

Cost Benefit Analysis (CBA)

Problem

How to financially evaluate a plan?

Difficulty

Some training required

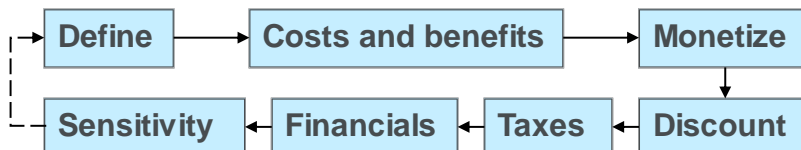
- A **Cost Benefit Analysis (CBA)** financially evaluates a plan.
- CBA compares costs and benefits
 - direct & indirect, tangible & intangible, opportunity costs, competitive benefitsto determine financial metrics
 - net present value (NPV), internal rate of return, payback period, ownership cost
- Costs and benefits are measured in monetary terms, then discounted.
- It can be challenging to identify all relevant CBA factors.
- CBA is often used to compare multiple alternatives.

- Project plan
- Alternatives (optional)

Cost Benefit Analysis Process

Quantitative analysis of plan(s)

1. Define the analysis framework (project scope)
 - Specify what will be changed.
 - Specify what effects must be considered.
2. Identity and classify costs and benefits.
 - That is, everything which contributes to the financial metrics.
3. Monetize the costs and benefits.
4. Discount the costs and benefits to obtain the net present values.
5. Determine the tax implications (if any).
6. Compute the desired financial metric(s).
7. Perform a sensitivity analysis to ensure credibility of results.
8. Accept results, or refine & repeat the analysis.



Cost Benefit Analysis – Invest in new HW and SW

Investment cost

Assume a 5% discount rate

Description		Year #1	Year #2	Year #3
Costs				
fixed	HW	8,500	0	0
	HW license	1,000	500	500
	SW	4,000	0	0
	SW licence	2,000	2,000	2,000
variable	Advertising	1,000	2,000	3,000
	Training	1,000	1,000	500
Costs - total		17,500	5,500	6,000
Discounted costs at 5%		17,500	5,238	5,442

Compute discount as $5,422 = 6.000 / (1+0.05)^2$

Investment benefit

Benefits		Year #1	Year #2	Year #3
tangible	Retire older HW & SW	4,000	4,000	4,000
	Increased productivity	3,000	3,000	3,000
	Reduced attrition	2,000	2,000	2,000
intangible	Employee satisfaction	500	500	500
	Client satisfaction	1,000	1,000	1,000
Benefits - total		10,500	10,500	10,500
Discounted benefits at 5%		10,500	10,000	9,524

\$28,180

\$28K is sum of values

\$10.5K is sum of values

\$30,024

\$ 1,844

\$1,844 = \$30K - \$28K

1.07

1.07 = \$30K/\$28K

Overall project benefit

Benefit cost ratio

Cash flow: inflow - outflow

cumulative cash flow

\$ (7,000)	\$ 5,000	\$4,500
\$ (7,000)	\$ (2,000)	\$2,500

Payback period (years)

2.44

2.5K = 4.5K + (-2.0K)

2.44 = 2 - (-2000)/4500

Internal Rate of return (IRR)

23%

Jan-22	Jan-23	Jan-24
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Payback period is the duration to break even on the original investments

IRR is the discount rate which makes the net present value of the project zero. (Computed using Excel's IRR function)

Cost Benefit Analysis – Notes

Slide 1

1. CBA was created by Jules Dupit in 1848.
2. When comparing two alternatives, it can occur that the preference order is reversed when tax considerations are included.
3. A project with unfavorable financials may be needed to meet regulatory requirements or if the project has strategic importance.
4. CBA inaccuracies can be caused by: inaccurate estimates, subjective assessments, confirmation bias, or if the project is too complex or very long.
5. Pros of CBA
 - A. Is a data-driven analysis
 - B. Is limited by the analysis framework
 - C. Can create a baseline for comparisons
 - D. Identifies projects with the most value
 - E. Includes tangible and intangible factors
6. Cons of CBA
 - A. May be unnecessary for smaller projects
 - B. May be expensive to perform
 - C. Relies critically on forecasted values
7. CBA accounts for the fact that, usually, most costs are in the initial years and most benefits are in later years.

Slide 2

1. In this example, 4 financial metrics are determined
 - Benefit cost ratio (1.07)
 - Internal Rate of return (23%)
 - Payback period (2.4 years)
 - Project benefit (\$1,844)
2. In this example, no tax considerations were included.
3. In this example, a sensitivity analysis could vary the discount rate, say, to assess the changes in the 4 financial metrics.