early as possible. Rather than wait until the end of the contract, a schedule of payments is typically developed as part of the contract and is connected to the completion of a defined amount of work or project milestones. These payments made before the end of the project and based on the progress of the work are called *progress payments*. For example, the contract might develop a payment schedule that pays for the design of the curriculum, then the development of the curriculum, and then a final payment is made when the curriculum is completed and accepted. In this case there would be three payments made. There is a defined amount of work to be accomplished, a time frame for accomplishing that work, and a quality standard the work must achieve before the contractor is paid for the work.

Just as the project has a scope of work that defines what is included in the project and what work is outside the project, vendors and suppliers have a scope of work that defines what they will produce or supply to the company. (Partners typically share the project scope of work and may not have a separate scope of work.) Often changes occur on the project that require changes in the contractor's scope of work. How these changes will be managed during the life of the project is typically documented in the contract. Capturing these changes early, documenting what changed and how the change impacted the contract, and developing a change order (a change to the contract) are important to maintaining the progress of the project. Conflict among team members may arise when changes are not documented or when the team cannot agree on the change. Developing and implementing an effective change management process for contractors and key suppliers will minimize this conflict and the potential negative effect on the project.

Procurement Process

The project procurement cycle reflects the procurement activities from the decision to purchase the material or service through to the payment of bills and closing of procurement contracts.

Procurement Plan

After the decision has been made to purchase goods or outsource services, the procurement team develops a plan that includes the following:

- Selecting the appropriate relationships and contract approaches for each type of purchased goods or outsourced service
- Preparing requests for quotes (RFQs) and requests for proposals (RFPs) and evaluating partnership opportunities
- Evaluating RFQs, RFPs, and partnerships
- Awarding and signing contracts
- Managing quality and timely performance
- Managing contract changes
- Closing contracts

Depending on the complexity level of the project, each of these steps can take either hours or sometimes weeks of work to complete. Each of these steps is also included in the project master schedule. The time involved in the procurement cycle can influence the scheduling of critical activities, including the decision to self-perform the work or contract the work to others. The delivery dates for equipment and materials and the work completion dates for contracted works are placed on the project schedule. Any procurement activities that create a project delay or fall on the project critical path may require special attention.

Selecting the Contract Approach

The technical teams typically develop a description of the work that will be outsourced. From this information, the project management team answers the following questions:

- Is the required work or materials a commodity, customized product or service, or unique skill or relationship?
- What type of relationship is needed: supplier, vendor, or partnership?
- How should the supplier, vendor, or potential partner be approached: RFQ, RFP, or personal contact?
- How well known is the scope of work?
- What are the risks and which party should assume which types of risk?
- Does the procurement of the service or goods affect activities on the project schedule's critical path and how much float is there on those activities?
- How important is it to be sure of the cost in advance?

The procurement team uses the answers to the first three questions listed above to determine the approach to obtaining the goods or services and the remaining questions to determine what type of contract is most appropriate.

A key factor in selecting the contract approach is determining which party will take the most risk. The team determines the level of risk that will be managed by the project and what risks will be transferred to the contractor. Typically, the project management team wants to manage the project risk, but in some cases, contractors have more expertise or control that enable them to better manage the risk associated with the contracted work.

Soliciting Bids

A **solicitation** is the process of requesting a price and supporting information from bidders. The solicitation usually takes the form of either an RFQ or an RFP. Partnerships are pursued and established differently on a case-by-case basis by senior management.

Qualifying Bidders

Potential bidders are people or organizations capable of providing the materials or performing the work required for the project. On smaller, less complex projects, the parent company typically has a list of suppliers and vendors that have successfully provided goods and services in the past, and the project has access to the performance record of companies on that list. On unique projects, where no supplier lists exist, the project team develops a list of potential suppliers and then qualifies them to become eligible to bid on project work. Eligible bidders are placed on the bidders list and provided with a schedule of when work on the project will be put out for bid.

The eligibility of a supplier is determined by the ability to perform the work in a way that meets project requirements and demonstrates financial stability. Ability to perform the work includes the ability to meet quality specifications and the project schedule. During times when economic activity is high in a region, many suppliers become busy and stretch their resources. The project team investigates the potential suppliers, before they are included on the bidder's list, to ensure that they have the capacity and track record to meet deadlines.

The potential supplier must also be financially stable to be included on the bidders list. A credit check or a financial report from Dun and Bradstreet (D&B)—a well-known provider of financial information about individual companies—will provide the project with information about the potential bidder's financial status. D&B services include the following:

- D&B proprietary rankings and predictive creditworthiness scores
- Public filings, including suits, liens, judgments, and UCC (uniform commercial code) filings—standardized financial disclosure documents that conform to the uniform commercial code
- Company financial statements and history

Request for Quote

An RFQ focuses on price. The type of materials or service is well defined and can be obtained from several sources. The bidder that can meet the project quality and schedule requirements usually wins the contract by quoting the lowest price.

Request for Proposal

An RFP accounts for price but focuses on meeting the project quality or schedule requirements. The process of developing a proposal in response to an RFP can be very expensive for the bidder, and the project team should not issue an RFP to a company that is not eligible to win the bid.

Evaluating Bids

Evaluation of bids in response to RFQs for commodity items and services is heavily graded for price. In most cases, the lowest total price will win the contract. The total price will include the costs of the goods or services, any shipping or delivery costs, the value of any warranties, and any additional service that adds value to the project.

The evaluation of bids based on RFPs is more complex. The evaluation of proposals includes the price and also an evaluation of the technical approach chosen by the bidder. The project team evaluating the proposal must include people with the expertise to understand the technical aspects of the various proposal options and the value of each proposal to the project. On more complex projects, the administrative part of the proposal is evaluated and scored by one team, and the technical aspect of the proposal is evaluated by another team. The project team combines the two scores to determine the best proposal for the project.

Awarding the Contract

After the project team has selected the bidder that provides the best value for the project, a project representative validates all conditions of the bid and the contract with the potential contractor. Less complex awards, like contracts for printed materials, require a reading and signing of the contract to ensure that the supplier understands the contract terms and requirements of the project schedule. More complex projects require a detailed discussion of the goals, the potential barriers to accomplishing those goals, the project schedule and critical dates, and the processes for resolving conflicts and improving work processes.

Managing the Contracts

The contract type determines the level of effort and the skills needed to manage the contract. The manager of supplier contracts develops detailed specifications and ensures compliance with these specifications. The manager of vendor contracts ensures that the contractors bidding on the work have the skills and capacity to accomplish the work according to the project schedule and tracks the vendor's performance against the project needs, supplying support and direction when

needed. The manager of partnering arrangements develops alignment around common goals and work processes. Each of these approaches requires different skills and various degrees of effort.

Items that take a long time to acquire—**long-lead items**—receive early attention by the project leadership. Examples of long-lead items are equipment that is designed and built specifically for the project, curriculum that is created for training a new workforce, and a customized bioreactor for a biotech project. These items might require weeks, months, or years to develop and complete. The project team identifies long-lead items early to begin the procurement activities as soon as possible because those procured through the normal procurement cycle may cause delays in the project.

After the contract is awarded, the project team tracks the performance of the contractor against performance criteria in the contract and his or her contribution to the performance of the project. Usually, contractors deliver the product or service that meets the quality expectations and supports the project schedule. Typically, there are also one or two contractors that do not perform to project expectations. Some project managers will refer to the contract and use it to attempt to persuade the contractor to improve performance or be penalized. Other project managers will explore with the contractor creative ways to improve performance and meet project requirements. The contract management allows for both approaches to deal with non-performing contractors, and the project team must assess what method is most likely to work in each situation.

Managing contractor performance on a project is as important to the overall project outcomes as the work performed by the project team.

Logistics and Expediting

Equipment and materials that are purchased for use on the project must be transported, inventoried, warehoused, and often secured. This area of expertise is called *logistics*. The logistics for the project can be managed by the project team or can be included in the RFP or RFQ. On international projects, materials may be imported, and the procurement team manages the customs process. On smaller projects, the logistical function is often provided by the parent company. On larger projects, these activities are typically contracted to companies that specialize in logistical services. On larger, more complex projects, the procurement team will include logistical expertise.

The project work often depends on materials procured for the project. The delivery of these materials influences the scheduling of the project, and often some materials are needed earlier than normal procurement practices would deliver. On long-lead items, the project schedule is included in the contracting plans and contractors must explain how they will support the project schedule.

On large, complex projects, critical items might be scheduled for delivery after they are needed on the project. The procurement team then explores ideas with the contractor to expedite the manufacturing or transportation of the equipment or materials. The contract can often place a priority on the fabrication of the equipment and delivery of the equipment to meet the project

schedule. The project logistics team can also explore ways of shortening the transportation time. For example, a project in Argentina flew some critical equipment from Sweden rather than transport the equipment by ship to save several weeks in transit. The logistics costs were higher, but the overall value to the project was greater.

WHAT IS PERFORMANCE MEASUREMENT AND EVALUATION?

Performance measurement is the ongoing, regular collection of information for monitoring how a program, policy or strategy is doing. It is a systematic way of mapping the evidence of the progress you are making towards your expected results. Evaluation is a specific, in-depth way to gather and analyze information and draw conclusions about the performance of a policy, program or strategy. Evaluations may also be focussed at the project level.

There are two broad types of evaluations:

- “Formative” or “process” evaluations that are designed to improve the design and implementation of a program, policy or strategy as it unfolds, and
- “Summative” or “outcome” evaluations that are designed to judge a program, policy or strategy’s relevance, success and/or cost-effectiveness (including its relative contribution to the intended outcomes).

WHAT ARE THE PERFORMANCE MEASUREMENT AND EVALUATION APPROACHES?

There are various approaches to performance measurement and evaluation. The approach you take depends on a range of factors, such as the:

- type and nature of the policy, program or strategy,
- practicality of gathering and analyzing information,
- timing, and
- available capacity – including financial resources - to carry out performance measurement and evaluation tasks. In the case of the Family Violence Initiative, there are varying possibilities – and limitations - to gather performance measurement and evaluation information within the policy, programs and research streams of the Initiative.

WHAT ARE THE BENEFITS

Performance measurement and evaluation are powerful tools to improve management and decision making at all levels. Participatory approaches, in particular, can help to build capacity for ongoing improvement at local levels. The following chart maps some of the key benefits and how they can be used.

Benefits of Performance Measurement and Evaluation

√ Policy and Program Planning and Development	Results may confirm policy and program direction, or identify gaps that need to be addressed.
√ Decision Making about Funding	Finding out what works well/not so well can be used to guide future funding decisions/priorities.
√ Clarifying Goals	At the outset, developing a "road map" clarifies goals, explains the "big picture" and ensures everyone shares a common focus.
√ Tracking Progress	Enables monitoring and, if required, permits adjustments to be made along the way.
√ Reporting Results	Promotes accountability and communicates what works well to facilitate improvement and ongoing development.

Project execution and control

Project execution (or implementation) is the phase in which the plan designed [in the prior phases](#) are put into action. The purpose of project execution is to deliver the the project expected results (deliverable and other direct outputs). Typically, this is the longest phase of the project management lifecycle, where most resources are applied.

During the project execution the execution team utilizes all the schedules , procedures and templates that were prepared and anticipated during prior phases. Unanticipated events and situations will inevitably be encountered, and the Project Manager and Project Team will have to deal with.

In the standard division of project management discipline this phase is called "Project Execution and Control"; the term "control" is included here because execution is not a blind implementation of what was written in advance but a watchful process where doing things goes along with understanding what is being done, and re-do it or do it differently when the action does not fully responds to what was meant for. This "control" is an integral part of project management and is a necessary task of the project manager. As such it is different for project [evaluation](#) as generally conceived in aid programmes, where [evaluation](#) is usually performed by a team different from the project execution team (e.g. the programme manager, the quality support officer, etc.), so as to independently verify the quality and the efficacy of the work done. (see also [establishing a M&E system; Manage the current project/programmes revising scope and schedules.](#)) When the whole team is close-knit control, monitoring and evaluation move hand in hand supporting and giving added value to each other. A possible way of differentiating project control by project evaluation is to say that while "control" is done by the project manager (that include monitoring of subordinates and self evaluation) [evaluation](#) is generally done directly or through a group by the line manager of the project manager and is an activity occurring in the "shared field" between project and programme management.

Project Termination

Project termination is one of the most serious decisions a project management team and its control board have to take. It causes frustration for those stakeholders who sincerely believed - and in most cases still believe – that the project could produce the results they expected, or still expect. The project manager and his or her team members, very important stakeholders of the project as well, will feel that they personally failed. They also will be scared of negative consequences for their careers; their motivation and consequently, productivity will decrease significantly.

In contrast to that, we are convinced that conscious project termination at the right time, based on clear and well communicated criteria, profoundly discussed with the whole project management team, and finally mutually decided, is one of the boldest actions the involved or affected members of an organization can take.

What can we do to avoid those negative consequences? Here, we list what we hear in our training, consulting, and coaching sessions, together with our own experiences:

- A clearly communicated strategy of the organization
 - Clearly communicated reasons why and how the project supports that strategy, and under what conditions it does not
 - Clearly set and communicated project success criteria (in terms of scope, schedule, and budget), if possible clearly set and communicated termination criteria
 - High level management attention, even for smaller projects, and even then when everything still seems to be on track
 - Periodical review meetings with the control board
 - Open discussions with the control board about problems and possible solutions or alternatives, including termination
 - In case the project has to be terminated, a clear commitment of the control board and high level management towards the project management team in order to enable the team to follow the [project closure](#) procedures
 - Upon successful termination, similar rewards and incentives for the project manager and his or her team as with regular project closure

Reasons why project termination becomes necessary

- Technical reasons
- Requirements or specifications of the project result are not clear or unrealistic
- Requirements or specifications change fundamentally so that the underlying contract cannot be changed accordingly
- Lack of [project planning](#), especially [risk management](#)
- The intended result or product of the project becomes obsolete, is not any longer needed
- Adequate human resources, tools, or material are not available
- The project profit becomes significantly lower than expected, due to too high project cost or too low project revenue
- The parent organization does not longer exist
- The parent organization changes its strategy, and the project does not support the new strategy
- Force majeure (e.g. earthquake, flooding, etc.)
- Necessary conditions disappear
- Lack of management support