

Project Budgeting

A project budget is the estimated financial plan for a project, for which funding is required. The budget should include expenses anticipated to be incurred for a specified period of time, as well as the income that will be generated over the course of the project. An example would be the burial of a fiber optic cable from a telephone company to a major corporate client.

Let's first focus on the cost of the project. In order to complete the project, materials and equipment must be used and labor costs must be incurred. Some of the material costs include the cost of the optical fiber, the cost of the pipe to protect the optical fiber cable, the cost of transmitters and receivers, etc. Equipment costs include the cost of renting a backhoe, shovels, water pumps, etc. Labor costs include salaries and wages, workman's comp, payroll taxes, benefits, etc.

Assuming that the project manager has done a good job estimating the material, equipment, and labor requirements to complete the project, the project manager must calculate how much money will be required and also take into account the cost of money.

If the project cost is estimated to be \$1,000,000 and the funds are going to be loaned from a bank, the project manager must also consider the interest and fees that the bank will charge.

Simple Interest

When money is borrowed, interest is charged for the use of that money for a certain period of time. When the loaned money is paid back, the principal (amount of money that was borrowed) and the interest is paid back. The amount of interest depends on the interest rate, the amount of money borrowed (principal) and the length of time that the money is borrowed.

The formula for finding simple interest is:

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time}$$

Example 1

If \$1,000,000 was borrowed for 5 years at an 8% interest rate, the interest would be $\$1,000,000(8/100)5 = \$400,000$. The total amount that would be due would be $\$1,000,000 + \$400,000 = \$1,400,000$.

Compound Interest

Compound interest is similar but the total amount due at the end of each period is calculated and further interest is charged against both the original principal and the interest that was earned during that period.

To find a formula for future value, we'll write P for your starting principal, and r for the rate of return expressed as a decimal. (So if the interest rate is 5%, r equals .05). Your balance will grow according to the following schedule:

Year	Balance
Now	P
1	$P + rP$ (same as simple interest)
2	$(P + rP) + r(P + rP)$

This starts to get messy in a hurry. But you can simplify it by noticing that you can keep pulling out factors of $(1 + r)$ from each line. If you do that, the balances collapse to a simple pattern:

Year	Balance
Now	P
1	$P(1 + r)$
2	$P(1 + r)^2$

If you follow this pattern out for n years, you get the general formula for future value:

$$FV = P(1 + r)^n$$

If you wanted to compound it more than once a year, the formula would have to be modified to shorten the compounding periods. Here is the formula:

$$FV_n = P(1 + r/n)^{Yn}$$

Example 2

If \$1,000,000 was borrowed for 5 years at an 8% interest rate compounded monthly, how much interest would have to be paid to the bank? How much more interest would have to be paid compared to Example 1?

$$FV_n = \$1,000,000(1 + .08/12)^{5(12)}$$

$$FV_n = \$1,489,845.71$$

$$\$1,489,845.71 - 1,400,000 = \$89,845.71$$

Project Variables

Most projects have three basic variables that are interrelated: time, money, and quality. These three variables are normally taken into consideration when making any sort of decision that will affect the outcome of the project. Oftentimes, project managers are given projects with variable decisions already made or required to be within a certain range. For instance, the project might already have a set budget, or time deadlines that have already established.

Example 3

If a homeowner wants to put a fence around his property, he must first decide when it has to be done, what materials will be required, and who will be doing the work.

- A. If the project normally takes three days to complete and the homeowner needs for it to be done in two days, he will have to pay the workers overtime, which will add to the cost of the project.
- B. Normally, fence posts are put approximately two feet in the ground and held upright by the dirt surrounding the posts. If the homeowner wants to make the fence more durable, he would have to secure the fence posts with concrete. This would take longer and increase the cost of labor and materials.
- C. If the homeowner wanted to just use day laborer for the installation, it would be much cheaper than hiring a professional carpenter to install the fence. However, the quality of work by the carpenter would most likely be greater compared to the day laborer.

Breakeven Analysis

Generally, projects are planned and executed for investment purposes. Stores are built so retailers can sell products, cars are built to be sold, gas stations are built to sell gas, etc. In order for an investor to make an informed decision, the investor must estimate how long it will take for he/she to recoup the initial investment.

Example 4

If a public pier is built for \$200,000 and the city is charging \$10/day for fisherman to use it, how long will it take the city to recoup its investment assuming that 100 fisherman fish from the pier each day?

$$\$2,000,000 = \$10(100)(t)$$

$$t = 2,000 \text{ days or approx. } 5 \frac{1}{2} \text{ years}$$

Sample Problem 1

You are building an office building and want to borrow \$5,000,000 for the cost of construction. You would like a 5-year loan and the interest rate you are given on this loan is 7.5%. When you make the last payment, how much money will you have paid total including the interest payments?

Sample Problem 2

You visit a different bank and they offer you a \$5,000,000 loan to be paid over 7 years at 5% interest rate compounded quarterly (4 times per year). How much will you have paid total including the interest payments when you make the final payment?

Sample Problem 3

You are building a bridge, which will cost you \$10,000,000. You decide that you will place a toll booth on the bridge to help recoup some of the cost of the bridge. Each car will pay \$.25 to cross the bridge. Each day about 3000 cars cross the bridge (counting return trips as another car). If you'd like to recoup 25% of the cost of the project, how long will you have to leave the toll booth on the bridge?