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28 July 1989

MEMORANDUM FOR AMSAV-BD (11-18c)

SUBJECT: Clearance of Article

1. The article entitled "Improper Use of Economic Analysis in Materiel Cost Comparison Studies," scheduled for presentation at the Department of Defense Cost Analysis Symposium at Leesburg, Virginia, 6-8 September, 1989, revealed no classified or sensitive unclassified material. The material has been cleared for release.

2. Point of contact is the undersigned, phone (314) 263-1164.

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IMPROPER USE OF ECONOMIC ANALYSIS IN MATERIEL COST COMPARISON STUDIES

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Economic Analysis (EA) is defined in Army Regulation 11-28 as a systematic approach to the problem of choosing how best to employ scarce resources. This approach is an investigation of the full implications of achieving a given objective in the most effective manner. Economic analysis is utilized to examine various alternatives to solve a problem so that the decision maker can select the best option. Costs and benefits for each alternative are analyzed and compared. When employed properly, economic analysis is a powerful tool for the decision maker. When not prepared properly, the EA can lead to the wrong decision.

Background

The cost-benefit analysis is the basis for reviewing the various alternatives. This analysis enables the decision maker to examine the costs, weigh the benefits and to determine the feasibility of implementing each alternative. All options which are not viable are eliminated from further consideration. Those which survive the initial test of feasibility are compared to each other showing both costs and benefits.

The first consideration in preparing an EA is to identify the problem. It is essential to analyze the problem, define it and to consider all possible alternatives. Alternatives which are not feasible should be immediately discarded. This procedure avoids time consumed addressing the wrong problem or in developing a detailed analysis of unsuitable alternatives. Analysis of the problem should be discussed in a benefit analysis. Proper identification of the problem and the potential solutions can save many manhours of work.

Issues

The overwhelming majority of EA studies are prepared with separate cost and benefit analyses with no effort to link them in a common equation. This should not be construed as a weakness for an economic analysis. However, the emphasis today is clearly on the cost analysis with sometimes little or no effort undertaken to present a true benefit analysis. Some detailed EA studies are submitted without any benefit analysis. PRIMIRs are prepared with only one or two paragraphs of benefit analysis. Validation experience at the U.S. Army Aviation Systems Command (AVSCOM) has confirmed the far heavier emphasis on the cost analysis process with up to ten pages of cost worksheets submitted for some PRIMIRs.

A textbook solution to the imbalance between cost analysis and benefit analysis is to combine these into a single comparison. Such an approach would appear as an ideal solution for equating costs and benefits. However, this approach is considerably more difficult and risky. Care must be taken to quantify benefits in the most logical and reasonable manner so as not to give one alternative an unfair advantage.

One of the major tasks of each Major Subordinate Command (MSC) is the preparation of PRIMIRs. Over 180 PRIMIRs were submitted for validation at AVSCOM during the second quarter of FY 89.

Recent PRIMIR guidance from HQ AMC directed that an EA should be prepared for all PRIMIRs which are categorized as a New Start, a Late Start, or a Significant Revision Upward (SRU). The SRU is defined as a 25 percent or a \$5M increase in the constant dollar estimate of program costs shown in the fourth quarter, FY 87 PRIMIR submissions. While it is apparent that an EA should be included in these PRIMIR packages, it should be noted that an EA is required when the base case or the no-action alternative shows zero life-cycle costs. The condition exists when an item is considered an add-on to an existing system. In such cases, the base case is a non-existing alternative with no costs for Research and Development, Production or Sustainment. The action case is the only real alternative. Performing an EA under such circumstances consumes needless manhours for developing, validating and reviewing the worksheets. Preparing these studies can actually diminish the significance of the EA process. Considering the time constraints resulting from the submission of PRIMIRs at the MSC level, the preparation of unnecessary EAs can significantly reduce the level of review of those EAs with viable alternatives. Care should be taken to preclude the decision maker from concluding that economic analysis is just excess paperwork.

In preparing PRIMIRs, the EA is not required when the action is DA-directed or is designated as a safety PRIMIR. It is important that the analysts reviewing the PRIMIRs ascertain whether these documents are truly safety PRIMIRs. Virtually any acquisition can be construed as an effort to improve system safety. Any acquisition which addresses a safety issue should be clearly stated in writing as an approved safety PRIMIR. Approval authority is generally assumed to be the MSC Safety Office.

Economic analysis is a process which enables the decision maker to evaluate cost estimates for competing alternatives from the current perspective. By excluding sunk dollars, the decision maker can select the alternative which best utilizes all current and future available resources. Cost analysis studies, such as ROCs and LRs, have sunk dollars excluded from the estimates. Economic analysis studies should be presented in the same manner.

During the recent review of PRIMIRs, it was noted that sunk costs were not extracted from the EAs. Instead, sunk costs were displayed in the early years of the cost comparison. The inclusion of sunk dollars into the EA presents program costs from an historical perspective, looking from the viewpoint of the start of the program. However, this historical view defeats the goal of the decision maker which is to review program costs from the current perspective. The intent of EA is not the justification for the consumption of sunk dollars.

AVSCOM has developed an EA model for PRIMIR submissions which compares discounted dollars for the action and the no-action alternatives. This model serves the purpose of facilitating preparation of EAs which are accurate and consistent with HQ AMC and HQ AVSCOM policy. This model displays Investment and Operating and Support costs, discounts these dollars, and computes the Uniform Annual Cost (UAC).

However, only Operating and Support (O&S) costs are rolled up on the EA cost comparison sheet. While the differential O&S costs are computed and discounted, Investment dollars are excluded from the comparison. The best methodology for implementing economic analysis is to develop cost estimates that compare total program costs which are not sunk. In many situations, the inclusion of Investment dollars will tip the balance in favor of a different alternative.

Operating and Support costs are not only a large percentage of the total program costs for most systems, in recent years these costs have been receiving increasing attention. In reviewing O&S costs, it is essential to question the source and the methodology employed in deriving these projections. O&S costs are the only costs shown on the cost comparison work sheet of the EA for the PRIMIR submissions. Consequently, a consistent set of assumptions must be applied to each alternative when estimating these costs. A reasonable and accurate bottom-line cost comparison can only be obtained when reasonable and accurate cost data is input into the model.

A significant calculation in EA submissions is the determination of the uniform annual cost. The UAC is calculated by dividing the sum of the discounted annual costs by the sum of the discount factors for the years in which benefits are received. The UAC is one of the best determinants in comparing cost estimates for several alternatives.

In reviewing the uniform annual cost, it is essential that a consistent definition of benefits be applied to each alternative. A PRIMIR recently submitted to the AVSCOM CECD office for validation showed a UAC value for one alternative as being approximately three times that for another alternative while the total discounted dollar estimates varied by only a few per cent. An analysis of this discrepancy revealed a varying definition of benefits. In the no-change alternative, the benefits were assumed to begin in the first year of the existing program, while the action alternative showed benefits commencing in the first year of acquisition of the new system. The problem was identified as the definition of benefit years. It was determined that the benefits for the second alternative should also start in the first year of the existing program since this alternative involved the phasing-in of a replacement system. Benefits were derived from the existing system prior to the commencement of the new program. Each UAC calculation should always include a review of the definition of the benefit years.

Special Considerations

The Department of Defense has employed an unchanging ten per cent discount rate for many years. This value has remained constant through periods of low inflation and high inflation and through periods of low prime lending rates and high prime rates. This inflexibility in the discount rate has undoubtedly led many to question the value of using the discounted dollars for comparing alternatives. Any change in discount factors will alter the discounted dollar projections and could tilt the balance to favor a competing alternative for certain programs.

An important issue surfaced during the recent PRIMIR submissions. Why are the economic analyses not forwarded to higher headquarters for review? In addition to consideration of the manhours expended preparing, validating and reviewing the subject documents, the EA should be an essential part of any program review. Decision makers should have access to validated economic analysis studies to ensure the most efficient use of program resources. Under current guidance fewer than twenty per cent of the PRIMIRs should require an EA. Can time constraints be responsible for the exclusion of EAs from the PRIMIR review process? Furthermore, does higher headquarters review EAs when these studies are not part of a PRIMIR package?

Another vital issue involving economic analysis concerns the integrity of the process itself. The use of various models to generate economic analyses facilitates increased office productivity and efficiency. Fewer arithmetic mistakes occur. However, utilization of such models could invite abuse. A program manager who favors a particular alternative could easily manipulate the model entering varying input data until the desired result is obtained.

This input data could be engineering estimates, such as failure rates, RAM factors, cost estimates, etc. Sometimes, a small change in an input variable can result in a substantial alteration in the output, such as a spares requirement. This could lead a decision maker to choose the "preselected" alternative. Decision makers need to ascertain the reasonableness of the key input data. A skeptical reviewer may ask how often the economic analysis model was run to secure the desired result. A sensitivity analysis will reveal the impact of variations of the input data on the output results.

Recommendations

1. When submitting an EA, a benefit analysis should be prepared with the cost analysis. Linking cost and benefit analysis into a joint comparison may be difficult to accomplish. Any reasonable effort to present a combined cost-benefit analysis should be encouraged.
2. An EA should not be required when no viable alternative exists.
3. Ensure that all PRIMIRs which are categorized as safety PRIMIRs are certified as such by the appropriate MSC office.
4. Sunk costs should be excluded from EA cost comparison worksheets. Such costs may be displayed on a separate line or footnote provided that these costs are not rolled into the cost comparison.
5. Development and Production costs should be included with Operating and Support Costs on the EA cost comparison worksheet. All program costs which are not considered sunk should be presented in the cost comparison.
6. Operating and Support costs should be reviewed carefully since these costs represent a substantial portion of the life cycle cost estimate. The source document for the O&S cost estimate should be stated on the EA.
7. Analysts should check the UAC values to ensure that the costs are determined properly considering the scheduled benefit years. It is imperative that a consistent definition of benefit year be applied to each alternative.
8. DOD discount rates should be adjusted when economic conditions indicate that such action would be reasonable and justifiable. One suggestion would be to require DOD to review the discount rate on an annual basis. Any adjustment to the standard ten per cent rate could be published in conjunction with the dissemination of inflation guidance. If economic conditions warrant additional changes to the rate during a particular year, then DOD could issue revised rates as deemed necessary.
9. Any economic analysis which is required by higher headquarters for submission within the PRIMIR packages should be forwarded to higher headquarters for review.
10. Decision makers should scrutinize key input data used in EA models to generate cost estimates. A sensitivity analysis should demonstrate the impact which adjustments to the input data have on the output cost data.

Conclusion

Economic analysis provides the means which enables the decision maker to select the best alternative at any point in time in the program acquisition cycle. However, misuse of economic analysis may involve misrepresentation of input data, miscalculation of costs, misinterpretation of results, and even misunderstanding of the purpose of performing the EA study. Proper application of EA techniques will facilitate optimal utilization of scarce DOD resources.

ACRONYMS

AMC	Army Materiel Command
AVSCOM	Aviation Systems Command
CECDC	Cost Estimate Control Data Center
DOD	Department of Defense
EA	Economic Analysis
HQ	Headquarters
LR	Letter Requirement
MSC	Major Subordinate Command
O&S	Operating and Support
PRIMIR	Product Improvement Management Information Report
RAM	Reliability, Availability, and Maintainability
ROC	Required Operational Capability
SRU	Significant Revision Upward
UAC	Uniform Annual Cost

REFERENCES

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2. Course Book, Economic Analysis for Decision Making, Rock Island, IL: U.S. Army Management Engineering Training Agency, December 1978.
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