



Managing Capital Investments at the Indian Health Service

A How-To Guide for An Analysis of Alternatives

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DOCUMENT CHANGE HISTORY

Version	Release Date	Summary of Changes
1.0	July 20, 2007	Initial release
2.0	October 31, 2008	Revised initial release to emphasize knowledge of investment requirement prior to developing an analysis of alternatives.
3.0	January 6, 2015	Update document to be consistent with current best practices; Delete Appendix with copy of sample report.

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PURPOSE

This guide is intended for use by Indian Health Service (IHS) project managers and project team members when conducting an analysis of alternatives for meeting an investment's objective and supporting the mission requirements of the organization.¹ The guide's purpose is to provide a basic, easy to use, step-by-step method for identifying and analyzing investment alternatives consistent with the policies and requirements of the Office of Management and Budget (OMB) and IHS. It is not intended to be a comprehensive reference guide.

The guide is divided into two sections. The first section, The Basics, provides the background and explanation for the analysis of alternatives. The second section, The Analysis, describes the process and contents of the analysis of alternatives. The guide also contains an example of an outline of the report documenting an analysis of alternatives for an investment (see Analysis of an Alternatives Report).

This is a generic guide. It is intended to be used by project managers of all projects. However, it does provide specific guidance for project managers who are required to complete an investment defined as a major project by the Department of Health and Human Services (HHS).

¹ Because this guide supports the Capital Planning and Investment Control (CPIC) process, the term "investment" is defined as being a project, program, system, or other asset that falls under the purview of the CPIC process.

THE BASICS

WHAT IS AN ANALYSIS OF ALTERNATIVES?

The analysis of alternatives is an evaluation tool that helps stakeholders and agencies identify and select investments that will achieve essential mission performance goals and objectives with minimal risk, lowest life-cycle costs, and greatest benefit to the organization.

WHY CONDUCT AN ANALYSIS OF ALTERNATIVES?

An analysis of alternatives provides a consistent method for identifying, understanding, and evaluating investment alternatives and for selecting the best investment. The analysis of alternatives is used to select Information Technology (IT) investments that will support core mission functions that must be performed by the federal government and demonstrate projected returns on capital investment that are clearly equal to or better than alternative uses of available public resources.

The Clinger Cohen Act of 1996 requires that each federal agency must have a documented capital investment program that defines the following:

- How the agency will select a capital investment.
- How the agency will control the investment, once it is initiated, to achieve intended cost, schedule, and performance outcomes.
- How the agency will evaluate the performance of the investment, once it is operational, to ensure that it continues to maintain a positive return on investment (ROI).

The analysis of alternatives supports all three phases of the Capital Planning and Investment Control (CPIC) process: select, control, and evaluate. The analysis of alternatives is the process by which the solution to a set of objectives (requirements) is chosen. The documented analysis of alternatives directly furnishes the information required in the OMB business case that justifies the selection of the chosen solution, and it indirectly contributes both to identifying the development and implementation milestones and activities and to establishing the performance goals for the operational solution.

The analysis of alternatives directly supports the select phase of the CPIC process by recommending the project or program solution, the budget for it, and the justification through benefits and financial ROI. From the approach selected, acquisition activities and measurable milestones can be developed to feed the earned-value management system (EVMS) that is required by OMB. The EVMS will be used to monitor and control (control phase) the development and implementation of the selected alternative.

The analysis of alternatives includes an estimate of the benefits (and ROI) of the chosen solution. Once implemented, actual performance is measured against the estimated performance (benefits) projected in the analysis of alternatives. The analysis of alternatives estimates expected outcomes (performance). After implementation, actual performance is measured against these projections to determine if the value received from the project or program (evaluate phase) met expectations.

An alternatives analysis for major projects is required by OMB Circulars A-130 and A-11, HHS, and IHS. OMB requires a formal analysis of alternatives and annual reporting of progress before approving the requested investment funding. The agency's documented analysis of alternatives from which the information is extracted does not have to be submitted to OMB unless OMB asks for it.

HHS, in its description of its Enterprise Performance Life Cycle (EPLC) states that "During the Concept Phase, high-level analysis and preliminary risk assessment are performed on the proposed project to establish the business case for proceeding forward in the life cycle. The business process is modeled and possible business and technical alternatives are identified."² An analysis of alternatives is required as part of the business case.

The terms "cost-benefit analysis" and "benefit-cost analysis" may be used interchangeably; "benefit-cost analysis (BCA)" is the terminology currently used by OMB.

An analysis of alternatives analysis is required for major projects, but should not be conducted just to meet these mandated requirements. An analysis of alternatives is a component of good management procedure and project management responsibility. It is a tool applicable to both large and small projects. Performing an alternatives analysis ensures that appropriate questions and concerns are addressed to support the project direction decision. The alternatives analysis provides the baseline documentation to demonstrate that good project management processes and techniques were followed in identifying and selecting the project solution.

WHAT ARE THE STEPS IN CONDUCTING AN ANALYSIS OF ALTERNATIVES?

The analysis of alternatives is approached sequentially using the six steps in Figure 1. The Analysis of an Alternatives Report provides an example of the outline of a report showing how the analysis of alternatives is to be documented. To be considered complete and properly documented, the analysis of alternatives should contain at least all of the information needed to complete the Analysis of Alternatives requirements of the HHS EPLC. Even if an OMB business case is not required for a specific

² *Enterprise Performance Life Cycle Framework, Overview Document*, Department of Health and Human Services, July 18, 2012.

project, the project information probably rolls up into an OMB business case for a major IHS IT investment, such as the Resource and Patient Management System, and the analysis of alternative data becomes part of the data for the major IT investment business case.

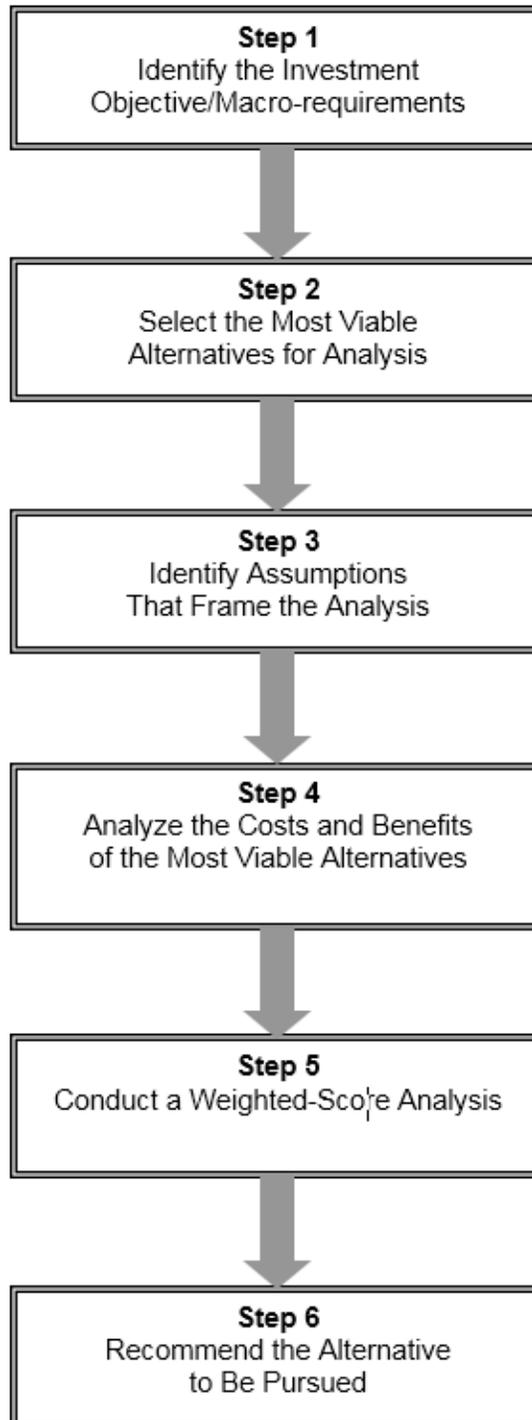


Figure 1: Steps for Conducting an Analysis of Alternatives

THE ANALYSIS

STEP 1: IDENTIFY THE INVESTMENT OBJECTIVE/MACRO-REQUIREMENTS

The first step in the analysis of alternatives is to understand the status quo environment and then to understand the future environment requirements. The business objective and the high-level business and functional requirements that the investment is to accomplish are the bases for identifying and evaluating alternatives. The objective and the macro-requirements are constant across all alternatives. They, along with the project description, justification, background, and status, provide the context for understanding the need for the investment.

For new projects, the planning information, legislation, and agency project documentation can be used to identify the investment objective. At this point in the project, a full functional requirements document is not required. However, the macro-requirements or high-level requirements need to be defined to assist in properly evaluating the capability of the potential alternatives to meet the project objectives.

For projects that have already been started, regardless of the life-cycle phase (planning, acquisition, or operations and maintenance [O&M]), an existing business case, a post-implementation review, operational analysis, a previous analysis of alternatives, existing requirements documents, or other project documentation can be the initial source of investment information. These documents should reference other documents and activities that can be perused for additional information in describing the investment and its objective.

Chapter 1 of the analysis of alternatives report should contain the investment objective, the high level business and functional requirements that the investment is to accomplish, background information, and other introductory information.

STEP 2: SELECT THE MOST VIABLE ALTERNATIVES FOR ANALYSIS

After the investment objective and macro-requirements are clearly understood and documented, alternative solutions to meeting the objective can be identified. The initial list of possible solutions must include those required by HHS and OMB, such as to maintain the status quo as a baseline, as well as possible solutions identified through brainstorming and market research. These may include process or organizational changes only or a mix of possibilities. Possibilities should reflect a review of the agency mission and strategic goals to verify that the investment objective is still valid and has not been overcome by events or changed by legislation or administrative direction.

The IHS Enterprise Architect should also be consulted to determine if there are business processes or technical solutions in IHS or HHS that will satisfy the objective. In general, the alternatives considered are not specific software solutions, such as application X developed by company A versus application Y developed by company B, but rather alternative ways to satisfy the requirement, such as reuse of Department of Veterans Affairs software, use of commercial off-the-shelf (COTS) software, commercial development (outsource), in-house development, or a change in the business processes, etc.

Market research is an OMB requirement. It is also a good management practice. A search of solutions available or used in the private sector and in other federal, state, and local government organizations should be conducted. The process may use a survey, phone calls, an official request for information, professional and trade association contacts, etc., and is to be documented along with the results of the search.

The initial list may contain 10 to 15 possible alternatives and perhaps even more; there is no set number. Table 1 identifies a sample set of the alternatives for initial consideration; the list shows the breadth of alternative solutions to be considered.

Table 1: List of Potential Alternatives

Alternative	Considerations
Maintain the status quo	The Status Quo, or an explanation of the current method of meeting the mission need, should always be one of the alternatives. To do nothing differently is the baseline. There will be no changes to the current system/current plans. An explanation of the limitations and/or adverse effects on performance associated with the current status must be included. Presumably, investment in a solution is justified because the current way of meeting the mission need is inadequate.
Organizational or process changes only	This alternative would include reorganization or the reengineering of a particular business process that helps address the meeting of a mission need. Analysis and documentation of the benefits, risks and costs of restructuring processes or functions vs. meeting the mission need with the solution must be performed. This alternative would preclude the need for new technology solutions.
Government Owned and Operated	This alternative would include investing in a system or IT asset utilizing the Agency's staff without any underlying organizational changes. If government owned and operated is chosen as an alternative, analysis and documentation should include the benefits, risks and costs of maintaining the function within and ownership of assets by the Government. The hosting would be by the IHS and the application support would also be by government employees. This alternative will be evaluated and compared in much the same way as the traditional A-76 analysis. Are government in-house resources available or can they be acquired? Can this alternative be competitive with outsourcing?

Alternative	Considerations
Outsourcing	If outsourcing is chosen as an alternative, analysis and documentation of the benefits, risks and costs of outsourcing the function would need to be included.
Design and develop a new system	Have organizational functions or processes changed, or has technology advanced to the extent that a new design may be beneficial? The functional requirements and technical design would be approached as they would for a new business requirement.
Consolidate similar IHS applications	This alternative involves using one or more existing IHS applications to meet the needs of the investment, if similar systems exist. How distinctly different are the IHS processes and functions, and how much technical duplication exists? Can hardware, commercial software, and repeatable code and database structures be shared to reduce support requirements and cost?
Hybrid	An alternative could also be stated as a mixture of the options listed above. Analysis and documentation of the benefits, risks and costs involved in the hybrid approach must be performed.
Outsource maintenance of the current system, with IHS hosting	The application maintenance would be performed by a contractor while the IHS hosts it. Does this alternative provide efficient coordination without inefficient overlap of responsibilities? Does the government maintain adequate project management oversight and direction while supporting contractor design and operation? Are software and technology ownership identified and maintained without conflict?
Partially Replace the Current System	Other systems or exiting processes may be integrated to meet some of the requirements (such as through the use of modules).
Interface with Other Systems	Output hand-offs and add-ons. Some of the required functionality may be met outside the system/project; interfaces to transmit data will be used. Output of one system is handed off to other systems, or other systems are modified with additional modules to support the requirement.
Use a GOTS solution developed by another agency	This alternative involves using an existing application external to IHS, a government off-the-shelf (GOTS) solution. This may include developing functionality that is outside of, but interfaced with, the GOTS solution. Are there other government departments/agencies with similar needs that are already being met by a system that can be leveraged?
Develop a government-wide system	Are the needs of this project for this organization compatible enough with the needs of other agencies that a collaborative effort similar to other e-government efforts might be feasible? A functional needs assessment will determine to what extent, if any, a common system might be feasible.
Implement a commercial system	This alternative would be evaluated and compared in much the same way as the traditional A-76 analysis. Is there an existing COTS solution that can be used in lieu of the current or proposed solution or as a partial replacement for it? This alternative meets the HHS alternative requirement for integration.

Alternative	Considerations
Process data manually	This scenario would result in the termination of the system, but the processes would still be performed manually. The current process that is automated would be performed by solely manual functions. Do the volume of transactions and processes, complexity of the functions, time and accuracy response requirements, and number and diversity of data access methods and locations make manual processing impractical?
Eliminate the system	This scenario would result in the termination of the system. Does the organizational mission still require the processes and functions performed by the system? Has a “sunset” law or other legislation or executive decision affected the need for this system? Have organizational responsibilities or realignments affected the need for this system or significantly changed the requirements for it?

Neither the list in the HHS guidance nor the list in Table 1 should be considered exhaustive or independent. Other options may be identified as a result of the market survey, technical capability requirements, or business and financial analysis. Also, alternatives may be identified that are a combination of the alternatives listed. For example, an alternative may be to implement a new system (listed in both the HHS guidance and Table 1 as an alternative to be considered).

However, the analysis cannot be completed with only this information. How the new system is obtained and implemented must be known to estimate the costs and identify the risks. Whether to build or buy the new system must be evaluated. These options (build or buy) are listed as alternatives under “use in-house resources” and “outsource,” but they are not complete with only this explanation. The in-house versus outsource question applies to what is being furnished, such as a new system, modification to an existing system, or continued operation and maintenance of an existing system. This example illustrates the need for identifying the alternatives to be considered at a level that enables definition of the approach and estimation of the cost.

A similar example of refining the alternatives for evaluation through a combination of actions is the use of existing systems and processes found in other agencies, the private sector, or within the agency. The use of another system will usually not achieve 100 percent of the functionality or operational capability required or desired. A viable alternative may be the use of another system, but this use must be combined with related factors in the total analysis. These other factors may include business process reengineering, development of interfaces to external data or systems, or development of additional capability to supplement requirements that otherwise will not be met. Alternatives selected for evaluation are a result of an analysis that matches the objectives to be accomplished by the solution with an approach that can be described at a level that allows estimation of the resources needed and benefits to be obtained. If the alternative approach cannot be described or the costs and benefits cannot be derived, the alternative has not been defined with enough detail.

Only the most viable of the alternatives on the initial list, but a minimum of three plus the baseline (status quo), should undergo detailed analysis, which includes a BCA and often a weighted-score analysis. Therefore, alternatives on the initial list that are not viable must be identified and eliminated from further consideration. To develop a short-list of alternatives, each alternative is evaluated using non-financial, qualitative factors including the criteria for consideration for potential cloud computing. The alternatives that are eliminated from further analysis do not have to be eliminated by a quantitative analysis, but the reason/logic for their elimination should be explained. The project manager may select the process to use in reducing the number of alternatives. Some elimination decisions may be straightforward and easily explained. For complicated or complex decisions, a method such as the weighted-score analysis may be used here as it is in step 5 of Figure 1. However, the criteria may be different in this step; for example, cost comparison data may not be available yet.

Chapter 2 of the documented analysis of alternatives should explain the process that is being used, including the market research that was used to develop the initial list of alternatives. It also should present the initial list of alternatives and the key questions and other considerations used to determine which alternatives should be evaluated further. Next, Chapter 2 should identify the alternatives selected to undergo the BCA and weighted-score analysis. Finally, it should explain the rationale for eliminating the remaining alternatives from further consideration.

STEP 3: IDENTIFY ASSUMPTIONS THAT FRAME THE ANALYSIS

The alternatives to meeting the investment objective must be equitably compared. This does not mean that the objective must be met the same way by each alternative or that the quality of the results must be the same. It does, however, mean that the differences must be measured and analyzed equitably. For example, an alternative that costs more than another alternative, but delivers higher quality, can be compared; however, to do this, the benefits of the increased quality must be quantified by monetary value.

Assumptions may vary among alternatives. The assumptions will affect costs, benefits, or both. The differences in these assumptions must be evaluated and compared with monetary results. Often, factors other than the best benefit for the cost affect the choice of alternative. The budget is an example of this. An analysis of alternatives must be prepared in accordance with agency guidance, but occasionally the best alternative cannot be pursued because the funding for it is not available. The investment objective and best value drive the recommendation of the alternative to be pursued based on a financial analysis; however, this does not necessarily mean that this alternative will be selected. For example, the budget may restrict the alternatives to be considered or may create a need for modification of the recommended alternative or implementation plan.

Chapter 3 of the analysis of alternatives should present the assumptions that drive the alternative evaluation criteria and the constraints that limit them. Chapter 3 is only for assumptions that are applicable to all alternatives. Assumptions unique to a specific

alternative are presented in Chapter 4 under the section discussing that specific alternative. Assumptions applicable to all alternatives fall into the following four areas:

GLOBAL ASSUMPTIONS

These assumptions address the investment objective and project definition.

LIFE-CYCLE ASSUMPTIONS

These assumptions apply throughout the life of the project. They address the project life and the project management processes used during its life, such as the number of years for the life of the project or calculations that would be pertinent to both cost and benefits throughout the life-cycle of the investment. Examples of life-cycle assumptions are:

- The analysis starts with Fiscal Year (FY) 2017 so that the selection of the alternative can be made consistent with the next budget submission.
- The analysis is for a 7-year project life: FY2017 through FY2023.
- One annual full-time equivalent (FTE) is 1,776 hours of project time.
- Costs and benefits will be adjusted by an inflation rate of 2 percent.³
- Costs and benefits will be adjusted for mid-year net present value (NPV) calculations. Use of the mid-year value assumes that spending during the fiscal year is linear or that the average expenditure rate approximates spending in the middle of the year.
- The NPV discount rate will be 2.5 percent.⁴

COST ASSUMPTIONS

These assumptions address cost components such as number of hours for an FTE, e.g. a staff person; inflation rate; the algorithm for calculating government salaries, benefits, and overhead; the availability of real estate for space rental or purchase; the hardware and commercial software markets and potential impact on pricing; and comparison directed by OMB Circular A-76.

³ The inflation rate should be the difference in the nominal discount rate and the real discount rate in accordance with the latest transmittal memo of OMB Circular A-94, *Discount Rates for Cost-Effectiveness, Lease Purchases, and Related Analyses*, Appendix C.

⁴ The discount rate should be in accordance with the latest revision of OMB Circular A-94, *Discount Rates for Cost-Effectiveness, Lease Purchases, and Related Analyses*, Appendix C.

BENEFIT ASSUMPTIONS

These assumptions address both quantitative and non-quantitative benefits.

Quantitative benefits are benefits for which a monetary value can be calculated, and are a component of the BCA. Examples of quantitative benefits include savings from reduced processing time, reduced cost for rework due to increased accuracy, and elimination of duplicative expense for data entry or other duplicative activities. Both direct and indirect benefits are to be included. Direct benefits are those realized by the organization that owns the investment. Indirect benefits are those realized outside the organization, such as the general public. Most importantly, quantitative benefits should be specifically defined as those that represent cost savings and those that represent cost avoidance. Even if the project does not require preparation of an OMB business case, it may be part of a larger investment, such as the Resource and Patient Management System (RPMS), which is required to complete an OMB business case and needs the identification of the type of benefits for that purpose.

Non-quantitative benefits cannot be assigned a monetary value but nevertheless contribute to achieving the business objective and therefore should be part of the decision process. Improvements in customer service and employee morale are certainly recognized as benefits, but rarely can they be included in the dollar-valued benefits stream or ROI. Because many public goods are difficult to reliably quantify in dollar units, non-monetary benefits are also vital to understanding the total implementation outcome of the solution. They can be a component of the weighted-score analysis. Examples of non-quantifiable benefits are greater sharing of information and knowledge, increased patient confidence, improved communications with oversight organizations, etc. A description of the non-quantitative benefits is specifically required in the OMB business case. Even if the project does not require preparation of an OMB business case, it may be part of a larger investment, such as the RPMS, which is required to complete an OMB business case and needs the information to do so.

STEP 4: ANALYZE THE COSTS AND BENEFITS OF THE MOST VIABLE ALTERNATIVES

The BCA is by far the largest and most complicated element of the analysis of alternatives. Several spreadsheets (e.g., Excel worksheets) may be needed to support the tables for cost and benefit data. The types of spreadsheets are as follows:

- Assumptions and common data such as general schedule and locality pay rates, benefits, and overhead; hours per FTE; inflation rate and net present value discount rate and discount factors; and supporting numerical data for the cost element and benefit calculation of each alternative.
- Costs for each alternative.
- Benefits for each alternative. Benefits can be extremely hard to quantify, and not all benefits need to be quantifiable. Typical benefits include savings in personnel

time, savings in utilities, savings in space, lower operating costs, lower maintenance costs, potential future operating costs that will be avoided, functional benefits derived from more timely or more complete information, savings at other levels of the organization or at other agencies as a result of this alternative, etc.

- ROI and NPV for each alternative by year and totaled for the investment analysis life-cycle. This spreadsheet would contain a summary of the information contained on the prior two types of spreadsheets.
- Comparisons of the alternatives’ life-cycle costs.

Where duplicative data is being used in more than one spreadsheet sheet, it is best to link the spreadsheets, rather than copy one spreadsheet table into another spreadsheet. That way, if data changes, it need only be entered into the spreadsheet once.

Chapter 4 of the analysis of alternatives should present the costs, quantifiable and non-quantifiable benefits, ROI, NPV, and payback period. It also should compare the ROIs of the evaluated alternatives across the project life-cycle.

The analysis of alternatives uses tables to collect data for costs and benefits for each alternative and to display the data for comparison. The data are then summarized and analyzed. Table 2 is an example of a financial analysis summary. A summary table will be developed for each of the alternatives (a minimum of four; status quo plus three additional viable alternatives). Depending upon the complexity of the project, additional spreadsheets may be needed to calculate the amounts for costs and benefits. Item 1, annual costs, and Item 2, annual benefits, are the totals from other spreadsheets. Item 3, midyear discount factor, is calculated based on a standardized percentage for the discount rate. Items 4 through 10 are calculated based on Items 1 through 3.

Table 2: Example of a Financial Analysis Summary for One Alternative (\$ Million)

Item	FY2017 ⁵	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023	Total
1. Annual costs	2.502	2.621	2.747	2.877	3.016	3.160	3.312	20.235
2. Annual benefits	1.718	2.901	3.353	5.042	5.852	6.300	6.514	31.68
3. Midyear discount factor	0.9877	0.9636	0.9401	0.9172	0.8948	0.8730	0.8517	
4. Discounted costs (DC)	2.471	2.526	2.583	2.639	2.699	2.759	2.821	18.497
5. Discounted benefits (DB)	1.697	2.796	3.152	4.625	5.237	5.500	5.548	28.554

⁵ Normally, the first year of the financial analysis is the budget year, not the year that the analysis of alternatives is being prepared. Although OMB wants sunk costs identified (sunk costs are funds that have already been expended on the investment), these should not be considered in the analysis.

Item	FY2017 ⁵	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023	Total
6. Discounted net benefits (DB – DC)	-0.774	0.270	0.570	1.986	2.538	2.741	2.727	10.057
7. Cumulative net benefits (NPV)	-0.774	-0.505	0.065	2.051	4.589	7.330	10.057	
8. Benefit/cost ratio	0.687	1.107	1.221	1.753	1.940	1.994	1.967	1.544
9. ROI (%)	-31.3%	11.1%	22.1%	75.3%	94.0%	99.4%	96.7%	54.4%
10. Payback period (years)			2.89					

The 10 items are explained in the following subsections:

ANNUAL COSTS

Annual costs are captured by nine cost elements (program staff, training and administration, contract services, software, hardware, equipment, facilities, security, risk and other) within the three life-cycle phases (planning, acquisition, and maintenance). The maintenance phase is also called steady-state or O&M. The last line in each of these tables is the total life-cycle cost by year. These are the costs to be used in Item 1, annual costs, by year.

ANNUAL BENEFITS

Each benefit is identified by year. The last line in each of these tables is the total benefits by year. Benefits should be identified either as cost savings or as cost avoidance. These are the benefits to be used in Item 2, annual benefits, by year.

MIDYEAR DISCOUNT FACTOR

The discount rate is used to discount future costs and benefits to achieve an NPV. The use of NPV and the discount rate (interest rate) to calculate it provide a common unit of measurement to address the value of money in different time periods and provide a reference for comparing the value of this project with other uses of the funds (what you could get if the funds were invested elsewhere at the specified interest rate). OMB Circular A-94 states:

The standard criterion for deciding whether a government program can be justified on economic principles is net present value, the discounted monetized value of expected net benefits (i.e., benefits minus costs). Net present value is computed by assigning monetary values to benefits and costs, discounting future benefits and costs using an appropriate discount rate, and subtracting the sum total of discounted costs from the sum total of discounted benefits. Discounting benefits and costs transforms gains and losses

occurring in different time periods to a common unit of measurement. Programs with positive net present value increase social resources and are generally preferred. Programs with negative net present value should generally be avoided.⁶

The discount rate is updated each year, normally in the December – February time frame, as an update to OMB Circular A-94.⁷ The discount rate to use may be “real” or “nominal.” Use of the nominal discount rate and including inflation in the cost estimates is the recommended approach for IHS analyses of alternatives.

A real discount rate does not include inflation. A real discount rate may be more accurate for comparing NPV in a BCA because it removes the uncertainty of what the inflation rate may be in future years. However, budget submissions require inflation adjustments. If the BCA is also to be used for budget estimates, as most of them are, then inflation will have to be added to the costs shown in the analysis before they are submitted in the budget request. The other choice is to include inflation in the analysis. If inflation is used in the analysis, the nominal discount rate will be used to calculate the NPV. Use of the nominal discount rate and including inflation in the cost estimates is the recommended approach for IHS analyses of alternatives.

The example presented in Table 2 includes inflation in the costs and benefits. The discount factor was based upon a nominal rate of 2.5 percent for a seven-year life-cycle, per OMB A-94 Appendix C revised in February 2014.

A midyear discount factor was used. This means that the funds are spent relatively evenly throughout the year or that the average expenditure rate approximates spending in the middle of the year. The formula is:

$$\text{Midyear discount factor} = \frac{1}{(1 + i)^{(n-0.5)}}$$

where:

i = interest rate (discount rate)

n = year

The minus 0.5 moves the average time from the beginning of the year to the middle of the year. FY2017 is the first year of the analysis. The calculation for year 1 ($n = 1$), FY2017, using a nominal discount rate of 2.5 percent per OMB Circular A-94 for 2014 for a seven-year life-cycle ($i = 0.025$) is:

$$\frac{1}{(1 + 0.025)^{(1-0.5)}} = \frac{1}{(1.025)^{0.5}} = 0.9877$$

⁶ OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Section 5.a.

⁷ OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Appendix C.

DISCOUNTED COSTS

Discounted costs, Item 4, are the present value of the future costs. To calculate future costs at the present value, Item 1, annual costs, is multiplied by Item 3, midyear discount factor. Using FY2017 as an example:

$$\text{Discounted costs} = \text{Item } 4_{FY2017} = \text{Item } 1_{FY2017} \times \text{Item } 3_{FY2017}$$

$$\text{Item } 4_{FY2017} = 2.502 \times 0.9877 = 2.471$$

DISCOUNTED BENEFITS

Discounted benefits, Item 5, are the present value of the future benefits. To calculate future benefits at the present value, Item 2, annual benefits, is multiplied by Item 3, midyear discount factor. Using FY2017 as an example:

$$\text{Discounted benefits} = \text{Item } 5_{FY2017} = \text{Item } 2_{FY2017} \times \text{Item } 3_{FY2017}$$

$$\text{Item } 5_{FY2017} = 1.718 \times 0.9877 = 1.697$$

DISCOUNTED NET BENEFITS

The discounted net benefits, Item 6, are the annual NPV. They are determined for each year by subtracting Item 4, discounted costs, from Item 5, discounted benefits. Using FY2017 as an example:

$$\text{Discounted net benefits} = \text{Item } 6_{FY2017} = \text{Item } 5_{FY2017} - \text{Item } 4_{FY2017}$$

$$\text{Item } 6_{FY2017} = 1.697 - 2.471 = -0.774$$

The negative sign (–) means the costs for the project for this year are greater than the benefits received from it.

CUMULATIVE NET BENEFITS (NPV)

The cumulative net benefit, Item 7 for FY2017 through FY2023, is the cumulative NPV of the benefits for the life of the project. Item 7 is the total of the annual net benefits, or the sum of all Items 6 for FY2017 through FY2023. This life-cycle NPV is a primary calculation used in evaluating the financial feasibility of the project and in determining the payback period for the investment.⁸

$$\text{Life-cycle NPV} = \text{sum of annual NPVs.}$$

For FY2017 through FY2023, Item 7 = \sum Items 6 for all years FY2017 through FY2023.

$$\text{Item } 7 = 10.057.$$

⁸ See explanation of net present value under Item 3, midyear discount factor.

The cumulative net benefits through a specific year are the sum of the annual net benefits through that year minus the sum of Items 6 through that year, or the cumulative net benefits through the previous year, Item 7, plus the discounted net benefit for the given year, Item 6. Using FY2020 as an example:

$$\text{Cumulative net benefits through FY2020} = \text{cumulative net benefits through FY2019} + \text{discounted net benefits for FY2020} = 0.065 + 1.986 = 2.051.$$

BENEFIT/COST RATIO

This ratio, Item 8, is calculated by dividing Item 5, discounted benefits, by Item 4, discounted costs. A ratio of 1.000 means one dollar of benefit for every dollar spent: the break-even point. A ratio less than 1.000 means costs are exceeding benefits. Using FY2017 as an example:

$$\text{Benefit/cost ratio} = \frac{\text{discounted benefits}}{\text{discounted costs}}$$

$$\text{Item } 8_{\text{FY2017}} = \frac{\text{Item } 5_{\text{FY2017}}}{\text{Item } 4_{\text{FY2017}}}$$

$$\text{Item } 8_{\text{FY2017}} = \frac{1.678}{2.443} = 0.687$$

ROI (%)

The return on investment, Item 9, is the discounted benefit minus the discounted cost, or the net benefit [i.e., Item 5 minus Item 4] divided by the cost, Item 4. Another way of expressing this is that it is Item 8, the benefit/cost ratio, minus 1.000, expressed as a percentage. A negative percentage means the project costs exceed the benefits (a loss in financial terms). Zero is the break-even point; costs have been recovered by the benefits. A positive number indicates benefits exceed costs. There is no quantitative reason to fund a project that does not produce a positive ROI. A bank account that receives 7 percent interest means the principal is paid back along with an additional 7 percent of the principal; the same is true for the alternatives analysis. A project with a 10 percent ROI means the cost (principal) has been recovered and the total benefits equal the cost plus an additional 10 percent of the cost. Using FY2017 as an example:

$$\text{ROI} = \text{Benefit/cost ratio} - 1.000 \text{ expressed as a percentage.}$$

$$\text{Item } 9_{\text{FY2017}} = \text{Item } 8_{\text{FY2017}} - 1.000 \text{ expressed as a percentage}$$

$$\text{Item } 9_{\text{FY2017}} = 0.687 - 1.000 = -0.313, \text{ or } -31.3\%$$

For the life of the project:

$$\text{Item } 9_{\text{Total}} = 1.544 - 1.000 = 0.544, \text{ or } 54.4\%$$

ROI, Item 9, can also be calculated without using the discounted benefit/cost ratio by subtracting the discounted costs, Item 4 from the discounted benefits, Item 5, thereby

obtaining the net benefits, and then dividing that difference by the discounted costs, Item 4. The answer is expressed as a percent. Using FY2017 as an example:

$$ROI = \frac{\text{discounted benefits} - \text{discounted costs}}{\text{discounted costs}}$$

$$Item\ 9_{FY2017} = \frac{Item\ 6_{FY2017} - Item\ 5_{FY2017}}{Item\ 5_{FY2017}}$$

$$Item\ 9_{FY2017} = \frac{1.691 - 2.471}{2.471} = \frac{-0.774}{2.471} = -0.313\ \text{or}\ -31.3\%$$

For the life of the project:

$$Item\ 9_{Total} = \frac{28.554 - 18.497}{18.497} = \frac{10.057}{18.497} = 0.544\ \text{or}\ 54.4\%$$

PAYBACK PERIOD (YEARS)

The payback period is the point in time when the cumulative benefits received are equal to the cumulative costs. The calculations are based on Item 7 cumulative net benefits (NPV). The payback period occurs in the year in which cumulative net benefits are positive (this means the cumulative net benefits exceeded the cumulative costs during that year). To determine when during the year the payback period was reached, add the absolute values of the previous year (when the cumulative NPV was still negative) to the cumulative NPV of the year in which it turned positive. Divide that total into the value of the previous year (when it was negative). Ignore the negative sign (use absolute value); add this fraction to the number of years that cumulative net benefits were negative. This is the payback period in years. For this example:

- Cumulative NPV, Item 7, is -0.505 in FY2018 and turns positive at 0.065 in FY2019. NPV is negative for 2 years (FY2017 and FY2018) plus a fraction of the third year.
- To calculate the fraction, ignore the negative sign (absolute values used). Add 0.505 (NPV for FY2018) + 0.065 (NPV for FY2019) = 0.570 .
- Divide 0.505 by 0.570 (last year of negative NPV); $0.505 \div 0.570 = 0.89$ (use 2 decimal places). The cumulative net benefits were negative for 2 years (FY2017 and FY2018). These 2 years plus 0.89 of the third year = 2.89 years for the payback period (or 2 years and 11 months).

The process for Table 2 is repeated for each of the alternatives, but the analysis is not complete there. Assumptions were made about the variables (parameters). A sensitivity analysis should be conducted to determine the degree to which changes in parameters can influence the recommended alternative:

- A parameter is considered to be “not sensitive” if it requires a decrease of 50 percent or an increase of 100 percent to cause a change in the selected alternative.

- A parameter is considered “sensitive” if a change between 10 percent and 50 percent causes a change in the selected alternative.
- A parameter is considered to be “very sensitive” if a change of 10 percent or less causes a change in the selected alternative.

The result of the sensitivity analysis does not necessarily change the recommended alternative, but it identifies how important the accuracy of the parameters are and the potential impact that a change in the parameters can have on the ROI of the recommended alternative.

A traditional BCA disregards sunk costs (money that has already been expended on an investment) and achieved benefits (benefits that have already been achieved by an investment). The decision should be based upon what can be managed – planned costs and benefits. However, for an investment that is in a mixed-cycle, which is an investment that is partly in development and partly in operation, HHS is reporting total investment life-cycle costs (including sunk costs) and life-cycle benefits (including already achieved benefits) to OMB (presumably at OMB’s direction) as part of the life-cycle analysis reported in the OMB business case. Although this makes the alternative costs consistent with the summary of spending table for the OMB business case, it is inconsistent with using the analysis of alternatives for good decision making. Accordingly, life-cycle costs and life-cycle benefits should also be calculated to make the analysis useful for OMB business case reporting.

STEP 5: CONDUCT A WEIGHTED-SCORE ANALYSIS

The BCA identifies costs and quantifiable benefits of the project; however, additional qualitative, or intangible, information is included in the alternative selection process. The NPV or ROI should be used as the primary financial decision-making criterion. However, the use of NPV or ROI as the basis for recommending an alternative may be in conflict with the requirement that costs for the selected alternative be within a predetermined budget. NPV is calculated as the life-cycle difference between benefits and costs (both discounted). A large NPV may have large benefits and large costs. These costs may exceed the available funding level, making the selection of the alternative improbable even though the NPV is high. Obtaining a large NPV favors large projects in which both costs and benefits are high. This may be in conflict with budget constraints.

NPV shows the dollar value of the investment, and ROI indicates the rate (percent) returned on the investment. Alternatives may have the same NPVs but different ROIs, depending on the actual values of the costs and the benefits. For example, an alternative costing \$1 million with \$2 million in benefits has an NPV of \$1 million, as does an alternative that costs \$10 million and has benefits of \$11 million. The first alternative has a much higher ROI. Similarly, alternatives with different NPVs may have the same ROIs. For example, an alternative costing \$1 million with \$2 million in benefits has the same ROI as an alternative costing \$10 million with \$20 million in benefits. The first alternative has an NPV of \$1 million, and the second alternative

has an NPV of \$10 million. The financial analysis is an important part of the selection of alternatives, but not the only consideration.

A total business case analysis includes other criteria in addition to the NPV and ROI. These criteria are both financial and non-financial. Weighted scoring is used as the business analysis tool. The selected alternative may not have the highest business case value; however, it must score well in comparison with the highest-scoring alternative, and it usually must be within the budget if a project budget has already been established. The selected alternative may not have the highest NPV; however, the NPV should be positive (there are occasional mandated projects that may not have a positive NPV but which still have to be implemented).

The weighted-score analysis involves assessing how well each alternative satisfies each of several criteria and assigning a raw score reflecting that assessment. Typically, raw scores have a standard scale ranging from 0, indicating that the alternative does not satisfy the criterion, to 10, indicating that the alternative fully satisfies the criterion. A weight is then applied to each raw score to reflect the relative importance of the criterion. Finally, the weighted scores for all of the criteria for each alternative are summed and compared.

The criteria used in the weighted-score analysis include quantitative items as well as qualitative or intangible information that should also be part of the decision process. HHS has established the following criteria for use in an alternatives analysis weighted evaluation:⁹

- **Mission.** The elements of the operational division's mission to be supported (i.e., business needs).
- **Requirements.** Specific requirements that the new project must support.
- **Schedule.** Phasing, durations and milestones.
- **Cost.** Full life-cycle costs to include design, development, testing, training, migration, implementation, and operations and maintenance both in total and by fiscal year.
- **Security.** Conformance with government and industry security standards.
- **Risk.** Assessment of cost, schedule, security, technical, and overall risk.
- **Enterprise Compliance.** Conformance with the HHS enterprise approach to IT management (architecture, standards, licenses, migration strategies, etc.).

Although HHS has specified the criteria to be used in the weighted-score analysis, it has given the project manager the flexibility to use different criteria and weights¹⁰. However, if the project manager uses different criteria, he/she must provide the

⁹ HHS-IRM-2003-0002, *HHS IRM Policy for Conducting Information Technology Alternatives Analysis*, Section 4.6.1.3, June 13, 2003.

¹⁰ Ibid.

rationale for the changes in the criteria from the HHS criteria. Numerous other criteria may be used and for many reasons. NPV or ROI may be used instead of cost (or used with it). Cost may be important if there is a predefined budget, but NPV or ROI may be used if the most cost-effective solution is being sought independent of the budget or before a budget is requested. NPV and ROI are used for best value; cost is used to meet budget constraints. Technical approach is another criterion that may be important for some projects. If innovative solutions are being sought or if alternatives present varying technical approaches, technical approach may be included as a criterion. If technical scores are used elsewhere, they may be converted to scores in the weighted-score analysis.

The project manager is responsible for determining how the raw scores will be assigned. The weighted score for each criterion is calculated as follows:

$$\text{weighted score} = \text{raw score} \times \text{weight}$$

The top-scoring alternative is the leading candidate for being the recommended alternative; however, HHS guidance does not require that the alternative with the top weighted score be the selected alternative.¹¹

Chapter 5 of the analysis of alternatives should describe the scoring criteria, present the raw and weighted scores for each alternative, and provide the scoring rationale for each criterion. The following paragraphs present an example of a weighted-score analysis. The purpose of the example is to show how the weighted-score analysis is to be conducted. This is hypothetical; the facts and discussion leading up to this analysis are not included. This information would be developed from the data in the chapters preceding the weighted-score analysis.

Table 3 presents the raw and weighted scores for each alternative of the hypothetical example. The criteria and weights in the HHS Information Resource Management Policy for Conducting Information Technology Alternatives Analysis were used. In the example, Alternative 2, the baseline or Status Quo, is the continuation of what is being done currently. Alternative 3, Host, moves the operation of the system to a new hosting facility and uses contract support for system maintenance. Alternative 4, Government Operation, supports the system with 100 percent government employees with no contract support. Alternative 4, New Design, completely replaces the current system with a new one.

¹¹ Section 4.6.1.3 of HHS-IRM-2003-0002 says that “the top scoring alternatives will be selected for further comparison.”

Table 3: Weighted Scores of Hypothetical Alternatives

Criterion	Weight	Alternative 1 Status Quo		Alternative 2 Host		Alternative 3 Government Operation		Alternative 4 New Design	
		Raw score	Weighted score	Raw score	Weighted score	Raw score	Weighted score	Raw score	Weighted score
Mission	100	8	800	8	800	8	800	10	1000
Requirements	90	7	630	7	630	7	630	10	900
Schedule	60	9	540	7	420	5	300	4	240
Cost	70	10	700	7	490	8	560	0	0
Security	80	7	560	7	560	8	640	8	640
Risk	70	8	560	7	490	5	350	4	280
Enterprise Compliance	90	7	630	7	630	8	720	8	720
Total		—	4,420	—	4,020	—	4,000	—	3,780

The baseline score of 4,420 in this example is the highest weighted score; therefore, the baseline would most likely be presented as the recommended solution.

The following subsections discuss the rationale for the scores of our hypothetical example:

MISSION

How well an alternative supports the mission can usually be evaluated by comparing its relative support for the goals and objectives of the agency with the support of the other alternatives. This criterion can also be expanded to address the effect on business processes and functions, organizational, cultural, and other non-quantifiable aspects of the business environment and mission. A new design can be created that receives a 10, but this is not necessarily done; tradeoffs are often made to address cost and other factors. In this example, a 10 is given for mission support for a new design, Alternative 4. The baseline, Alternative 3, and Alternative 4 are each given an 8 based on their relative mission support when compared with Alternative 4. They receive the same score because all three solutions maintain the system functionality and mission support as it is now.

REQUIREMENTS

If a functional requirements document has been prepared, the scores for meeting the requirements can be based on a combination of how well each alternative meets each requirement and the relative importance of each requirement. This is especially appropriate for evaluating COTS packages or existing systems that are being considered. In the example used here, a 10 is given to Alternative 4 because a new design can be developed that meets all the requirements. The baseline and Alternatives 2 and 3 are each given a 7 based on meeting 70 percent of the requirements. They receive the same score because all three solutions maintain the system functionality as it is now.

SCHEDULE

Continuing the baseline introduces no new problems or issues. O&M is well defined, and the development, modernization, or enhancements (DME) activities will be performed by a contractor who has successfully been working with the system for several years. There is the slight chance of unanticipated funding or contract issues so the baseline schedule is given a 9 (rather than a 10). The same contract would maintain the system and perform DME under Alternative 3. The only change is to move the hosting site; Alternative 3 schedule is scored at 7. Having government employees 100 percent responsible for the system requires hiring and training a significant number of new staff members and making a transition from contractor support. These changes create a potential for significant schedule slippage; Alternative 4 is given a 5. A new design, Alternative 4, has even greater potential for schedule complications than Alternative 4. Not only are there the issues of who is running and maintaining the system, and how, but the system functionality may be changed, creating design complexity and the need for coordination among stakeholders who may have conflicting priorities. These factors may affect the schedule; Alternative 4 received a schedule score of 4.

COST

The cost scores were based on the estimated cost for each alternative in the BCA and ranked according to their relative differences. The alternative with the lowest cost receives a score of 10 and the other alternatives are compared to it. One point is deducted for each increase in cost of 10 percent (rounded), to a minimum of 0 (no negative scores):

- **Example 1:** The baseline is the least costly alternative; it receives a score of 10. Alternative 3 has costs 33.6 percent higher than the baseline and receives a score of 7 (33.6 percent rounds to 30 percent; 1 point for each 10 percent is 3 points: $10 - 3 = 7$).
- **Example 2:** Alternative 4 costs 17.8 percent more than the baseline and receives a score of 8 (17.8 percent rounds to 20 percent; 1 point for each 10 percent is 2 points; $10 - 2 = 8$).
- **Example 3:** Alternative 4 costs 120 percent higher than the baseline. One point for each 10 percent is 12 points: $10 - 12 = -2$. Zero is the lowest possible score so Alternative 4 receives a 0.

SECURITY

This criterion addresses access controls, firewall implementation, and use monitoring, as well as security responsibility, authority, and reporting. In our evaluation of the alternatives, the following aspects of security were considered:

- Federal Information Security Management Act
- Standards issued by the National Institute of Standards

- Certification and accreditation
- Technical capability and capacity.

Security requirements can be best met when the processes and information required for security implementation, monitoring, analysis, and reporting are the responsibility of those accountable for the security program. For this reason, the scores are higher for the alternatives that place operational responsibility close to project management. The in-house alternative (Alternative 4) scored an 8 because all project components are controlled by IHS, but not a 10 because two different IHS components (the system project management office and the hosting organization) must coordinate for complete security. The baseline (status quo) received a 7 because it is very close to the in-house alternative; the contractors report directly to the system project management office and have several years of successful experience. Bringing the hosting to IHS with no other changes (Alternative 3) is similar to the status quo so it also scored a 7. A new design (Alternative 4) can be implemented by a combination of operational responsibilities that include outsourcing or using in-house resources. The final determination might influence the security score, but a score of 8 was assigned because security can be built into the new processes.

RISK

The risk scores are based on a preliminary evaluation of the 19 risk elements for implementing the alternative and for operating the alternative over its system life. The risk of implementing and operating an alternative different from the status quo might be less than maintaining the status quo if the latter is unable to meet the business requirements or has obsolete technology, high operational costs, or other limitations or high-risk components. However, this is not the case. The baseline (status quo) poses the lowest risk; a score of 8 was assigned. The other alternatives pose a greater risk because risk increases as change increases. Thus, developing a new design (Alternative 4) poses the greatest risk (score of 4) because the application design, operations, hosting, and maintenance support will change. Risk scores of 7 and 5 were assigned, respectively, for moving the hosting (Alternative 3) and for moving the hosting while also shifting applications responsibility to government personnel (Alternative 4).

A preliminary evaluation of the risks posed by each alternative should use the 19 risk categories specified by OMB:

- Schedule
- Initial costs
- Life-cycle costs
- Technical obsolescence
- Feasibility
- Reliability of systems

- Dependencies and interoperability
- Surety (asset protection)
- Risk of creating a monopoly for future procurements
- Capability of the agency to manage the investment
- Overall risk of investment failure
- Organizational and change management
- Business
- Data/information
- Technology
- Strategic
- Security
- Privacy
- Project resources

ENTERPRISE COMPLIANCE

Generally, compliance can be best met when the processes and information required for compliance are the responsibility of those accountable for compliance and for reporting it. For this reason, higher scores were assigned for the alternatives that place operational responsibility close to project management. The in-house alternative (Alternative 4) received an 8 because all project components are controlled by IHS; it did not score a 10 because two different IHS components (the system project management office and the hosting organization) must coordinate for complete compliance. The baseline (status quo) received a 7 because it is very close to the in-house alternative (Alternative 4); the contractors report directly to system project management and have several years of successful experience. Bringing the hosting to IHS with no other changes is similar to maintaining the status quo and also scored a 7 (Alternative 3). A new design (Alternative 4) can be implemented by a combination of operational responsibilities that include outsourcing or using in-house resources. The final determination might influence the compliance score, but a score of 8 was assigned because compliance can be built into the new processes.

In addition to providing the necessary business functionality, the system must be able to meet the requirements and guidelines specified by executive directives, congressional legislation, and external oversight entities (such as the Inspector General and Government Accountability Office [GAO]), as well as internal policy and standards. Therefore, each alternative's ability to comply with and be responsive

to those needs was considered. The following are key requirements and guidelines with which the selected alternative must comply:

- Government-wide guidelines such as the Clinger-Cohen Act, Paperwork Reduction Act, Government Performance and Results Act, OMB Circular A-130, and GAO
- IHS policy
- Mission support
- Technology standards.

STEP 6: RECOMMEND THE ALTERNATIVE TO BE PURSUED

Two analyses are used in the analysis of alternatives: the BCA and the weighted-score analysis. The BCA is quantitative, emphasizing the ROI, NPV, and payback period that justify the investment. OMB stresses the BCA; a proposed investment with a poor ROI or poor NPV is difficult to get approved. Often, experience, judgment, and subjective evaluations are required to produce quantifiable estimates. If the estimates are close, additional analyses may be needed to evaluate the significance of the differences. The potential variation in these estimates can be addressed through statistical confidence intervals in the calculations and by sensitivity analysis.

A sensitivity analysis evaluates the effects of different values in the cost or benefit calculations. Examples include different inflation rates and longer or shorter time to realize the benefits or changes in hardware or contract costs. Sensitivity analysis is valuable in evaluating risks. It will show the consequences of variations in the estimates.

Frequently, benefits or costs that are not quantifiable must be included in the total investment analysis. The weighted-score analysis is appropriate for both quantitative and qualitative analysis. The emphasis is on comparing the alternatives; the relative importance and relative values determine the outcome rather than individual assessments.

If the same alternative receives the highest score in both the BCA and weighted-score analysis, the recommendation is obvious. However, the facts, assumptions, and calculations should still be reviewed to ensure that the bases for the analyses were correct. When different alternatives score higher on each of the analyses, additional analyses and potential reconciliation should be undertaken. Areas such as risk, sensitivity analysis, confidence intervals, cost and benefit assumptions, and rationale behind subjective values and relative weights should be reviewed. Results that are close may not be significantly different statistically. Results that are not statistically different will require an explanation as to how the alternative was selected. An even stronger explanation is required for the selection of an alternative when two different alternatives receive the highest scores in the two analyses and the results are statistically different.

An alternative may be selected that scores higher on the weighted-score analysis than the other alternatives, but lower than other alternatives on the BCA. However, the selected alternative must have a positive ROI and positive NPV to avoid the high risk of it not being approved by IHS, HHS, and/or OMB.

Appendix A: ANALYSIS OF AN ALTERNATIVES REPORT

This appendix contains an example of the table of contents of an analysis of alternatives for an investment. The analysis of alternatives document contains the following chapters and addresses each of the steps of a comprehensive alternatives analysis:

- **Chapter 1: Introduction.** Addresses Step 1: Identify the investment objectives and macro-requirements. It also presents background information, the approach to the analysis, and the organization of the document.
- **Chapter 2: Selection of Alternatives for Analysis.** Addresses Step 2: Select the most viable alternatives for analysis.
- **Chapter 3: Assumptions.** Addresses Step 3: Identify assumptions that frame the analysis.
- **Chapter 4: Benefit-Cost Analysis.** Addresses Step 4: Analyze the costs and benefits of the most viable alternatives.
- **Chapter 5: Weighted-Score Analysis.** Addresses Step 5: Conduct a weighted-score analysis.
- **Chapter 6: Conclusions and Recommendations.** Addresses Step 6: Recommend the alternative to be pursued.

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ACRONYM LIST

Acronym	Meaning
BCA	Benefit-Cost Analysis
COTS	Commercial off-the-Shelf
CPIC	Capital Planning and Investment Control
DME	Development, Modernization, or Enhancements
EPLC	Enterprise Performance Life Cycle
EVMS	Earned-Value Management System
FTE	Full-Time Equivalent
FY	Fiscal Year
GAO	Government Accountability Office
GOTS	Government Off-The-Shelf
HHS	Department of Health and Human Services
IHS	Indian Health Service
IT	Information Technology
NPV	Net Present Value
O&M	Operations and Maintenance
OMB	Office of Management and Budget
ROI	Return on Investment
RPMS	Resource and Patient Management System