

Total Cost of Ownership (TCO)

When determining whether to buy an item or which item to buy, it's wise to base your decision on the total cost of ownership (TCO) for two reasons:

- 1) TCO includes not only the initial purchase price, but also the revenues/costs associated with implementing and using the item, as well as any revenues/costs that will occur when you're finished using the item and need to dispose of it.
- 2) Since the various costs and revenues may occur at different points in time, TCO translates them all to net present values (NPV).

Here are the steps you should follow:

1. Create a table with a row for each cost/revenue category (i.e. a type of cost or revenue) and a column for each time period you need to consider. (If your decision covers a five-year period, you should have a column for each year.)
2. For each category (row), figure out where or how to get the cost/revenue. If a value isn't given directly in the problem data, determine what logic or formula you should use to obtain it.
3. Enter each value in the table, using the logic/formulas you determined in step 2. (Although we call this the total COST of ownership, we're actually computing total VALUE, so show costs as negative values and revenues as positive values.)
4. Total the costs and revenues for each year. (i.e. Add the numbers in each column.)
5. Use the given discount factor to convert each year's sum (each column total) to a net present value.
6. Determine the TCO by summing the NPVs for all years.
7. If you're comparing alternatives, repeat steps 1-6 for the next alternative. (Note that you need to go all the way back to step 1 because different alternatives may have different kinds of costs/revenues.) Pick the alternative with the highest value.

To be sure you understand this correctly, practice these steps using the data from Example 11.1. When you're finished, check to be sure you got the same results the authors did. If you didn't, re-read their explanation and if you still don't understand, seek help from the instructor or a classmate.

Here's how to solve Problem 2 at the end of Chapter 11...

Although this problem looks different from the example shown in the chapter, it's still a TCO problem because we want to compare two different alternatives that will each incur several different kinds of costs. This problem is simpler than the chapter's example because we're only looking one year's costs, so we won't have to calculate NPV, and there aren't any revenue streams. But it's more challenging to figure out how to calculate each different kind of cost. The following table shows the costs that need to be considered and how to calculate them. Add them up for each supplier to find which one has the lowest TCO.

Cost category	What it represents	How to determine it	Example
Purchase Price	The price of the items is different for each supplier. In addition, both suppliers give quantity discounts, meaning that the price they charge depends on the size of our order.	The prices are given in the first three rows of the second table.	If we're looking at Supplier 1 and we're ordering 1,000 engines at a time, the table shows the engines will cost \$500 apiece.
Tooling cost	This is a one-time cost for the chosen supplier to purchase and install any machine tooling or equipment they'd need to produce our engines.	This is a fixed cost, given to us in the fourth row of the second table. The cost is different for the two suppliers, probably because one supplier already has more of what's needed than the other.	The tooling cost would be \$22,000 for Supplier 1 and \$20,000 for Supplier 2.
Ordering cost	This is a cost incurred each time an order is placed, regardless of how many engines are ordered. It includes things like labor costs for purchasing, tracking, receiving, and inspecting each order.	First, determine the number of orders placed during the year by dividing the annual requirement by the lot size being ordered. (On part b, you'll first have to determine the lot size by dividing the truckload size by the weight of an engine.) Then, multiply the resulting number of orders by the cost per order (third row of the first table) to get the total ordering cost.	For part a... $12,000/1,000 = 12$ orders $12 * 125 = \$1,500$ For part b... $40,000/22 = 1,818.18...$ (use 1,818 for lot size) $12,000/1,818 = 6.6$ $6.6 * 125 = \$825$
Holding cost (also called inventory carrying cost)	These are costs incurred for items you're holding (carrying) until they're needed. It includes things like warehouse costs, insurance, loss, theft, and cost of capital.	First, multiply the item's price by the holding rate (%) to find the holding cost per unit. Then, multiply that result by the average inventory level (# of units) to get the total holding cost. (The average inventory level is often assumed to be half of the lot size used to place orders.)	For Supplier 1 and a lot size of 1,000... $500 * 20\% = 500 * .2 = \100 $100 * (1,000/2) = \$50,000$
Transportation cost	Primarily the cost of shipping, usually based on the weight or volume of what's shipped.	Multiply the lot size by the weight per unit to find the weight of each order. Multiply that weight by the distance to be shipped and by the freight rate to get the shipping cost of one order. Finally, multiple that cost by the number of orders per year to get the total transportation cost. Note: Freight rates vary by the carrier and also by the quantity being shipped. If a shipment fills the entire truck, the freight rate is lower than the normal, less-than-truckload (LTL) rate.	For Supplier 1 and a lot size of 1,000... $1,000 * 22 = 22,000$ lbs/order $22,000/2,000 = 11$ tons/order The distance from Supplier 1 is 125 miles and since $22,000 < 40,000$, we use the LTL rate of \$1.20 per ton-mile. $11 * 125 * 1.20 = \$1,650$ Since we'll place 12 orders per year $1,650 * 12 = \$19,800$