Module 3 - Product Support Business Case Analysis (BCA)

Introduction

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Welcome to the Building the Product Support Business Case Analysis (BCA) lesson. This lesson focuses on the Information Technology (IT) inputs into building the Product Support BCA.

This lesson contains an overview of the software engineer's inputs into the cost estimation process and the details of IT-related issues and risks that directly impact the building of the PS BCA. The IT-related issues and risks play an important role in determining the best value product support decision.

We will walk through the Product Support BCA outline and highlight places where the IT-related issues and risks must be examined.

Product Support BCA Outline

- Executive Summary
- Introduction
- Desired Outcomes and Requirements
- Assumptions and Methods
- Alternatives
- Mission and Business Impacts
- Risk Analysis and Mitigation Plans
- Sensitivity Analysis
- Conclusion
- Recommendations

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Learning Objectives

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After completing this lesson you should be able to:

- Recall the important sections of the Product Support BCA to ensure IT product support considerations are included.
- Recognize the IT inputs needed for software cost estimation.
- Recognize the importance of Open Systems Architecture (OSA) principles to successful product support.
- Recognize the Intellectual Property (IP) principles needed for successful product support.
- Recognize the software support products needed for successful product support.
- Recognize the data management products needed for successful product support.
- Recognize IT security inputs needed for successful product support.

Product Support BCA Subsections

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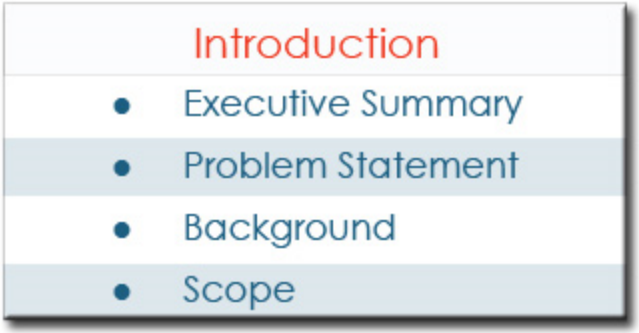
The Introduction provides guidance on drafting the problem statement and background to begin the main body of the Product Support BCA.

The introduction lays out much of the background and reasoning for conducting the Product Support BCA and helps to define the issue being addressed and supported by the analysis.

The Introduction is composed of the following elements: Executive Summary, Problem Statement, Background and Scope.

Click on each element in the graphic to learn more.



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Knowledge Review

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Which component of the Product Support BCA is arguably the most critical?

- [ ] Problem Statement
- [ ] Scope
- [ ] Executive Summary
- [ ] Background

Check Answer

Desired Outcomes and Requirements

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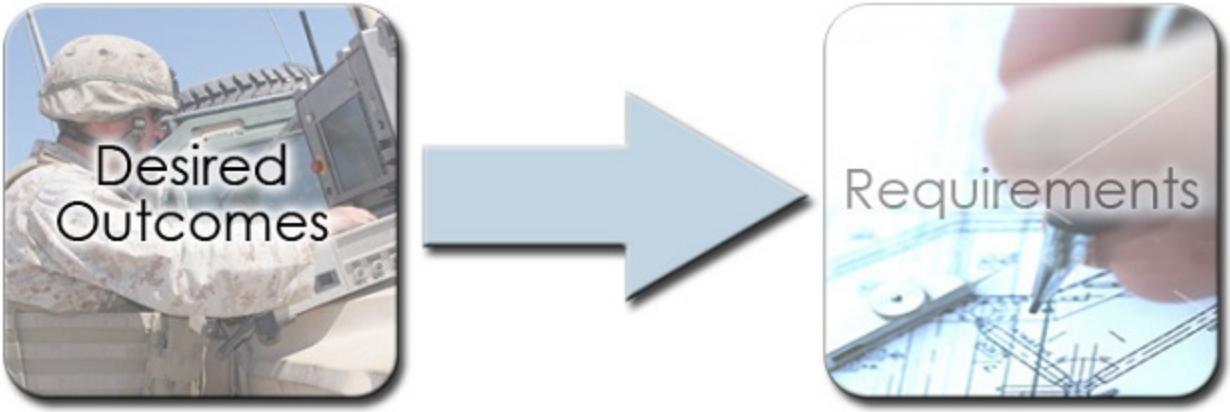
It is critical to identify and document the Warfighters' **desired outcomes** rather than just the documented requirements. Identifying both the desired outcomes and requirements ensures that the desired outcomes are not buried in the details of the requirements.

Not taking the time to fully understand the Warfighters' desired outcome is the number one reason software programs fail. Take the time to understand exactly what the Warfighters' desired outcome is and ensure the written requirements support this vision. DoD's goal is to build the correct software one time and minimize software re-work.

The Product Support BCA team and its stakeholders must come to consensus on the desired outcomes and periodically refer to them to stay on track. The governance board should concur with the desired performance outcomes in any deliverables to the sponsor.



Desired Outcomes and Requirements, Cont.

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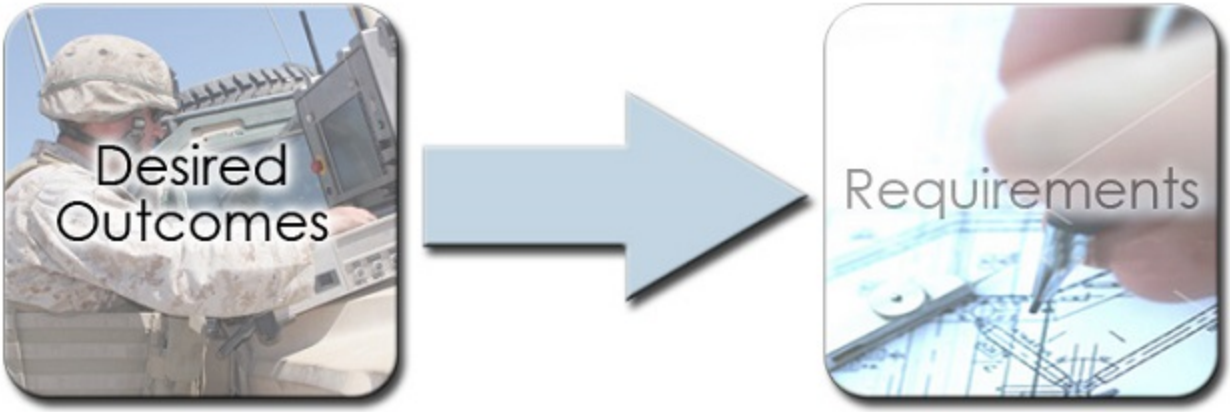
After identifying the desired outcomes, state the Program **requirements**. Some possible sources of the requirements may be the Key Performance Parameters (KPP), Key System Attributes (KSA), Performance Measures already identified by the Capability Development Document (CDD), Capabilities Production Document (CPD), Information Systems (IS) Initial Capabilities Document (ICD), Requirements Definition Package (RDP), etc.

Identify the KPPs and KSAs, including the range of KPPs and KSAs. Performance Measures must be addressed through the recommended approach and policy documents (i.e., Joint Supply Chain Architecture (JSCA) Metrics and RAM-C manual).



Knowledge Review

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The Software Engineer must understand both the warfighter desired outcomes and requirements to ensure that we build the best value software solution and minimize rework. This understanding must permeate all sections of the Product Support BCA. True or False?

- [ ] True
- [ ] False

Check Answer

Assumptions and Methods

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The next section of the BCA outlines Assumptions and Methods. This section is composed of four subsections including: Ground Rules; Assumptions; Analysis Methods, Tools and Rationale; and Evaluation.

The following pages detail each of these components.

Assumptions and Methods

- Ground Rules
- Assumptions
- Analysis Methods, Tools and Rationale
- Evaluation

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Ground Rules

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The ground rules document the Product Support BCA's known or dictated parameters and conditions. Prior to formulating assumptions, what is known with certainty should be stated under the ground rules: facts, laws, defined criteria, constraints, regulations, OSD, or Service guidance

Include any factor known to be true that may affect the current or future business conditions under consideration in the analysis. Constraints are those factors known or discovered during the research and due diligence period, normally beyond the control of the PM or PSM, which bound the Product Support BCA analysis.

For example, Title 10, U.S. Code, Paragraph 2320, requires all major weapons systems and subsystems to create a strategy for Intellectual Property (IP) Rights for software used. DoD extends this requirement for all DoD programs via DoDI 5000.02. As part of the Acquisition Strategy, DoD addresses this requirement by requiring an Intellectual Property (IP) Strategy. The IP Strategy must be updated as appropriate to support and account for evolving IP considerations associated with the award and administration of all contracts throughout the system life cycle. The IP Strategy becomes part of the Life-Cycle Sustainment Plan (LCSP) during Operations and Support (O&S).

The BCA team must understand these constraints before beginning the analysis. Constraints should be presented to the governance board and reader of the BCA. For example, funding constraints such as congressional mandates could qualify as a ground rule.

Assumptions

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An assumption is an informed position about what is true of a current or future state of affairs for a situation where explicit factual knowledge is unobtainable (i.e., inflation rates). Assumptions define aspects that are beyond the control of the BCA team.

They are explicit statements about the conditions on which the BCA team bases the analysis. After stating factors in the ground rules section, list the assumptions about what is not known, or about future states affecting business conditions.

It is crucial to identify all key assumptions and gain stakeholder concurrence used in the Product Support BCA and critical for the risk or sensitivity analysis. Any non-concurrence by a stakeholder should be documented. Describe why a particular item is an assumption.

Analysis Methods, Tools, and Rationale

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Document the types of financial and non-financial analysis methods used and why. The Product Support BCA team should use guidance from OMB Circular A-94: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (OMB A-94) on cost benefit analysis at all relevant points.

As a general rule, the Product Support BCA team should include the following financial analysis measures, tools, and techniques unless there is a documented rationale not to use them:

- Net Present Value (NPV)
- Payback Period
- Break Even Point
- Return on Investment (ROI),
- Internal Rate of Return (IRR)
- Life Cycle Cost (LCC)
- Time Value of Money Considerations (current or constant dollars and discounted dollars)
- Operating and Support (O&S) cost

Evaluation

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Before we identify the possible product support alternatives, we need to establish an evaluation baseline process. This process is established without knowledge of the alternatives. This independent evaluation process ensures that each alternative will be graded equally.

Evaluation is a multiple step baseline process. Here is one example of the steps within that process: 1-Establish Criteria; 2-Scoring/Weighting; 3-Expert Evaluators; 4-Consistent Scale; 5-Define Weighting Scale; 6-Realistic Scoring; 7-Summarize Results

Cost Evaluation must also be base lined. It is sometimes called 'Cash Flow Analysis,' 'Phased Cost Estimate,' or 'Financial Analysis,' among other titles. These methods are setup ahead of time so that when we evaluate alternatives we compare normalized dollars to normalized dollars (i.e., apples to apples).

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Alternatives, Mission and Business Impacts, Risk Analysis and Mitigation Plans Sections of the Product Support BCA

Alternatives

Each Product Support Alternative will be identified and analyzed. The main Analysis of Alternatives (AoA) will be based on the normalized Evaluation factors discussed earlier. The AoA is where most of the work is done to understand the cost-benefit of each Product Support Alternative. Information Technology (IT) impacts on each alternative will be identified and assessed here.

Mission and Business Impacts

Each Product Support Alternative will be assessed as to its ability to perform the mission (Should be part of the Evaluation Factors) and business impacts. Business Impacts are projected based on a cost estimate. There are four (4) basic cost estimates used in a PS BCA: (1) Analogy; (2) Engineering; (3) Parametric; (4) Delphi or Expert.

Risk Analysis and Mitigation Plans

Each Product Support Alternative will be assessed to identify any potential risks. Some key areas where potential risks can be found are: technical, schedule, organizational, sustainability, safety, environmental, business, programmatic or process risks. Information technology (IT) risks can impact any of these areas. For each risk identified, an associated Risk Mitigation Plan should be created to track the trends of the risk being realized.

The Product Support BCA Alternative description, Mission and Business Impacts, Risk Analysis and Mitigation Plans sections are the most critical sections for the software engineer. These are the sections where software-related product support impacts must be factored in to the best value analysis.

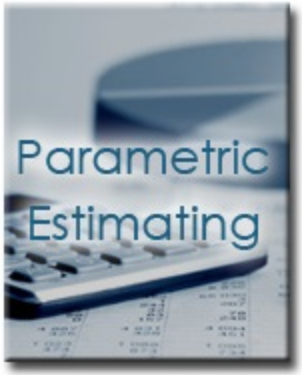
Types of Cost Estimating

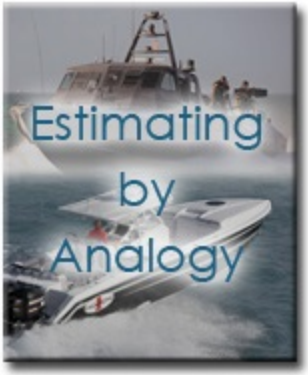
There are four general types of cost estimating, which include; Parametric Estimating, Estimating by Analogy, Engineering Estimating and Expert Opinion Estimating.

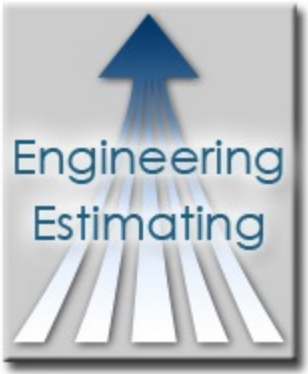
The software engineer should provide subject matter expert (SME) input into each cost estimation method as applicable.

The selection as to which type is most appropriate is dependent on the maturity of available cost data. When practical, it is an evidence-based best practice to use multiple cost estimating models to help get a better idea of the predicted costs. Most agencies use analogy along with parametric modeling when doing software cost estimates.

Click each cost estimating image to learn more.







Learn about the Delphi Questionnaire

Knowledge Review

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Which type of cost estimating is used when there is **not** a significant amount of cost data upon which more detailed estimating methods may be applied; this is also the method where software engineers can provide their input about the goodness of the software development environment?

- [ ] Engineering estimating
- [ ] Parametric estimating
- [ ] Estimating by analogy
- [ ] Expert opinion

Check Answer

Open Systems Architecture (OSA) Principles Impact on the Product Support BCA

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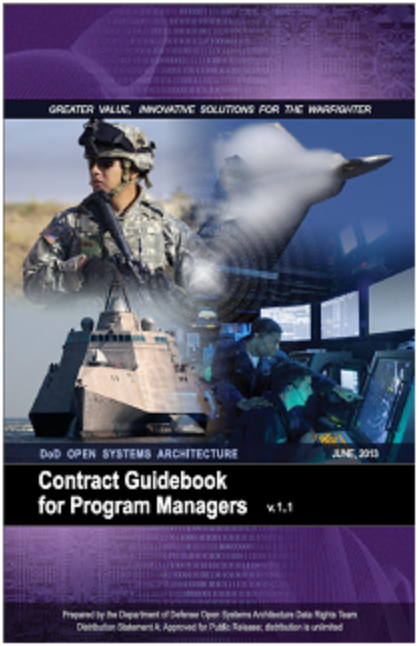
Using Open Systems Architecture (OSA) ensures best value. An open architecture is a technical architecture that adopts open standards supporting a modular, loosely coupled and highly cohesive system structure that includes publishing of key interfaces within the system and full design disclosure.

A key enabler for open architecture is the adoption of an open business model, which requires doing business transparently to leverage the collaborative innovation of numerous participants across the enterprise permitting shared risk, maximize asset reuse and reduce total ownership costs.

The combination of open architecture and an open business model permits the acquisition of Open Systems Architectures that yield modular, interoperable systems allowing components to be added, modified, replaced, removed and/or supported by different vendors throughout the life cycle in order to drive opportunities for enhanced competition and innovation.



Click here to see the five (5) guiding principles of establishing an Open Systems Architecture (OSA) for your program.

Ensuring that the system design includes OSA principles ensures that the government will obtain "best value" performance during the O&S phase of acquisition.

For more information, see the "DoD Open Systems Architecture Contract Guidebook v.1.1"

Intellectual Property (IP) Strategy Impact on the Product Support BCA

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Per the DoDI 5000.02, the Intellectual Property (IP) Strategy is mandatory to be built for all DoD programs. The IP Strategy is statutory for weapon systems/subsystems and regulatory for all other program types. The IP Strategy must be updated as appropriate to support and account for evolving data rights considerations associated with the award and administration of all contracts throughout the system life cycle. The IP Strategy is a major consideration of each product support alternative analyzed in the Product Support BCA.

The IP Strategy shall identify and manage the full spectrum of IP and related issues (e.g., technical data and computer software deliverables, patented technologies, and appropriate license rights) from the inception of a program and throughout the life cycle. The IP Strategy will describe, at a minimum, how program management will assess program needs for, and acquire competitively whenever possible, the IP deliverables and associated license rights necessary for competitive and affordable acquisition and sustainment over the entire product life cycle.

This approach integrates technical requirements with contracting mechanisms and legal considerations to support continuous availability of multiple competitive alternatives throughout the product life cycle.

Software Support Products are Needed for the Product Support BCA

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Software has become very important. Software is usually a part of any product we build. As a result, when developing a Product Support BCA, you must also understand and describe the software needed to build the product software. This includes compilers, debuggers and other software tools used to create and maintain the products software. This also includes testing and training software. Any software needed to ensure high system availability and reliability must be identified and included in all cost estimates.

This includes understanding what is needed to support the support software: manpower, data rights, training to use this software, etc. The entire package must be understood and included in the Product Support BCA.

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Data Management Strategy and Products that Impact the Product Support BCA

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It is important that the program's Data Management strategy identifies how data records are described and how to access, share and manage the program's data elements. This includes the description and management of Metadata elements (Information about information). Data management directly impacts the availability of data to program applications. This includes the tools and technologies used to store and retrieve data (e.g., web access). Finally, this also includes the governance for how data conflicts will be resolved (e.g., if two data elements named the same thing mean two different things).

If the data is not available or understood during the O&S phase, this could make the system not supportable. We must ensure proper understanding of all types of data when building the Product Support BCA.

NOTE: DoD data refers to both data schema/records within a software application and technical data packages (TDP). TDPs are any written document that describes the design or use of the software. We must also ensure the government has appropriate data rights to all types of data.

Software Security Considerations that Impact the Product Support BCA

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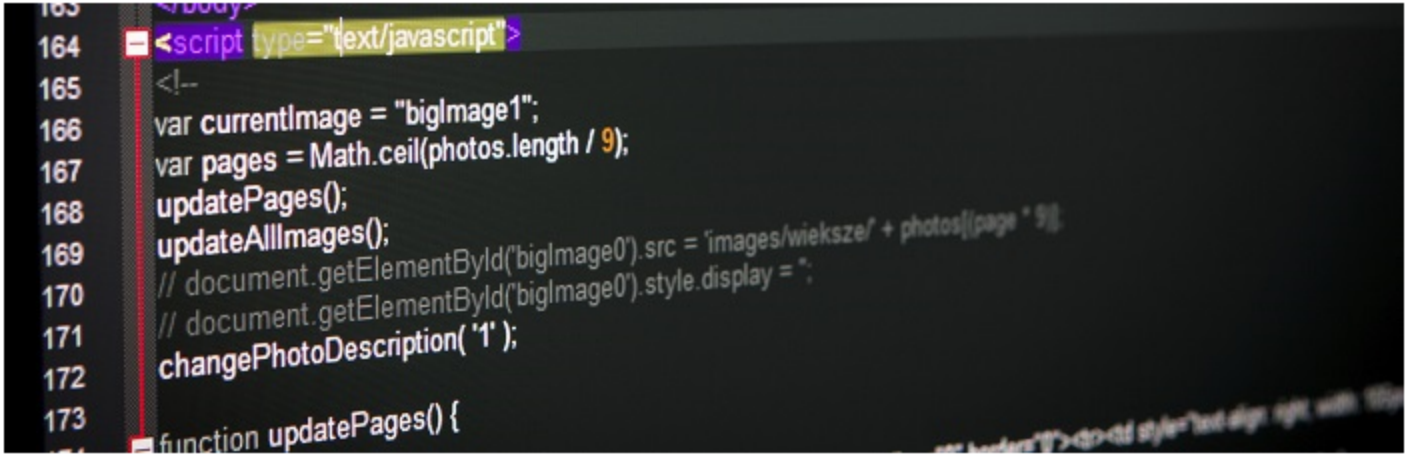
Where did we get the software code for the product's software? How do we know it is secure? Do we have access to the source code? The Product Support BCA is impacted with the use of unsecure software code. Software must be analyzed for the level of security it offers. The use of code coverage tools can be of great value. Code coverage tools can scan source code and determine both the efficiency of the code that was built and if there is any security issues. Code coverage analysis results can be added as a deliverable to a software development contract if there are security concerns so we can see the results of the code scans. If the software code cannot be characterized for its ability to run securely, a cost estimate for the Product Support BCA cannot be made accurately.

Another important security concern for the Software Engineer is the fact that security controls that need to be designed into the software architecture must be determined early in the design process. The Software Engineer must ensure that security is being designed into the solution architecture from the beginning of the design and not bolted on later in the software development process.



Sensitivity Analysis

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After each of the Product Support alternatives have been evaluated, a sensitivity analysis can be accomplished that explains what happens to costs and benefits if an underlying assumption changes or is wrong, or how certain changes in inputs have an impact on the output. The Program Manager can run a "what if" scenario on each alternative to see what changes if certain risks are realized (i.e., become 100%/become an issue).

Knowledge Review

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Open Systems Architecture (OSA) is important to DoD systems designs because (Select All that are correct):

- [ ] Systems that utilize OSA principles have proven to be more cost effective during the O&S Phase
- [ ] Systems that utilize OSA principles are easier to modernize
- [ ] Systems that utilize OSA principles cannot be changed during the O&S Phase
- [ ] Systems that utilize OSA principles are able to maintain a higher system availability rate than non-OSA designed systems

Check Answer

Knowledge Review

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The Software Engineer is responsible for analyzing which of the following areas for each Product being analyzed by the Product Support BCA? (Select all that apply)

- [ ] Level of OSA
- [ ] Intellectual Property (IP) Rights
- [ ] Data Management Strategy
- [ ] Products required for Product Support
- [ ] Security posture of the product

Check Answer

Knowledge Review

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Which type of risk is associated with failing to develop or implement the technology necessary to institute process change?

- [ ] Business/programmatic risk
- [ ] Process risk
- [ ] Technical risk
- [ ] Organizational risk

Check Answer

Conclusions

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Compare the baseline against the alternatives according to the selection criteria identified during the kickoff with the key stakeholders and approval from the governance body. Provide a value analysis that includes a narrative explaining the methodology and rationalization of comparison criteria. Finally, restate the methodologies and tools used to develop the conclusion. There may be a need for an incremental analysis approach for complex systems.

The trade space among key analytical factors should be fully vetted and described in order to present a fully matured analysis and conclusions focused on providing the decision maker the richest understanding of the feasible choices and tradeoffs.

Summarize all the results of all the different analyses conducted in the BCA, across all alternatives. This should be a list of all alternatives, along with pros, cons, risks, and additional findings/observations for each.

Recommendations

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The Software Engineer in support of the Systems Engineer should read the recommendations made by the Product Support Manager (PSM) in the final Product Support BCA and ensure that the seven software considerations were addressed.

This is a quality check to ensure we don't allow a choice that is unsupportable during the O&S phase.

BCA Review and Approval Process

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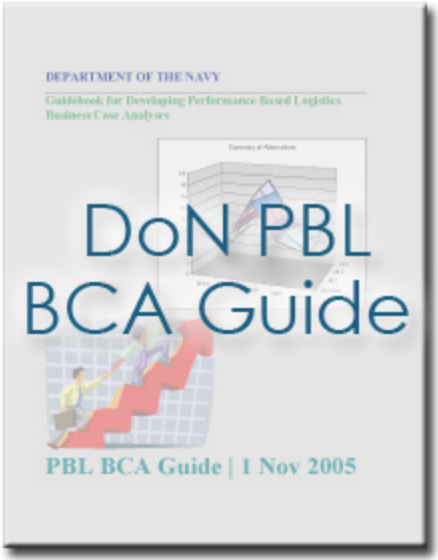
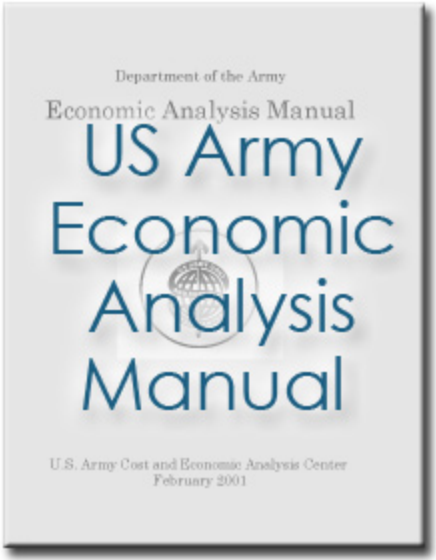
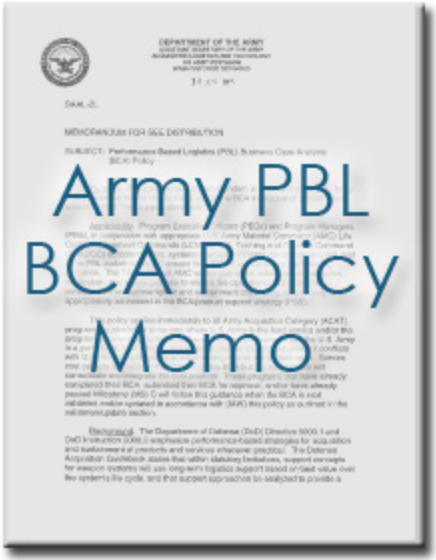
OSD policy and guidance regarding BCAs does not specify a review and approval process. The content of the Product Support BCA includes a conclusion that compares the baseline against the alternatives according to the selection criteria.

Individual services have published their own specific policy or guidance outlining their BCA approval process. The US Army Economic Analysis Manual has the most thorough coverage of software impacts on software support. Please see Appendix D of this manual for more information on "Major IT System Cost Cell Structure and Definitions." ***Select each document to learn more.***







Summary

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Congratulations! You have completed the Building the Product Support BCA lesson. The following are some of the topics that were presented:

- The Executive Summary provides a concise recommended solution and why it is recommended over the competing alternatives.
- The Software Engineer must understand both the warfighter desired outcomes and requirements to ensure that we build the best value software solution and minimize rework. This understanding must permeate all sections of the Product Support BCA.
- The Alternative description, Mission and Business Impacts, Risk Analysis and Mitigation Plans sections of the Product Support BCA are the most critical sections for the software engineer. These are the sections where software-related product support impacts must be factored in to the best value analysis.
- The Software Engineer provides the software development environment understanding in support of the software cost estimate.
- The Software Engineer ensures that an Open Systems Architecture (OSA) approach is used for the systems and software design.
- The Software Engineer ensures that the Intellectual Property (IP) Strategy provides the best value return for the government during the O&S phase.
- The Software Engineer identifies the software support products needed during the O&S phase and ensures they are accounted for in the Product Support BCA.

Summary, Cont.

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Additional topics that were presented in this lesson:

- The Software Engineer ensures that the Data Management Strategy (DMS) provides a clear understanding of the program's data for proper sustainment during the O&S phase.
- The software engineer should emphasize the use of secure coding practices as much as possible to be included in the software development environment.
- The software engineer must ensure that proper software security features are designed into each product; we want security to be designed into the software architecture from the beginning, not bolted on later.

Lesson Completion

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You have completed the content for this lesson.

To continue, select another lesson from the Table of Contents on the left.

If you have closed or hidden the Table of Contents, click the Show TOC button at the top in the Atlas navigation bar.