Conducting an Analysis of Alternatives

WHAT IS AN ANALYSIS OF ALTERNATIVES

The purpose of an analysis of alternatives (AoA) is to assess the effectiveness, cost, and risks of alternatives that have potential to close or mitigate the capability gaps identified in the business problem and subsequent process analyses. An AoA helps identify more cost effective alternatives, validate the appropriateness of the selected solution, reduce risks, and improve performance.

The AoA should assess critical technology elements associated with each proposed solution, including technology maturity, integration risk, manufacturing feasibility, technology maturity, and demonstrated needs. It must provide compelling evidence of the capabilities and worth of the alternatives. The results should enable decision makers to discuss the appropriate cost, schedule, performance, and risk tradeoffs and assess the capabilities and affordability of the alternatives.

PLANNING FOR THE AOA

The first step in producing a successful AoA is the creation of a well-considered study plan. The study plan (or outline) establishes a roadmap for how the analysis should proceed, who is responsible for doing what and why it is being done. The study scope defines the focus of the study by describing what is, and is not, in the study. Ultimately, the scope is driven by the information decision makers need to make a decision; previous analyses; and ground rules, constraints, and assumptions.

When determining the scope of the study, the team should consider the decision to be supported, the capability gaps to be assessed, previous analyses, what information is already known and not known about the alternatives, the end-to-end effects, a clear understanding of the baseline capability, and limitations on the AoA including constraints imposed by time and resources.

The following fundamental aspects of the effectiveness, cost, and risk analyses should be addressed in the study and can be the basis for your study plan or outline:

- Defined business processes, measures of effectiveness, measures of suitability, and measures of performance.
- Specific tools or techniques under considerations.
- Cost capability and other sensitivity analysis.
- Operational scenarios used for the comparison.
- Assumptions and constraints.
- Cost analysis approach that includes the development of life cycle cost estimates and what they include (i.e., research, development, test and evaluation), procurement, operations and support, and disposal costs).
- Risk assessment methodology used.
- Criteria for viable versus non-viable alternatives.

An AoA should be conducted during the Concept phase to explore alternative concepts and methods to satisfy the business need.

AOA KEY CONCEPTS AND STEPS

The following comprise major elements of the AoA:

1. The technology gaps and capability gaps. What need is the intended solution supposed to meet?
    a. Know the baseline before beginning the AoA. For most AoAs, there is an existing capability, but it may be nearing end of life or does not satisfy current needs. Understanding the baseline is important for the future comparisons contained in the analysis. Internal technology consultants or support personnel may need to be involved in the creation or review of the baseline if the system is not well documented. They should also be enlisted to help forecast an upgrade path for the baseline alternatives.
    b. In AoA studies, the baseline is defined as the existing system, funded and operated according to current plans. This includes improvements, such as additional procurement, additional maintenance, or other efforts to continue to provide the baseline level of capability, that are scheduled and approved for future years. The baseline capability includes legacy systems, their approved modifications, and existing and/or planned systems.
2. Agency mission. What elements of the agency mission will be supported (what is the business need)?
3. Identify viable alternatives or representative solutions (systems/programs).
    a. Most organizations require at least 3-5 viable alternatives. The alternatives should be realistic and grounded in industry (normally via requests for information or market research). The study should avoid contriving idealized alternatives that have no basis in industry or government.
    b. Additional alternatives may be required, such as when there is more than one system integration option or if there are substantially different options for the scope, technical approach, or other aspect of a new system.
    c. General practices emphasize the exploration of the full range of viable modifications to baseline systems in the AoA. These alternatives are generally referred to as baseline+ or modified baseline. The team should consider having multiple alternatives with appropriate modifications, rather than one with all potential modifications.
    d. Below is a short list of potential alternatives to include:
        i. Status Quo (“do nothing”)
        ii. Integration or partial replacement (modified legacy systems)
        iii. Interfacing (output handoffs and add ons)
        iv. Repurposing and/or recombining existing systems with new pieces in a system-of systems approach,
        v. New system (new requirements or full replacement of old system), including As-is or modified commercial, government, or allied off-the-shelf systems,
        vi. Duplicative efforts (similar systems exist).
4. Consider project requirements. These include:
    a. Schedule – phasing, durations, milestones.

b. Cost – full life cycle costs to include design, development, testing, training, migration, implementation, and operations and maintenance both in total and by fiscal year.

c. Security. Conformance with government and industry security standards.

d. Risk. Assessment of cost, schedule, security, technical, and overall risk.

i. Risks are important to assess because there may be technical programmatic, or operational uncertainties associated with differing alternatives that should be considered in determining the best approach.

e. Enterprise Compliance.

5. Identify, request and evaluate data from the representative systems and programs that are determined to be viable.

   a. Early in the AoA, it may be possible to screen out some alternatives because they are non-viable.

6. Present your findings in a table format or spreadsheet for easy reference and scoring. A sample Detailed Solution Comparison table is shown below.

Example 1 – Solution Comparison – Decision Criteria

Decision Criteria	Solution 1	Solution 2	Solution 3
Business Process Impact	Very Good	Very Good	Fair
Technical Feasibility	Very Good	Good	Fair
Maturity of Solution	Very Good	Fair	Good
Resources Required	Good	Good	Good
Constraints Impact	Good	Good	Fair
Cost Benefit Analysis	Very Good	Good	Very Poor
Return on Investment	Very Good	Good	Very Poor
Other	Very Good	Fair	Very Poor
Total	Very Good	Good	Poor

Rating Scale: 1 = Very Poor, 2 = Poor, 3 = Fair, 4 = Good, 5 = Very Good.

Potential Cost Considerations: total cost of ownership, software licensing and annual maintenance, implementation, training and documentation, hosting, help desk, security, hardware procurement and replacement cycles, contracts, IV&V, staff (including travel), interfaces systems/data exchange fees, intangible (disruption to program and users), risk analysis/mitigation

Example 2 – Solution Comparison – Cost/Benefit/ROI Analysis

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost Benefit Analysis* (Perform for Each Alternative)						
Year to year Staffing Change						
Operational Costs						
Revenue						
Total Project Cost						
Net Benefit**						
Cost/Benefit Summary						
ROI Analysis (Perform for Each Alternative)						
Payback Period (yrs)						
Breakeven Fiscal Year***						
Net Present Value (NPV)						
Return on Investment (ROI) %						

* How long it will take to break even on the project investment

** NPV accounts for the time value of money. It is more appropriate for long projects

*** This is the year in which the project's investment costs are recovered.

7. Score your selections. A selection of examples is shown below. You may use one method or set of criteria or a blend, depending on the needs of your decision-makers.

Example 3 – Simple Scoring, Weighted Scale

Criteria	Baseline (Weight)****	Alternative 1 (e.g. Interfacing)	Alternative 2 (e.g. New)	Alternative 3 (e.g. Duplicative)
Alternative Description				
Feasibility	5 *	(-1, 0, +1)	(-1, 0, +1)	(-1, 0, +1)
Risk Adjusted Lifecycle Costs**	4*			
Risk Adjusted Lifecycle Benefits***	1*			
Maintainability	3*			
Availability of Resources	2*			
(Other Factors as Appropriate)				
Sum of Positives				
Sum of Negatives				
TOTAL				

* Example only, rate by importance for your project

** The overall estimated cost over the life of the investment that has been adjusted to accommodate any risk identified.

*** Projected benefits and costs for each viable alternative.

****Multiple the weight by the factor (-1, 0, or +1) in the alternative rating

Example 4 – Weighted Scoring

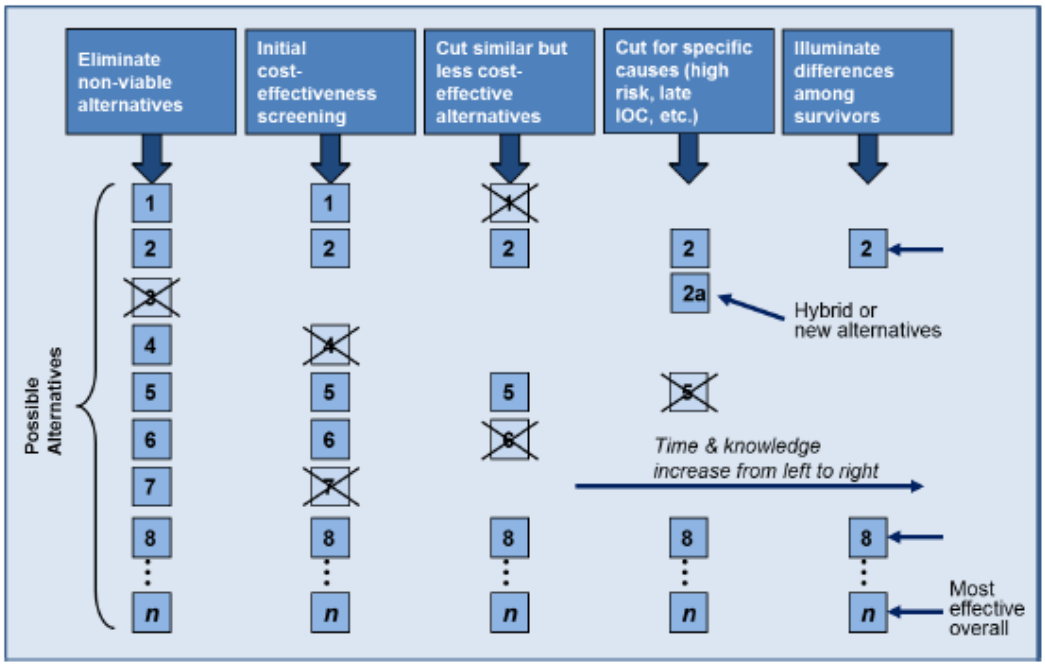
Criteria	Weight	Baseline Current	Alternative 1 (e.g. Interfacing)	Alternative 2 (e.g. New)	Alternative 3 (e.g. Duplicative)
Alternative Description					
Mission	100*	Score 1 to 10 then multiply by weight	(e.g. "6" x 100 = Score of 600)		
Requirements	90*				
Schedule	60*				
Costs	70*				
Security	80*				
Risk	70*				
Enterprise Compliance	90*				
(Other Factors as Appropriate)					
TOTAL					

* Example only, rate by importance for your project

8. As the AoA progresses, additional alternatives may be screened out for a variety of reasons including poor performance, high risk, or higher costs than comparably performing alternatives. In other cases, continued analysis of alternatives that have already demonstrated potential may not provide any additional useful information. In these cases, and with the approval of governance, the team should discontinue further evaluation and apply the study team's time and resources elsewhere.

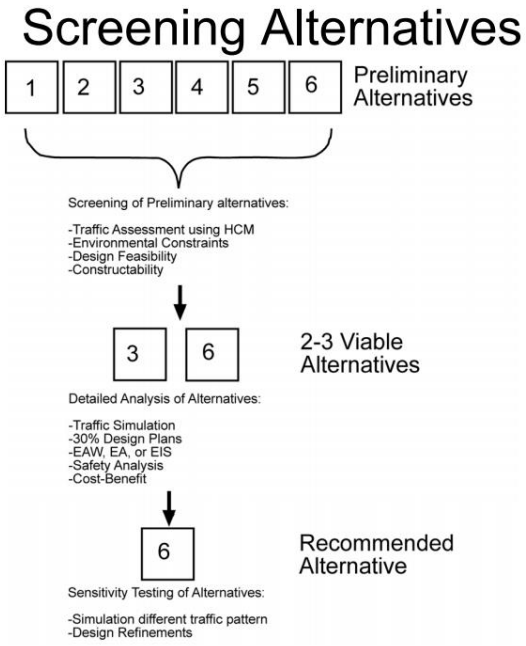
9. Select alternatives for final comparison. Two examples of methods for screening alternatives are shown below:

Example 5



U.S. Department of Defense ADDM: Analysis of Alternatives Study Guidance Version 1.0

Example 6



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10. Beware of premature convergence.
    a. A recent GAO study attributes premature focus on a particular solution or range of solutions as a failing of AoAs. If stakeholders are already enamored with a particular solution, completing a full AoA may be difficult. The intention is to survey a broad range of alternatives to ensure the best value and technical match to the need. A narrow scope or attention paid to a particular solution renders the AoA ineffective for decision making and leads to increased risk in the resulting program.
11. Present Recommendations. These may include the following:
    a. Weighted score from analysis tools
    b. Specific recommended solution
    c. Explanation of why solution was selected over all others.
    d. Supporting documentation showing analyses, scoring and selectin (show your work)

Analysis of Alternatives – Major Steps and Tasks Summarized

Step 1	Step 2	Step 3
During Concept – Phase 1		
Requirements Analysis (business gaps, technical gaps, assumptions, criteria, alternatives) **Market Survey**	**Decision Analysis** (prioritization, rating alternatives, risks)	**Decision to Recommend** the best solution and prepare a final report
Tasks -Baseline -Literature review -Stakeholder Interviews -Technologies -Analysis -Market Survey	***Tasks*** -Initial Prioritization of Solutions -Risk Analysis (risk of alternatives, operational risk financial risk, technical risks, cognitive bias, etc.) -Scenario Analysis -Techniques (statistical methods, regression)	***Tasks*** -Develop final prioritized solutions -Conduct cost benefit analysis -Present pros and cons of alternatives -Recommend the best solution -Develop risk mitigation plan for selected solution -Prepare report
During Concept – Phase 2		
Detailed Business Requirements **Detailed Technical Requirements**	**Baseline Project Plan**	**Final Cost Analysis**
Tasks -Detailed business requirements -Detailed technical requirements -Use cases	***Tasks*** -Effort Estimates -Resource Estimates -Cost Estimates -Baseline Project Plan	***Tasks*** -Cost components -Cost analysis -Benefit components -Cost analysis