Cost Benefit Analysis

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1. Define a Cost Benefit Analysis (CBA)
2. Identify when a CBA is required
3. Explain the structure of a CBA
4. Identify the key components of a CBA
5. Outline the key aspect of reviewing a CBA
Exercise 1

In everyday English:

1. Define what a Cost Benefit Analysis is
2. Explain the objective(s) of a Cost Benefit Analysis
3. Outline the benefits of a Cost Benefit Analysis
A cost benefit analysis is an unbiased comparative analysis that presents facts and supporting details among competing alternatives.

A CBA considers life cycle cost and quantifiable and non-quantifiable benefits.

It should also consider quantifiable and non-quantifiable costs and benefits.
Cost-Benefit Analysis

1. Formal
   - Trade-Off Decisions
   - Equipment Purchases
   - Alternative Selection (AoA)

2. Informal
   - Day to Day Decisions
   - Joint Travel Regulation
   - Allocated versus Tax-Payer Perspective
   - Short-Term versus Long-Term Perspective
Cost Benefit Analysis is a:

*Decision support tool* or framework to systematically identify, analyze, and compare benefits and costs of alternative courses of actions.

*Communication tool* that answers the questions:

1. What are the financial and non-financial consequences if a proposed action or decision is implemented?

2. What are the proposed investment’s scope and objectives, as well as a basis for measuring future performance?

3. Which attributes of the project contribute most to the business objectives?
What’s in a Name?

Trade-off Analysis

- Business Case Analysis
- Benefit-Cost Analysis
- Cost Effectiveness Analysis
- Cost Utility Analysis
- Cost-Benefit Analysis
- Analysis of Alternatives
Purchase Decisions - Cost versus Benefit
Cost and Benefit Analysis

**Performance** and **Schedule** are balanced with **Cost** to get the highest benefit for the dollars spent.
Example - Analysis of Alternatives

- **Effectiveness**: 95% (Alternative 1), 92% (Alternative 2), 98% (Alternative 3), 95% (Alternative 4)
- **Life Cycle Cost**: $250M (KPP 1), $X M (KPP 2), $100M (LCC), $250M (IOC)
- **Cost – Effectiveness Ratio**: 2.63 (KPP 1), 1.08 (KPP 2), 3.06 (LCC), 1.57 (IOC)

**Mission Capability Needed**: Best balance between **PERFORMANCE** and **COST**
Cost Benefit Relationship

Smaller Workforce
Cost Savings
Efficiency
- Time
- People
- Dollars
Improved Performance

Costs
Benefits
## Cost Benefit Analysis is a:

<table>
<thead>
<tr>
<th>LCC Estimate and AOA</th>
<th>CBA Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breadth of Estimate</strong></td>
<td></td>
</tr>
<tr>
<td>Cradle to grave regardless of when completed</td>
<td>Snapshot profile, tailored to the decision</td>
</tr>
<tr>
<td><strong>Depth of Estimate</strong></td>
<td></td>
</tr>
<tr>
<td>Includes ‘sunk’ costs</td>
<td>Rarely includes ‘sunk’ costs</td>
</tr>
<tr>
<td>Includes all costs borne by DoD</td>
<td>Doesn’t include common costs</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td></td>
</tr>
<tr>
<td>Select an alternative</td>
<td>Select an alternative</td>
</tr>
<tr>
<td>Broken Out by Appropriations</td>
<td>Portions may be used for budget justification</td>
</tr>
<tr>
<td>Budget Justification</td>
<td></td>
</tr>
<tr>
<td><strong>Ground Rules</strong></td>
<td></td>
</tr>
<tr>
<td>Considers Assumptions</td>
<td></td>
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</tbody>
</table>
Benefits of a Cost focus

- Better Decisions
  - POM/BES Submittal
  - Supporting Unfunded Requirements
  - Budget Performance (Obs and Exp)
  - “What If” Drills

- Best Value
  - Technical Performance
  - Schedule Impacts
  - Contract Pricing
  - Contractor Performance Measurement

Cost Focus

Better Decisions

Best Value
Outcomes of a Cost Focus

- Develops Sensitivity Analysis
- Conducts Benefit Analysis
- Better Budget Justification
- Identifies Cost Drivers
- Compares Options
- Analyzes Assumptions
- Conducts Pricing Research
- Improved Budget Planning
- Measures Contractor Performance
- Conducts Payback Analysis
When is a CBA Required?

- All Acquisition Programs require an AoA, BC, EA, COA, and/or Cost Estimates
  - Statutory for MDAP and MAIS programs
  - Updated at all Milestone Decisions
- Performance-Based Logistics (PBL) Implementation Strategy
- Purchase versus lease decisions
- IT Evaluations
Cost Benefit Analysis Process

- **Problem or Decision Statement**
  - Status Quo
  - Others

- **Select Alternative**

- **Compare Alternatives**

- **Determine Selection Criteria**
  - Status Quo
  - Others

- **Determine Alternatives**

- **Analysis**
  - Deficiency Analysis
  - Sensitivity Analysis
  - Payback Period
  - Benefits Analysis
  - Present Value
  - Assumptions
  - Cost Analysis

- **Determine Selection Criteria**
Critical Thinking (Paul & Elder)

Elements of Thought

- Points of View
- Purpose of the Thinking
- Implications and Consequences
- Question the Issue
- Assumptions
- Information
- Interpretation and Inference
- Concepts
- Points of View

Elements of Thought

- Question the Issue
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Critical Thinking and Cost Benefit Analysis

- Problem or Decision Statement
- Analysis
  - Deficiency Analysis
  - Sensitivity Analysis
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Points of View

Implications and Consequences

Assumptions

Information

Concepts

Interpretation and Inference

Question the Issue
• Executive Summary
• Introduction/Overview
  • Subject, Purpose, & Objectives
  • Background & Organization
• Methods and Assumptions
  • Major Assumptions
  • Scope and Boundaries
  • Financial Metrics Used and Defined
  • Analysis Methodology
  • Cost and Benefit Model Used
• Business Impacts
  • Description of Alternatives
  • Costs and Benefits over time /Financial Analysis
  • Non-quantitative Factors, Criteria, and Rationale
  • Comparison of Alternatives (quantitative and qualitative )
• Sensitivity and Risks
• Conclusions and Recommendations
Leadership needs to be involved (upfront)
  • Review/Approve the Problem Statement
  • Review/approve the Course of Action

A Cost Benefit Analysis:
  • Must be tailored to fit the problem/situation
  • Is a tool; it doesn’t replace judgment and doesn’t make the decision
  • CBAs are decision supporting documentation and are subject to audit
Financial Quantitative Methods

- Net Present Value (NPV) – Required
- Other Methods
  - Internal Rate of Return (IRR)
  - Benefit/Cost Ratio (BCR)
  - Break-even Point (BEP)
  - Payback Period

Decision-makers may need to be educated on methods
Discounting

Which would you prefer, $1M today or $1M in ten years?

Why?

• By having it now, I can spend or invest it
• By investing it, I can turn it into more

Future costs and benefits must reflect today’s value
Net Present Value (NPV)

- **Present Value (PV):** the current worth of future dollars
  - Cash inflows or outflows
  - Based on a specified rate of return
- **Net Present Value:** the difference between the PV of cash inflows (benefits) and the PV of cash outflows (costs).

\[
PV = \frac{\text{Future Value}}{(1 + \text{Discount Rate})^{\text{number of years}}}
\]

\[
\text{NPV} = \text{PV Benefits less PV Costs}
\]
Net Present Value (NPV)

- Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows.
- All costs and benefits reduced by the same discounted rate (interest or internal rate of return).
- Economic life must be:
  - Equal to the period of analysis
  - Specified
  - Equal for all alternatives

Pump A has a useful life of 6 years
Pump B’s has a life of 12 years
Must use the same useful life for both to calculate comparable NPVs
- Purchase a 2nd pump A at the 6 year point (12-year useful life)
  - or
- Salvage pump B at the 6 year point (6-year useful life)
Internal Rate of Return (IRR)

- The value of the internal use of capital
- Higher is better

Managerial Accounting/Economics Definition:

- The return on investment (ROI) of investing in the company
- Rationale: If my IRR is 18% and I can earn 25% by purchasing stock in another company; why would I invest in my company?

DoD Definition:

- The discount rate where NPV = 0
- PV Inflows = PV Outflows
Benefit - Cost Ratio

• Similar to Return on Investment (ROI)
  • The ratio of money gained or lost on an investment relative to the amount of money invested
  • Return / Investment
• Benefit-Cost Ratio = PV Benefits / PV Costs
  • Higher is better
  • Benefit-Cost Ratio of 1 indicates PV Benefits = PV Costs

Sometimes called Discounted Return on Investment
Payback Period

- Point in time where investment is recouped
  - Benefits equal costs
- Typically not discounted
- Smaller is better
- Rough measure
- Ignores totality of benefits

Discounted Payback Period can be calculated
Summary

• CBA is the ‘heart’ of any decision or problem determination
  • There are many different definitions and focuses
• CBA is required for specific decisions
  • AOA, Lease versus Buy, A-76 Studies
• Decision factors/considerations should drive the format
  • Content is more important than format
• Valuable tool
  • Decision support
  • Communication
  • Established approach with a flexible analysis process
  • Does not replace judgment; doesn’t make decisions

Assumptions drive the analysis