

2. Looking first at only cost, what decision would you make?
3. After cost, what other factors should be considered before making a decision?

Appendix 5.1

Learning Curves for Estimating

A forecast estimate of the time required to perform a work package or task is a basic necessity for scheduling the project. In some cases, the manager simply uses judgment and past experience to estimate work package time, or may use historical records of similar tasks.

Most managers and workers intuitively know that improvement in the amount of time required to perform a task or group of tasks occurs with repetition. A worker can perform a task better/quicker the second time and each succeeding time she/he performs it (without any technological change). It is this pattern of improvement that is important to the project manager and project scheduler.

This improvement from repetition generally results in a reduction of labor hours for the accomplishment of tasks and results in lower project costs. From empirical evidence across *all* industries, the pattern of this improvement has been quantified in the *learning curve* (also known as improvement curve, experience curve, and industrial progress curve), which is described by the following relationship:

Each time the output quantity doubles, the unit labor hours are reduced at a constant rate.

For example, assume that a manufacturer has a new contract for 16 prototype units and a total of 800 labor hours were required for the first unit. Past experience has indicated that on similar types of units the improvement rate was 80 percent. This relationship of improvement in labor hours is shown below:

Unit		Labor Hours
1		800
2	$800 \times .80 =$	640
4	$640 \times .80 =$	512
8	$512 \times .80 =$	410
16	$410 \times .80 =$	328

By using Table A5.1 unit values, similar labor hours per unit can be determined. Looking across the 16 unit level and down the 80 percent column, we find a ratio of .4096. By multiplying this ratio times the labor hours for the first unit, we obtained the per unit value:

$$.4096 \times 800 = 328 \text{ hours or } 327.68$$

That is, the 16th unit should require close to 328 labor hours, assuming an 80 percent improvement ratio.