Business Case Analysis – Methodology, Framework, and Considerations

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Some Guiding Advice for BCA

“If all you have is a hammer, everything looks like a nail.”

- BCA is about “What problem is being solved?”
  - Don’t lead with the solution

- The right solution takes time to formulate. No easy fix.

- Transparency and hard numbers instill confidence and allow for outside input

- Business case should be treated as its own “mini-project”

- Correctness, Clarity, Unbiased, Efficient
Structure of Business Case

1. Define the problem / opportunity
   → What problem are we trying to solve?

2. Define the scope and state facts/assumptions
   → What is the application and what do we have to work with?

3. Define and describe alternatives
   → What are our options and what do they involve?

4. Identify quantifiable and non-quantifiable metrics
   → How do we measure the performance, acceptance, or use?

5. Develop cost estimates
   → How much does it cost to install, operate, and train?

6. Define selection criteria
   → What is important for our organization and application?

7. Compare Alternatives
   → How do the options compare to each other (technical, operational, risks)?

8. Report Results and Recommendations
   → Which direction should we go?
Define Problem & Scope

What problem are we trying to solve?

1. **Describe the problem**
   a. Application or role in operations
   b. Key assumptions
   c. Boundaries, limitations
   d. Minimum solution requirements

2. **Summarize the impact of the problem**
   a. Identify all stakeholders
   b. How does this fit in with my organization’s mission or business strategy

3. **Identify the decision to be made**

   • *Too early to formulate a complete value proposition*
     – Assumes a certain solution or outcome
     – Part of final recommendations
Define Alternatives

• **Suitability, Feasibility, Acceptability, Distinguishability, Completeness**
  
• No predefined options or process for identifying
  – Involve teams and SMEs when possible
  – Highly dependent on application, mission, and technology area

• **Strive for 3+ Alternatives**

• Include Status Quo (As-Is) whenever possible
  – New requirement may eliminate status quo

• Define for each Alternative
  – Technical
  – Functional
  – Operational

1. Status Quo
2. Enhanced Status Quo
3. Full Replacement
Define the Attributes

• Characteristics of the Alternatives relevant to the problem
  – Inputs to be used in the comparison, rating, and decision
  – Technology and application dependent
  – Use attributes applicable to all Alternatives being considered

• Quantifiable
  – Equal Error Rate, Failure to Capture, FMR @ FNMR of X, Access Time
  – Time to process access/visit, # Arrests/Month, Duration of Traffic Stop

• Non-Quantifiable
  – Compatibility with IT Infrastructure, Maintenance complexity
  – Ease of Use, User Acceptance, Physical Ergonomics, Vendor Tech Support, Training Reqs

• Consider data collection to turn NonQuant into Quant
  – Surveys, additional research, pilot efforts
Attribute Groups

- Group key performance measures by type
- Each group should strive to have 3+ attributes
- Addresses imbalances and improves weighting the priorities

**Example Attribute Set #1**

*Technical Performance*
- FNMR at FMR X
- Failure to Capture
- Failure to Enroll
- Query Response Time

*Sustainment*
- Complexity
- Frequency of Maintenance

*Operational Suitability*
- Ease of Use
- Compatibility (existing processes)
- Required training
- Productivity Impact

**Example Attribute Set #2**

*Technical Performance*
- Failure to Access (i.e., FNMR)
- Security (i.e., FMR)
- Failure to Enroll
- Access Time (i.e., Query Time)

*Sustainment*
- Complexity
- Frequency of Maintenance

*Operational Suitability*
- Ease of Use
- Compatibility (existing processes)
- Required training
- Productivity Impact
Grading the Attributes

- Turn the ratings for attributes into comparable quantities
- What constitutes Excellent, Good, Average, Fair, Poor?
- Recommend simple 1-3, 1-5, or 1-10 scale
- Set thresholds for each grade of each attribute
- Quantitative > Qualitative
  - Consider data collection efforts

<table>
<thead>
<tr>
<th>Grade for Failure to Access</th>
<th>Rating (Biometric or Smart Card)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent (5)</td>
<td>FNMR or Fail to Read (FTR) &lt; 1%</td>
</tr>
<tr>
<td>Good (4)</td>
<td>FNMR or FTR 1-5%</td>
</tr>
<tr>
<td>Average (3)</td>
<td>FNMR or FTR 6-10%</td>
</tr>
<tr>
<td>Fair (2)</td>
<td>FNMR or FTR 11-15%</td>
</tr>
<tr>
<td>Poor (1)</td>
<td>FNMR or FTR &gt;16%</td>
</tr>
</tbody>
</table>
Costs – Investment, Operational

• Consider all cost elements during lifecycle
• Develop based on organization cost cycles
  – Investment + (Annual Operation x # yrs)

• Installation
  – Hardware
  – Software
  – Infrastructure (physical, integration with legacy)
  – Vendor/Contractor Labor

• Training
  – Users
  – Sustainment Staff

• Operation
  – Effect on business processes
  – Effect on daily activities

• Sustainment
  – Facility Costs & Overhead
  – Support Staff
  – Equipment repairs/replacements
  – Software Licenses
Selection Criteria & Weighting

• Stakeholders - Priorities and weighting

• Restate minimum solution requirements

• Revisit defined problem and scope

• Sum of Groups = 1.00

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Performance</td>
<td>0.5</td>
</tr>
<tr>
<td>- Failure to Access</td>
<td>(0.15)</td>
</tr>
<tr>
<td>- Security</td>
<td>(0.2)</td>
</tr>
<tr>
<td>- Failure to Enroll</td>
<td>(0.05)</td>
</tr>
<tr>
<td>- Access Time</td>
<td>(0.1)</td>
</tr>
<tr>
<td>Sustainment</td>
<td>0.2</td>
</tr>
<tr>
<td>- Complexity</td>
<td>(0.15)</td>
</tr>
<tr>
<td>- Freq. of Maintenance</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Operational Suitability</td>
<td>0.3</td>
</tr>
<tr>
<td>- Ease of Use</td>
<td>(0.05)</td>
</tr>
<tr>
<td>- Compatibility with existing processes</td>
<td>(0.2)</td>
</tr>
<tr>
<td>- Required training</td>
<td>(0.05)</td>
</tr>
<tr>
<td>- Productivity Impact</td>
<td>(0.1)</td>
</tr>
</tbody>
</table>
# Trade-off Analysis

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Weight</th>
<th>Alt 1 Grade</th>
<th>Alt 1 Score</th>
<th>Alt 2 Grade</th>
<th>Alt 2 Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Performance</td>
<td>0.5</td>
<td>2.00</td>
<td></td>
<td></td>
<td>1.55</td>
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<tr>
<td>- Failure to Access</td>
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<td>4</td>
<td>0.6</td>
<td>4</td>
<td>0.6</td>
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<tr>
<td>- Security</td>
<td>(0.2)</td>
<td>5</td>
<td>1.0</td>
<td>2</td>
<td>0.4</td>
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<tr>
<td>- Failure to Enroll</td>
<td>(0.05)</td>
<td>2</td>
<td>0.10</td>
<td>5</td>
<td>0.25</td>
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<tr>
<td>- Access Time</td>
<td>(0.1)</td>
<td>3</td>
<td>0.3</td>
<td>3</td>
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<tr>
<td>Sustainment</td>
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<td>0.75</td>
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<td>- Complexity</td>
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<td>0.45</td>
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<tr>
<td>- Freq. of Maintenance</td>
<td>(0.05)</td>
<td>4</td>
<td>0.2</td>
<td>3</td>
<td>0.15</td>
</tr>
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<td>Operational Suitability</td>
<td>0.3</td>
<td>1.55</td>
<td></td>
<td></td>
<td>1.4</td>
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<td>0.15</td>
<td>5</td>
<td>0.25</td>
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<tr>
<td>- Compatibility with existing processes</td>
<td>(0.2)</td>
<td>4</td>
<td>0.8</td>
<td>4</td>
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</tr>
<tr>
<td>- Required training</td>
<td>(0.05)</td>
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<td>0.1</td>
<td>3</td>
<td>0.15</td>
</tr>
<tr>
<td>- Productivity Impact</td>
<td>(0.1)</td>
<td>5</td>
<td>0.5</td>
<td>2</td>
<td>0.2</td>
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<tr>
<td><strong>TOTAL SCORE</strong></td>
<td></td>
<td><strong>4.2</strong></td>
<td></td>
<td></td>
<td><strong>3.7</strong></td>
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</table>
## Cost-Benefit Analysis

<table>
<thead>
<tr>
<th></th>
<th>Alt #1</th>
<th>Alt #2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost (Invest + Op)</strong></td>
<td>$16.5M</td>
<td>$15M</td>
</tr>
<tr>
<td><strong>Cost (Invest)</strong></td>
<td>($14M)</td>
<td>($10M)</td>
</tr>
<tr>
<td><strong>Cost (Operational/yr x 5)</strong></td>
<td>($0.5/yr x5)</td>
<td>($1/yr x5)</td>
</tr>
<tr>
<td><strong>Trade-Off Score</strong></td>
<td>4.2</td>
<td>3.7</td>
</tr>
<tr>
<td><strong>Cost Benefit Index (CBI)</strong></td>
<td><strong>3.93</strong></td>
<td>4.05</td>
</tr>
</tbody>
</table>
Risk Assessment

• **Risk Management**
  1. Planning
  2. Identification
  3. Assessment
  4. Review and Update

• Level of risk management depends on scope

• Develop response strategies for High priority risks
  – (Avoid, Transfer, Mitigate, Accept)
Risk Likelihood/Consequence Matrix

### Step One: Assess the likelihood and consequence of each risk.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Likelihood</th>
<th>Consequence</th>
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</thead>
<tbody>
<tr>
<td>VHI</td>
<td>~90%</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>HI</td>
<td>~70%</td>
<td>Severe</td>
</tr>
<tr>
<td>MED</td>
<td>~50%</td>
<td>Moderate</td>
</tr>
<tr>
<td>LO</td>
<td>~30%</td>
<td>Minimal</td>
</tr>
<tr>
<td>VLO</td>
<td>~10%</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

### Step Two: Plot results on matrix to determine risk score and priority.

The matrix is color-coded with green for low (L), yellow for moderate (M), and red for high (H) to visually represent the likelihood and consequence levels.
Example Risk Response

Example

• **Cause:** Because FBI revises security requirements…

• **Uncertain Event:** Fingerprint sensors have to be upgraded ahead of schedule…

• **Impact:** Resulting in an additional $100k in equipment and labor costs during 5 yr cycle.

• **Priority (Likelihood, Consequence):** High (VHI, Mod)

• **Response:** Mitigate – Add current NIST technical guide being used as standard foundation as a hardware requirement
Sensitivity Analysis

• Examines sensitivity of attribute scoring and cost on uncertainties and risks

• Critically examine uncertainty in Alternatives
  – Focus on high weighted attributes
  – Focus on attributes impacted by high risks

• Recalculate scoring using multiple scenarios
• Input into recommendation and decision process

→ The best CBI may not be the best recommendation
## Sensitivity Analysis

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<tr>
<td>Technical Performance</td>
<td>0.5</td>
<td>4</td>
<td>1.80</td>
<td>4</td>
<td>1.55</td>
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<td>2</td>
<td>0.6</td>
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<td>processes</td>
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<td>0.5</td>
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- Example: Alt 1 Security grade drops to 4 due to risk event
- Cost-Benefit Index increases to **4.125** (> 4.05 of Alt 2)
Recommendation & Reporting

• **Why is Alternative X the right course of action…**
  – Feasibility
  – Benefits
  – Cost
  – Comparison to other Alternatives
  – Risks
  – Pilot efforts or data collections to test or strengthen Business Case

• **Strive for Correctness, Clarity, Unbiased, Efficient**
References

• U.S. Army Cost Benefit Analysis Guide 3\textsuperscript{rd} ed. (http://goo.gl/ru6ZVf)

• PMBOK Guide 5\textsuperscript{th} ed. (http://www.pmi.org)

• Risk Management Guide for DoD Acquisition (http://goo.gl/jtXmEJ)

• Practical Project Risk Management: The ATOM Methodology (Management Concepts, Inc.)


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