



# Project Management Basics Guide

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## Project Management Fundamentals

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### Definition of a Project

Projects have a few distinct aspects:

- Have a definite start and a definite end.
- Create a unique product or service.
- Differ from the repetitive, ongoing nature of organizational operations.

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### Definition of Project Management

Project management is the process, knowledge, principles, tools and techniques used to manage projects.

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### History of Project Management

Project management has a long history dating back to ancient times. The following are significant eras in the timeline of project management history:

- Aspects of project management were used during pre-modern times for constructing the Pyramids, Roman buildings, and the Great Wall of China.
- With advent of large, complex projects in late 19th century, such as the Transcontinental Railroad, the need for tools to handle the complexity emerged in the Western world.
- Frederick Taylor began studying the detailed aspects of work in the first part of the 20th century.
- Also in the first part of the 20th century, Henry Gantt developed a charting system, called the Gantt chart, which outlined the progress of work.
- After World War II, tools such as the PERT chart and critical path methodology were developed to address the ever increasing complexity of managing limited resources on complex military and engineering projects and to give managers greater control over the work.
- Project management became a field of study in the 1960s, and the Project Management Institute (PMI) was formed in 1969.

## General Project Lifecycle

Phases in projects take on various names in different organizations. However, there are general phases which are common amongst all projects. These phases are organized into what is called a project lifecycle – from the birth (start) to the death (end) of the project. A general project lifecycle is described below:

1. **Feasibility** – determines the need for and feasibility of the project.
2. **Planning** – determines the time, resources, and budget needed to complete the project.
3. **Specification** – involves designing what the results of the project will look like when completed.
4. **Implementation** – completing the project tasks.
5. **Closure** – administratively closing out the operations involved with the project, e.g., handing products and services over to client, re-assigning personnel to other projects.

## Project Stakeholders

Stakeholders are individuals, or groups, who have a stake in how a project progresses. These stakeholders often impact the project as well. Some key stakeholders are:

- **Project manager** – the individual coordinating and managing the project.
- **Customer** – the individual, group, or organization receiving the products or services resulting from the project.
- **Project team** - the group or organization completing the majority of tasks on the project.
- **Sponsor** – the individual or group in the customer organization who is funding the project.

## **Organizational Influences on Projects**

Just as stakeholders impact projects, organizations do too. There are three major elements of organizations that impact projects, they are:

- **Organizational systems** – organizations tend to be either project-oriented or non project-oriented. Project-oriented organizations commonly have systems that support projects so that they run efficiently and effectively.
- **Organizational culture and style** – Organizational culture involves many variables, including shared values, beliefs, and expectations. These variables tend to be intrinsic, but are made apparent in policies and procedures, authority and power structures, and communications systems. Organizational culture is a soft issue which often greatly impacts project. For example, your team is completing a project, which will result in an innovative solution to the client’s problem. However, you have found that the client organization is traditional and does not respond to change well.
- **Organizational structure** – the arrangement of resources, such as departments and operations, in an organization often impact how resources are made available within an organization. Resources, both on the client and project team side, are often critical factors in the successful completion of projects.

## **Project Management Processes**

Even though projects tend to be linear in nature, there are several processes that are ongoing in the life of the project. The processes can be divided into two categories:

- **Management** – processes focused on the organization of project work.
- **Production** – processes focused on details and creation of products produced as a result of the project.

**Project  
Manager's Skills**

Project managers need to have a variety of skills to successfully manage a project. Some of the major skills are:

- **Communicating** –includes the ability to communicate verbally and in writing, formally and informally, and with peers, executives, subordinates, and clients.
- **Influencing** – has an innate way of “getting things done.”
- **Leading** – includes establishing the direction for the project, motivating and inspiring team members, and aligning team member actions with the goals and objectives of the project.
- **Negotiating** – involves working with others to reach mutual agreements.
- **Problem solving** – involves defining problems, identify causes of problems, generating alternate solutions, and choosing and implementing the most appropriate solution.

## Project Consideration

### Criteria for Starting a Project

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Before starting a project, the project manager should be sure that the following criteria are met:

- There is an adequate budget for the project available.
- One of your contacts in the client organization has the authority to authorize the project.
- There is a need that everyone can agree upon, or one which you and the Chief Executive Sponsor feel you can sell to the client organization.
- The project is imminent. You do not want to put too much of your time or resources into a project that will not be implemented in a reasonable amount of time.

### Project Start-Up Activities

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Before you begin the project, you want a clear picture of what it will take. To accomplish this, you will complete several activities:

- **Identify clients and stakeholders** – this is also known as Stakeholder Analysis.
- **Identify the clients' objectives and the project context** – client objectives are often obtained as a part of the Stakeholder Analysis process. However, identifying the project context involves asking the client a different set of questions.
- **Define the overall objectives** – this involves defining project and technical objectives, and the statement of work.
- **Define project requirements** – this involves agreeing upon the specifications for each project deliverable.
- **Develop project start-up documentation** – a document that summarizes the project information collected to date.

**Stakeholder Analysis**

To complete a Stakeholder Analysis, answer the following questions:

- Who are the stakeholders for this project?
- What are the stakeholders' goals and interests?
- What power and influence do the stakeholders' hold in the organization and over the project?
- What impact do the stakeholders have on the project?

**Client Objectives Identification**

You can add the following questions to the Stakeholder Analysis process to uncover your clients' objectives:

- What do you really want from the project?
- Is there a specific time when the project needs to be completed?  
What circumstances have mandated this time frame?
- By what standard will you measure the end product?
- How do you see the end product performing?
- What will be the use(s) for the end product?

## **Project Context Identification**

Project context is simply the conditions under which the project will be completed. Context can include considerations for the time frames, organizational culture, availability of resources, and budget.

The activities used to identify the context of a project involves activities which should be familiar to you:

- Review organizational documentation.
- Interview appropriate clients and stakeholders.

You can ask the following questions of the client to uncover the context of the project:

- Why do you want the project done?
- Why is it important to do the project at this time?
- Have you tried a similar project before? If so, what were the outcomes?
- What are the risks involved in this project?
- What impact will this product have on your organization, your supply chain, customers, and/or the marketplace?
- Are there any future or long-term issues that should be considered, as well as the short-term issues surrounding this project?
- What do you think the project will cost?
- What do you think are the tangible and intangible benefits that will result from this project?

**Overall  
Objectives  
Definition**

Defining the overall project objectives starts with the clients' objectives and continues until you and the client are comfortable with objectives addressing the following:

- Characteristics of deliverables (technical objectives)
- Target costs at completion
- Target completion date
- Target resource and asset utilization (e.g., how many people will be required and how much of their time must be dedicated to the project)

Defining technical objectives, as indicated before, is identifying the characteristic of project deliverables. It is also identifying the general standards the deliverables must meet. For example, generally deliverables must be produced on time and as specified in the project requirements.

The final aspect of defining the overall objectives is the Statement of Work (SOW). The SOW includes the parameters of the project, which are a:

- Statement describing the end product
- Time frame for the project
- Budget.

## **Project Requirements Definition**

Project requirements assist in the process of clearly and concisely describing the scope of work and establishing project parameters. Requirements simply are the desired attributes of the end product and preceding deliverables. There are several ways in which to describe the attributes of deliverables. Some of them are:

- Quality, e.g., is this application considered a quality product or service compared to similar applications?
- Performance, e.g., can the application handle 100,000 simultaneous users?
- Quantity, e.g., how many features will the application have?
- Reliability, e.g., will the application run with few or no errors?
- Maintainability, e.g., how much ongoing maintenance is reasonable for this solution?
- Sustainability, e.g., will this solution be able to handle our current needs and those within the next few years?
- Operability, e.g., does this application work across platforms?
- Flexibility, e.g., will this application allow for us to add additional functionality as the need arises?
- Corporate image, e.g., in which ways do you want the application to improve or support your corporate image?

## Project Start-Up Documentation

Project start-up documentation (some defer to a detailed Statement of Work) is simply a compilation of the data you have gathered to date about the project. At this point, it is assumed that you have met the criteria for initiating or obtaining commitment for a project.

The documentation should be reviewed by key people in your organization before presenting to the client.

The project start-up document should include:

- **Problem or opportunity statement** – describes why the project needs to be done.
- **Project scope** – identifies end deliverables and the parameters of the project.
- **Criteria for work** – identifies the criteria by which you will know the project is completed successfully.
- **Assumptions** – outlines the assumptions you made in scoping out the project, e.g., when the project will start, resources that client has available to work with project.
- **Impact and interfaces** – identifies who and what will impact the project and who and what the project will impact.
- **Risks** – outlines what problems may be associated with project.
- **Resources** – lists resources required to complete the project, particularly those from the client.
- **Constraints** – identifies the limitations placed on the project, e.g., the limited availability of technical experts.

## Project Planning

### **Guidelines for Effective Project Planning**

Project planning seems to be a simple process. However, it requires handling many considerations at one time. Following are some guidelines to help you develop your plan:

- Set realistic parameters, e.g., cost, time, resource allocation, quality.
- Make the plan simple.
- Make sure you get the appropriate approvals.
- Make sure the project details are accurate.
- Make sure that everyone working on the project has the appropriate level of authority and responsibility for the work they are completing.
- Take human factors into account, e.g., people getting sick, people not having the right skills to complete work.

**Project Modeling** The next activity for project planning is determining which tasks are necessary to complete the project successfully. The output is a Work Breakdown Structure (WBS). The process for developing a WBS is simple:

1. Identify the major tasks and steps it will take to produce the major deliverables.
2. Sequence the tasks/steps.
3. Determine the relationships between tasks/steps. (See next topic for details.)
4. Assign WBS outline numbers.
5. Identify milestones in the project.

**Note:** Milestones are often tangible deliverables, such as documents, review meetings, and prototypes.

## **Project Planning Tasks**

There is some overlap between the project planning and project start-up activities. The project start-up activities results in a detailed description of what the end deliverables will be. This same information serves as input for the project planning activities.

Project planning solidifies and flushes out answers to some basic questions:

- What are the end deliverables of the project?
- How will the project be completed?
- Who will complete the project work?
- When will project work be done?
- How much will project cost?

These questions translate into tasks:

1. Define the project.
2. Model the project.
3. Estimate and schedule the project.
4. Approve and publish the plan.

## **Task Relationships**

Task relationships refer to the order in which tasks occur compared to one another. There are four types of task relationships:

- **Finish to start** – one task must be completed before another one can begin.
- **Start to start** – two tasks start at the same time.
- **Finish to finish** – two tasks finish at the same time.
- **Start to finish** – one task must start before another one finishes.

## **Project Estimate and Schedule**

Once the projects tasks have been identified, you can schedule and estimate the cost of the project. Scheduling and estimating the project involves the following tasks:

1. Identify the duration of each task/step. (How long will each task/step take to complete?)
2. Identify the resources needed to complete each task/step. (What equipment, tools and personnel are needed to complete each task/step?)
3. Identify the utilization cost for each resource.
4. Calculate the project estimate and the completion dates for the project.

**Project Plan  
Approval and  
Publication**

Once the project plan is developed, key resources and stakeholders must approve it. Some of the key resources and stakeholders to consider are:

- People responsible for completing the work
- Managers who authorize the use of personnel and other company equipment
- Managers who authorize payment for resources needed
- Clients

When the project plan is approved, it serves as the baseline for the project.

## Project Planning Tools and Techniques

**Project Network** A project network is a visual tool, which represents the sequence of tasks and their relationships. Essentially, it is a process flowchart.

The process to produce a project network is relatively simple. The manual process for completing a project network is:

1. On Post-It-Notes, write each task/activity and its duration.
2. Place the Post-It-Notes on a surface that you can use to sort them, e.g., a wall.
3. Sequence the tasks/activities.
4. Align the tasks/activities so that their relationships are visible.

**Note:** this process can be accomplished with software, such as Microsoft PowerPoint or Microsoft Project.

## **Critical Path Analysis**

The critical path in a project is the longest sequential series of tasks between the beginning and end of the project. Identifying the critical path is extremely important because any delay in a task on the critical path will most likely delay the project. This type of information is useful for risk identification and project control management.

The process for analyzing the critical path involves:

1. Identify the tasks in the critical path.
2. Identify the duration, or elapsed time, of each task in the critical path.
3. Identify the early start and finish for each task in the critical path.
4. Identify the late start and finish for each task in the critical path.
5. Identify the float, or slack, time for each task on the non-critical path.

Note: Early start and finish refers to the earliest dates that a task will start or finish. Late start and finish refers to the latest dates that a task will start or finish. Slack time refers to the time a task can be delayed before it delays the project.

The critical path analysis process is an on-going event. It the information helps the project manager make decisions to keep the project on track.

## Resource Loading

Resource loading is used to determine how resources will be allocated on the project. This process is simply determining the amount of time each resource will be committed to each task. For example, a Technical Consultant may only be able to provide 20% of his time on any particular task, which translates to approximately eight hours per week.

A common problem associated with planning, scheduling, and controlling a project is the limited availability of personnel or equipment resources. To address this issue, there are a few alternatives:

- Shift or extend tasks within their slack time.
- Use overtime to get task completed on time.
- Create a temporary pool of resources for the project.
- Contract out some of the work.
- Increase the resource pool permanently.
- Delay a portion of the work, e.g., non-critical deliverables.
- Train staff on additional tasks or responsibilities so that they can serve as backup later on in the project or in other projects.

**Note:** Alternatives, such as using overtime or contracting out the work, may increase the cost of the project.

## **Schedule Compression**

Many times the project plan developed on the first attempt does not meet the target dates of the client. To meet the client's expectation, you can attempt to compress the schedule by using one or more of these techniques:

- Break the tasks into smaller tasks and schedule as many as possible to be completed in parallel.
- Alter the task relationship on finish-to-start relationships through negotiation.
- Assign additional resources.
- Remove a task from the critical path.
- Speed up a critical path task through efficiency.

## Project Quality Management

### Project Quality Management Processes

Project quality management involves three processes:

- **Quality planning** – identifying which quality standards will be applied to the project.
- **Quality assurance** – monitor project performance on a regular basis.
- **Quality control** – monitor specific aspects of the project, e.g., deliverables to make sure they meet the quality standards established.

### Quality Planning

The inputs for quality planning include:

- Quality policies of both the client and vendor organizations.
- Project initiation documents, including scope statement and product descriptions
- Standards and regulations established by the government, industry, or organization.

The process for quality planning includes:

- Benefit – cost analysis
- Benchmarking
- Flowcharting, i.e., cause-and-effect diagrams

The outputs of the quality planning includes:

- **Quality management plan** – includes components to address quality control, improvement, and assurance.
- **Operational definitions (metrics)** – describes in detail what the quality measures are and how they will be assessed.
- **Checklists** – structured tools used to assess quality.

**Quality Assurance**

The outputs from the quality planning process, such as the quality manage plan, serve as inputs for the quality assurance process. In addition, the tools and techniques used in quality planning also work with quality assurance. In addition, quality audits are used in quality assurance.

Quality audits are structured reviews of the qualitative aspects of a process or a product. These reviews can be planned or impromptu.

The result from the quality assurance process is the improvement in quality in the products or process of the project.

Quality control is another important aspect, but will be discussed in the Project Control section later in the guide.

## Project Communication Management

### Elements of Project Communication Management

Project communication management involves:

- Communication planning
- Project reporting
- Information distribution

Each of these elements should be considered during the planning stage of the project.

### Communication Action Planning

Communication planning identifies:

- What information stakeholders need
- When the stakeholders need the information
- In which format the information will be communicated

The process to determine this information should be considered during a Stakeholder Analysis.

## **Project Reporting**

The purpose of project reporting is to communicate the status of the project and provide pertinent and important information to stakeholders. The primary tool for project reporting is the status report. The status report addresses the following questions for the client and managers:

- What tasks have been completed since the last report?
- Which tasks are currently being worked on? How are they going?
- Which tasks will be started next?
- Is the project on schedule?
- If the project is not on schedule, why and how will it be resolved?
- Are there any open issues? (i.e., needed resources)

For team members, the status report addresses the following questions:

- What do you want each team member to do?
- What authority and resources do they have to complete the tasks?
- What outcomes are expected from the team members?
- What are the consequences for good and poor performance?

In addition to the status report, you may decide to have status meetings in which the status report is reviewed. In these instances, it is generally desirable to distribute the status report a few days prior to the meeting to attendees for review.

The frequency for providing status reports varies; however, it should not extend more than two-week intervals for team members. If the project timeline is tight, it is preferable to change the report period to weekly.

There are other forms of project reporting and communication, such as project scope change requests. Some of these will be discussed later in the course.

## **Information Distribution**

Another factor in project communication is the distribution of information to stakeholders. Since communication with stakeholders should be seen as a significant event, you should think through how you will do this. Consider the following:

- Who should get this communication?
- What media will be used?
- What is the purpose of the communication?
- What actions should result from this communication? What actions do you require the recipients to take and in what time frame?

## **Organizational Culture Aspects of Communication**

Communication would seem to be a straight forward issue; however, each organization handles communication differently. Think about these factors when planning your project communication management plan in dealing with the customer:

- Does the client prefer formal or informal communication?
- Does the client prefer verbal (face-to-face or telephone) or written communication?
- Is the client comfortable with electronic tools, such as email, project management software, web browsers?
- How does reporting occur within the client organization?
- What is the reporting relationship between the stakeholders in the client organization?

## Project Risk Management

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- Project Schedule Risks**    The most common risks associated with the project schedule are tasks:
- On the critical path
  - With several predecessors
  - With minimum slack time
  - With optimistic estimates
  - With heavy reliance on external resources, such as materials from vendors

- 
- Resource Risks**    The most common risks associated with resources are:
- One individual working on a task
  - Many people working on one task
  - Limited resources being used on tasks
  - Various personnel issues – extended leave, illness, turnover, insufficiently skilled staff
  - Poorly defined roles and responsibilities

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- Budget Risks**    The most common risks associated with the project budget are:
- Uncertainty of available funds
  - Shifts in budget priorities
  - Uncertainty of costs associated with resources
  - Poor estimates

## Scope Risks

The most common risks associated with the project scope are:

- Uncertainty inherently involved in new product development
- Dynamics involved with client requirements
- Availability of tools and techniques to complete the project
- Large number of defects
- Changes in requirements
- Design errors, omissions, and misunderstandings

## Risk Management Process

The risk management process includes eight steps:

1. Identify potential risks to the project.
2. Quantify the impact of the risks to the project.
3. Identify the triggers associated with the risks.
4. Outline preventative actions to address each risk.
5. Develop contingency plans in the event risks become an issue in the project.
6. Monitor project for problems.
7. Implement contingency plans as needed.
8. Evaluate how well the contingency plans correct the problem.

**Note:** In addition to contingency plans, workarounds can also be created to handle risks that emerge as a problem on a project.

## Project Change Management

### Types of Project Changes

There are two major types of changes that can occur in projects – scope and baseline. Scope changes can be focused on:

- Requirements
- Design
- Technology
- Business
- Personnel

Sources of baseline changes can be:

- Targets (time, milestones, and task slippage) will not be met.
- Resources (personnel, equipment) are not available or will not perform at peak performance.
- Tasks will not start on time.
- Budgets will be exceeded or under spent.
- Work will not meet the specifications of the plan.

## **Change Management Guidelines**

There are several guidelines, which help you manage the change process better:

- All changes, scope and baseline, should be funneled through one person, namely the project manager.
- The project manager should be the only person making commitments to changes in the project.
- Changes should be logged.
- Scope changes should be submitted using a formal scope change request form.
- Baseline changes should be reported on a schedule, i.e., every Monday.
- Changes should be communicated to team members and client.
- Approval procedures should be identified for changes, particularly scope changes.
- The number of people who have the authority to make changes should be limited.
- Changes should be researched so that you find solutions to prevent further problems.
- Changes should be tracked after they are implemented.

## Project Control

### **Project Control Considerations**

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Once the planning phase is completed, and work begins on completing the project tasks, the project manager switches from the planning role to the control and coordination role. The considerations include:

- Project status (alignment with schedule, cost, objective, and goals)
- Good aspects of the project
- Problems on project
- Emerging opportunities and problems
- What should be done that is not being done
- Project stakeholders' satisfaction with project results
- Project profitability

### **Project Control Tasks**

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Project control involves five basic steps:

1. Define performance standards.
2. Track performance.
3. Analyze performance information.
4. Take corrective action.
5. Report performance and corrective actions.

## **Performance Standards**

Producing standards occurs during the project start-up and project planning activities. Once the project tasks are executed, the standards need to be refined. Standards can be set for many areas, some of which are listed below:

- Project scope
- Project management processes
- Satisfaction of stakeholders, senior management, and team members
- Quality
- Reliability
- Effectiveness and efficiency
- Estimates and budget
- Project specifications
- Vendor performance
- Innovation
- Productivity
- Resource utilization

## **Performance Tracking**

The primary tool used for tracking the progress of the project is the Gantt chart. This is made much easier with tools like Microsoft Project.

Team members should be reporting the progress of their work on a regular basis to the project manager. It is useful to have team members produce weekly individual status reports, which are compiled into the status report given to the client.

**Performance Analysis**

Essentially, analyzing the performance of a project involves comparing the actual performance against the established performance standards. There are several calculations that can be performed to show the value of the project. Refer to the table below for detailed calculations.

**Table 1. Performance Analysis Calculations.**

<b>This Calculation</b>	<b>Assesses...</b>	<b>The Formula Is....</b>
Project Cost Variance	Whether or not project is within budget	$(\text{Budgeted Cost of Milestones Performed}) - (\text{Actual Cost of Milestones Performed})$
Schedule Variance	Whether or not project is on schedule	$(\text{Budgeted Cost of Milestones Performed}) - (\text{Budgeted Cost of Milestones Scheduled})$
Cost Performance Index	How well the project is performing in terms of cost	$(\text{Budgeted Cost of Milestones Performed}) / (\text{Actual Cost of Milestones Performed})$ Over 100% is good
Schedule Performance Index	How well the project is performing in terms of schedule	$(\text{Budgeted Cost of Milestones Performed}) / (\text{Budgeted Cost of Milestones Scheduled})$ Over 100% is good
Budgeted Cost for Remaining Milestones	How much money is left in the budget	$(\text{Budget at Completion}) - (\text{Budgeted Cost of Milestones Performed})$
Estimate to Complete Project	How much additional money is needed to complete project	$(\text{Budgeted Cost for Remaining Tasks}) / (\text{Cost Performance Index})$
Total Estimate at Completion	What the total budget will be at the end of the project	$(\text{Actual Cost of Milestones Performed}) + (\text{Estimate to Complete the Project})$