

Cost-Benefit Analysis

Cost-benefit analysis estimates the total monetary value of benefits that will be derived from a project and compares that value to the cost of a project. Cost-benefit analysis helps decide if the planned project is worthwhile in financial terms.

To conduct a cost-benefit analysis, you may perform productivity studies, determine if startup funds are necessary, and determine the number of people involved to quantify cost and benefit.

For the RD exam, be able to recognize examples of cost-benefit analysis or situations where it should be used in contrast to methods like value analysis and value-added research.

For example – Should we remodel the foodservice kitchen?

The cost of remodeling is \$3.4 million and the expected revenue generated after the remodeling is \$2.7 million. Is the value of the remodeling greater than the cost of the project?

Expected revenue following remodeling (value) – cost of the project

$\$2.7 \text{ million} - \$3.4 \text{ million} = \text{negative (net loss)}$

$\$2.7 \text{ million} / \$3.4 \text{ million} = < 1$

In this example, the cost of remodeling is greater than what we would expect to generate following the remodeling. Perhaps the goal of the remodel is to increase the number of customers served, thus increasing revenue. When people decide to remodel their home, they often think of the cost of the remodel versus the increase in home value in case they want to sell. Some remodeling decisions translate to increases in home value while others do not.

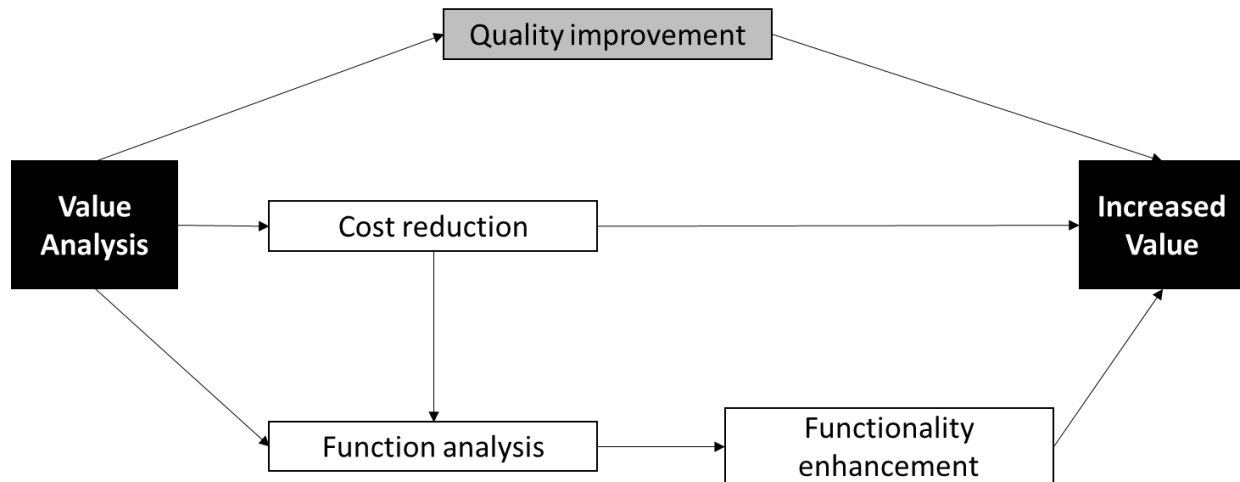
Value Analysis

Value analysis is the systematic assessment of every feature of a product to ensure its cost is no greater than is required to achieve its function. When evaluating a product, a manager might ask themselves, “Can the cost of this item or step be reduced or eliminated, without reducing the effectiveness, quality, or customer satisfaction?”

Value is a balance of quality and cost that is affected by many factors. Improving quality may not be cost-effective, that is, the increased cost spent to improve quality may not transfer into added value. Note that increasing the cost spent does not always add value. Another challenge is that standards of quality will vary by organization and product type. Thus, there is no single way to “increase quality” because there is no one single definition of quality. Specifically, in food service, quality is defined **by customer satisfaction**. Increased quality, in theory, should decrease costs by eliminating errors and mistakes – like food being sent back by a customer or thrown away because it did not sell.

Know that there are 5 factors that affect quality and they include money, materials, management, people, and market.

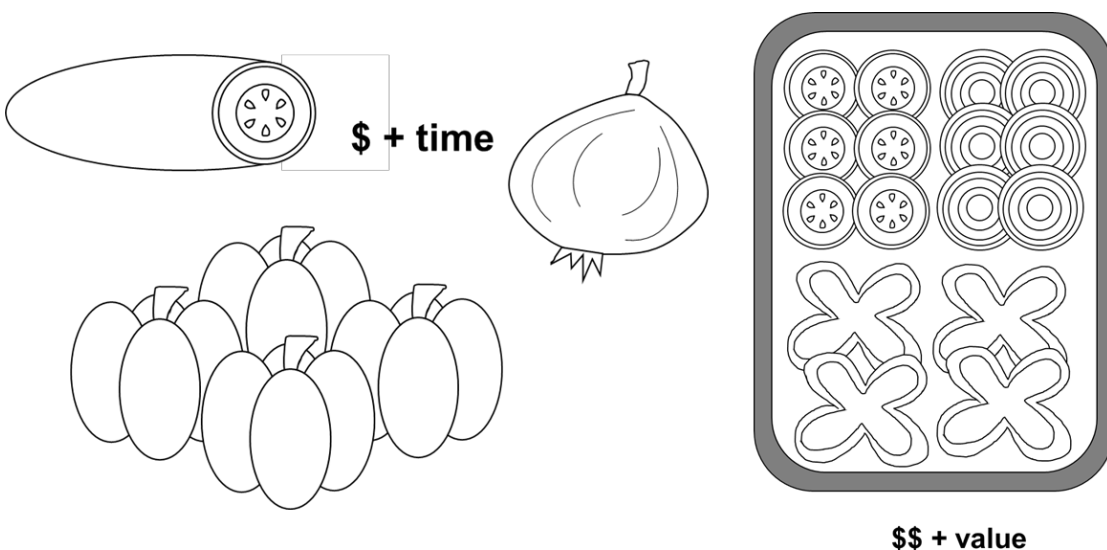
Here’s a schematic of how value analysis is related to increased value. The other terms in the diagram may sound familiar or they may come up again in your studies. Value analysis may result in quality improvement, cost reduction, or functionality enhancement, all 3 of which have the potential to increase value. Cost reduction in particular may increase value in that it increases profit while the value of the product to the customer remains the same.



Value-Added Research

“Value-added” is when a business adds something extra to a generic product that gives a greater perception of value. Thus, value-added research is the process of assessing if value should be added.

Pre-cut produce at the grocery store - A rising trend in grocery stores has been to cater to customers looking to eat healthy while short on time. Publix marketing shows that their pre-cut vegetables, including spiralized and ready-to-steam veggies, are “FRESH & CONVENIENT”, conveying added value to the customer.



Break-Even Point

Break-even point is when expenses and revenue are equal (total costs = total revenue). It's used to determine the number of sales or overall profits that will cover total costs.

Write down the definition of break-even point.

Total cost includes both fixed costs and variable costs.

$$\text{Total Costs} = \text{Fixed Costs} + \text{Variable Costs}$$

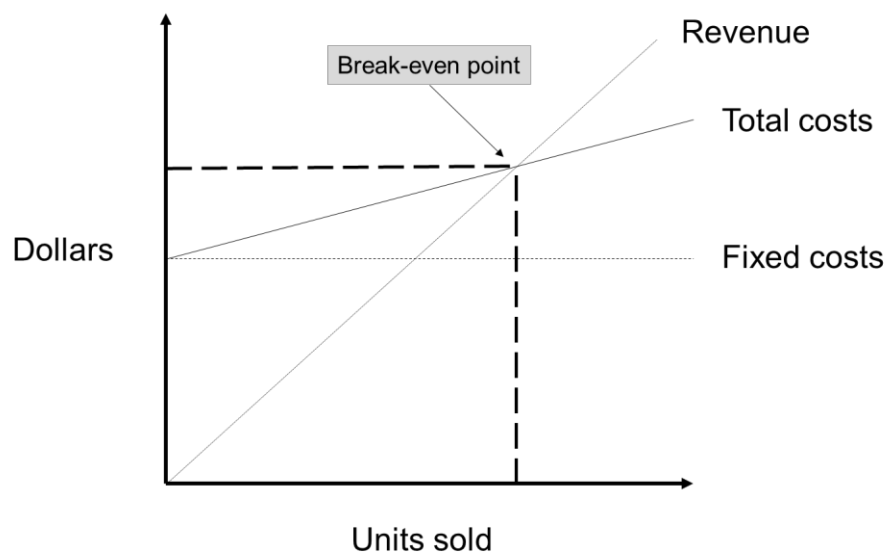
Fixed costs are the same over a time period and aren't relevant to output decisions – things like rent, equipment, insurance, interests, property taxes, salaries, and depreciation.

Variable costs vary with output and typically increase at a constant rate relative to labor costs and capital. Variable costs may include labor costs (hourly wages), utilities, and production costs.

To find the break-even point, find the point on the graph where the revenue line and total costs line cross one another. Then, draw the lines back to the y and x axis from the intersection to estimate dollars in revenue and units sold.

- What components make up total costs?
- What accounts for the difference between the fixed cost and total cost line?

To calculate the break-even point, you don't need to graph it by hand. Instead, you can use two different formulas, based on the information provided.



Given fixed costs, variable costs, and total sales, you can calculate the break-even point using formula 1. If you're given fixed costs, sales price per unit, and variable cost per unit, you can use formula 2.

$$\text{Formula 1: } \frac{\text{Fixed costs}}{\left(1 - \left(\frac{\text{Variable costs}}{\text{Sales}}\right)\right)}$$

$$\text{Formula 2: } \frac{\text{Fixed Costs}}{(\text{Sales price per unit}) - (\text{Variable cost per unit})}$$

Note that the denominator in formula 2 (Sales price per unit – variable cost per unit) is also known as the “Contribution margin”.

$$\begin{aligned} \text{Contribution margin} \\ = \text{Sales price per unit} - \text{Variable cost per unit} \end{aligned}$$

- If variable cost per unit goes down, the contribution margin goes up. What are variable costs?

Example 1.1

If fixed costs are \$85,000, variable costs are \$21,000, and total sales are \$420,000, calculate the break-even point.

Which formula will you use?

$$\text{Formula 1: } \frac{\text{Fixed costs}}{\left(1 - \left(\frac{\text{Variable costs}}{\text{Sales}}\right)\right)} = \frac{\$85,000}{1 - \left(\frac{\$21,000}{\$420,000}\right)}$$

First, calculate the denominator

$$\frac{\text{Variable costs}}{\text{Sales}} = \frac{\$21,000}{\$420,000} = 0.05$$

Variable costs comprise about 5% of all sales.

$$1 - 0.05 = 0.95$$

Then we divide fixed costs by 1 – proportion of variable costs relative to sales, which we just calculated.

$$\frac{\$85,000}{0.95} = \$89,473.68$$

Example 1.2

Given that fixed costs are \$85,000, sales price per unit is \$42, and variable cost per unit is \$12, we'll use Formula 2 and calculate the denominator first (the contribution margin).

$$\begin{aligned} \text{Formula 2: } & \frac{\text{Fixed Costs}}{(\text{Sales price per unit}) - (\text{Variable cost per unit})} \\ & = \frac{\$85,000}{\$42 - \$12} = \frac{\$85,000}{\$30} = 2,833 \text{ units} \end{aligned}$$

Note how in formula 1, we calculate the amount of revenue to equal expenses, but in formula 2, we calculate the number of units that we need to sell in order to generate said revenue.

Practice Question

On the exam you may be given a list of items, like below, or given direct estimations of fixed costs, variable costs, etc. In this example you'll walk through the steps you need to take to calculate break-even point. It might be more complicated than it seems at first!

Joe's Diner has the following financial numbers for the past 6 months. Calculate the break-even point.

Step 1: Go back to where the fixed costs and variable costs are described. Write whether each item below is a fixed cost, sales, or variable cost.

Rent: \$5,000	Utilities: \$2,500
Wages: \$12,050	Insurance: \$3,300
Food Purchasing Costs: \$13,110	Property Taxes: \$2,500
Total Sales: \$29,690	

Step 2: Calculate totals for each category (fixed costs, total sales, variable costs).

Step 3: Write down the break-even point formula you'll use in this question.

Step 4: Calculate the break-even point.

Full-Time Equivalents

We calculate full time equivalents (FTEs) because as a supervisor, you'll often receive your labor budget in terms of FTEs, not the number of employees you can hire.

On the exam, you may be asked to calculate FTEs based on the given information in a simple calculation, or it might be used for a patient-based or volume-based scenario.

FTEs: one full-time equivalent (1 FTE) is equal to 40 hours per week, or 8 hours per day (assuming a 5-day work week). An employee working 20 hours per week would be equivalent to 0.5 FTE.

What unit does FTE carry?

1 FTE = _____ = _____

In contrast to food calculation questions where we always round up our answer, you don't round your FTEs answers. Budgets can handle partial FTEs.

FTE Calculation Examples

Example 2.1: Given that full-time employees work 236 of 365 days per year (given vacation and benefit days), how many FTE are needed for daily coverage?

$$\frac{365 \text{ days/year}}{236 \text{ work days/year}} = 1.55 \text{ FTEs}$$

1.55 FTEs is required for each full-time position.

Why not 1 FTE for each full-time? Because its daily coverage (7 days a week)!

You can also write out the formula as:

$$\frac{365 \text{ days}}{1 \text{ year}} \times \frac{1 \text{ year}}{236 \text{ work days}}$$

Always remember that your units need to be opposite – see how year is in the numerator in one portion of the equation but in the denominator in the other? If you're having trouble deciding between multiplying and dividing, be sure to write out your formulas all the way, like I did here, to break up the units.

Example 2.2 You have 2 positions to fill, each for 7 days per week working 6:30am to 3pm with a 30-minute lunch. How many productive FTEs do you need for these positions?