

Project management tutorial

Purpose: To provide the basic skills and knowledge needed to effectively manage a group project.

Importance: Project scheduling and understanding/handling risk is crucial to success in science and engineering.

Goals: After this activity, you will be able to:

- Break a complex project into manageable sub-projects
- Assign responsibility/ownership of project components
- Set reasonable milestone's for the completion of major tasks
- Perform a risk analysis and integrate mitigation into your planning
- Develop and complete a project plan

Files:



[Project Management](#)

(Link provided on the section page)

SECTION 1: INTRODUCTION TO PROJECT MANAGEMENT

Project management is the art of matching a project's goals, tasks, and resources to accomplish a goal as needed. We say "as needed" because one has limited time, money, and resources (human and machinery) with which to accomplish a goal. One can think of a project as a process. Figure 1 shows this process as a simplified block diagram.

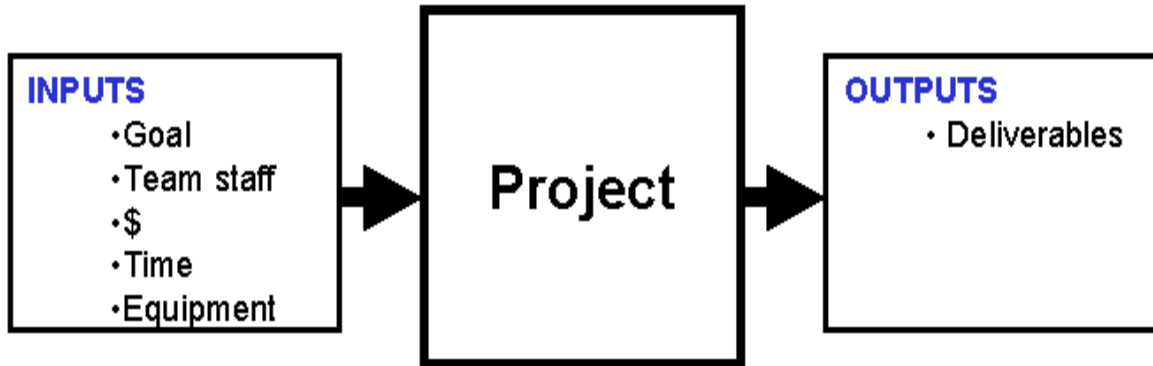


Figure 1: Simple Project Management System

The process involves inputs and outputs. Successful projects "do the right things, with the right tools, and in the right way".

SECTION 2: STAGES OF A PROJECT AND HOW TO COMPLETE THEM

Stage 1: Defining the goals of the project:

Garbage in equals garbage out. If you do not start a project with the correct goal(s), it is not likely you will accomplish the goal(s). This must be a team activity to ensure that everyone is given the opportunity to contribute and "buy-in" to what is going to happen. At the end of this stage, every team member should have an understanding of what must be accomplished.

This part of the project should end with a document that lists the goals with a short statement providing some detail. The statement should include a definition of success. This is a statement that provides a description of the vital few requirements that define the goal as accomplished. Vital few implies the minimum required to do a good job. Defining success is necessary to make sure there is no ambiguity as to whether the goal has been accomplished or not. It also prevents teams from performing unnecessary iteration and improvement on a goal which has been sufficiently accomplished.

Stage 2: Define project tasks/activities:

Each goal or sub-set of goals should be matched to the tasks required to accomplish them. This is best done by listing the goals on the left side of a sheet of paper, then writing the tasks to their right. The group should agree that the specify task will accomplish the goals as per required in the definitions for success the team laid out in the previous stage.

Stage 3: Determine and verify resource requirements:

Resources are those things which are needed to accomplish the project goals. Resources may include, but are not limited to:

- People
- Time
- Money
- Space
- Computers
- Software
- Others.....

The most important component of determining resource requirements is to be realistic. One of the most common mistakes project managers make is to underestimate the amount and type of resources required. This leads to projects that run over budget and fall behind schedule. DO NOT attempt to do any of the following:

- Squeeze a project into a shorter time frame to please your boss
- Cut corners to minimize resource requirements
- Plan on a best-case basis, i.e. "If everything goes correctly, we will finish on time."

Determine what you need to get the job done correctly, on time, and on budget. It is not a bad idea to build in a safety margin here. This is often referred to as "padding". For instance, one might multiply the estimated time to complete a task/project by say 20% to allow for additional time to deal with unexpected occurrences. The amount of padding usually depends on the certainty one has as to how effectively the resources can be used. One should keep padding to a minimum.

Once the requirements have been set, it is important to verify that the team will have access to them. If not, then it is not likely the project will be accomplished as required. In some instances it may be necessary to acquire resources as the project progresses. This is risky business and should be avoided if possible. This is risky business. Speaking of risk...

Stage 4: Identify risks and develop mitigation (backup) plans:

Projects always involve a finite amount of uncertainty (risk) that may lead to problems and surprises during the project. Dealing with surprises requires more time, energy, and money than originally planned. Risk management can help reduce the likelihood and affects of risks. Risk management is important as it helps the team accomplish the project with as little trouble as possible.

As a professional scientist, engineer, or project manager, you will be required to help get the job done. Excuses (whether real or imaginary) generally don't buy any sympathy. For instance, in the event of a surprise problem which causes project delays, it is all too easy to deflect responsibility with victim phrases such as, "I did my part, but the other guy did not." or "We had an unexpected problem which caused us to fall behind." Managers, professors, CEOs typically do not look favorably on people who invoke victim phrases. As a result, people who fall back on these types of phrases, even if they are true, typically do not go far in this world. You must learn how to deal with surprises and adversity, not be pushed around by them.

By becoming a member of a team, each member dedicates themselves to the success of the TEAM. If you are waiting on a team member to accomplish a task and they are behind, it is your responsibility to help them in any way you can. If you cannot help them, you must make sure they get the help to accomplish their task. The victim phrase does not absolve you of any responsibility, rather it makes you look like you are not a team player.

Risk management can be a complex process, for our purposes, we will use a simple management for dealing with the risk. Identify and list the practical risks for your tasks in a column to the right of the tasks. For each risk, develop a back up plan that when implemented will keep you on schedule. You may want to pay special attention to risks that are so great, that they could "kill" the whole project. A member of the group should be responsible for monitoring this risk throughout the project.

Stage 5: Develop a schedule

A gant chart is a schedule which plots the tasks, people responsible for these tasks, and a timeline. Gant charts are useful as they allow the team to look at the architecture (structure) of the project and easily identify responsibilities. The gant chart can serve as a document that people use in their planning as a visualization tool to see how tasks depend on each other. The basic format of a gant chart consists of a listing of tasks on the left hand side, followed by the start date, number of days to complete, and a finish date. Each task should be assigned one or more owners. To the right of the text listing is a graphical representation of the task duration in the context of the project time line. A sample gant chart is shown in Figure 2.

#	Task	Start	Days	Finish	Owner(s)	M	T	W	R	F	Sa	Su	M	T	W	R	F
						25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun	01-Jul	02-Jul	03-Jul	04-Jul	05-Jul	06-Jul
1	Research	25-Jun	2	26-Jun	Mike												
2	Design	26-Jun	3	28-Jun	Bill												
3	Build	28-Jun	5	2-Jul	Joan												
4	Test	3-Jul	2	4-Jul	Tina & Lisa												
5	Document	25-Jun	12	6-Jul	Lisa												

Figure 2: Sample Gant Chart

After the chart is made, look for conflicts of resources. For instance, make sure that team members are not assigned too many tasks during a given time period. For instance, in the schedule above, Lisa appears to be busier than her team mates on July 02nd and 03rd. Also make sure that different tasks which require the same machines or rooms are not scheduled for use at the same time. Make the changes and obtain agreement from the group that this is the schedule that is to be followed. It might be wise to review the risks during this time and adjust parts of the schedule if it would help.

Stage 6: Execute the schedule

Just do it! Every team member should know what they have to do and should have the right resources to get the job done.. They should know what the risks are and have back up plans in case of trouble. During this stage, the project manager is responsible for coordinating, though group members should communicate among themselves as required. If a group member feels he is going to go overtime/budget, it is their responsibility to bring it up to the group as soon as possible. This way, resources can temporarily be shifted to help keep the team member on schedule.

Each group member should document their activities. This is important as human memory is shaky at best and it is likely that each team member will be required to recall details of their activity. There is nothing more frustrating to a manager than to hear an employee say, "I can't remember what I did." If one can't remember, how can the team trust that what they did was correct? Documentation is the responsibility of the team members and will often be a saving grace for them.

It is likely that surprises and conflicts may occur during the course of the project. It is important to remember that it is the team's responsibility to make the project happen. If there are problems, the team should help figure them out. If there are conflicts, the team should act together to resolve them. This can be facilitated by regular meetings (daily, weekly, monthly, whatever is practical) of the team. At the meetings the team should review the schedule and the status (complete or not complete) of the project goals. Once the goals are accomplished, the project is complete.

Stage 7: Finish the project and assessing performance

After the goals have been achieved, it is good practice to evaluate the performance of the project team. In the last group meeting the team should discuss ways in which the experience could have been improved. This is where a good deal of learning and experience is gained. It will help prevent similar problems in future projects.

SECTION 3: PROJECT MANAGEMENT IN OUR ACTIVITIES.

Project management is in large part about being responsible. Today's high school and college programs rarely force young people to exert their discipline. Most people say it is impossible for young adults to manage themselves. I do not agree. Consider World War II. People between the ages of 17 and 22 formed the bulk of the force that fought in the war. They were responsible for flying fighter planes, bombers, driving tanks, and steering ships. These are huge responsibilities. If they can do this so can you.

You will be responsible for developing (with our help), implementing, and executing your own project schedule. There will be no "mercy" for falling behind, except in the most extreme of circumstances. Basically, it is your turn to step up to the plate and get the job done.

SECTION 4: ACTIVITY - START YOUR PROJECT

This is an incredibly open ended task. You are now charged with developing your project plan. Follow the steps above and proceed as best you can. Ask the staff for help if you have questions.

At the beginning of this document, you can download a template for a project development sheet and a gant chart. All that is required of the user is to fill in the yellow cells. The gant chart will automatically plot out the task/project time line for you. This is a required part of your project management activities.