

5.2.2 Alternatives Analysis

While the requirements define what the asset must achieve and how it must perform, the process of analyzing alternatives leads to identification of the solution that will best meet those requirements. Often, a solution is obvious and other times it may only seem obvious. The analysis is necessary to determine if a potential solution is available, affordable, and where the benefits outweigh the cost. Consideration must be given to whether the technology is readily available to implement the potential solution. If research and development is necessary, has the technology advanced beyond the fundamental research? Are real applications to the necessary technology available? In some cases competing alternative design concepts must be pursued to determine the feasibility of a particular alternative. Consideration of the life-cycle costs, including operations, maintenance, and disposal, are part of the alternative analysis. The life-cycle costs incurred by a chosen alternative may not be affordable to the program and may constrain the ability of the program in meeting its overall strategic objectives. For assets that are intended to provide production capability, analysis must be conducted to ensure that production or manufacturing rates can be achieved with a specific alternative. Demonstrations and prototyping, which provide proof of principle, are sometimes necessary to determine if the technology used by an alternative is realistic and reliable. The selection of a recommended alternative must be based on a systematic analysis of the benefits and costs.

5.2.3 Systems Engineering And Value Management Planning

Systems Engineering

A system is an integrated composite of people, products, and processes that provides a capability to satisfy a need or objective. Systems engineering is an interdisciplinary collaborative approach that is accomplished by integrating three major elements.

- Development phasing that controls the design process and provides baselines that coordinate design efforts
- A process that provides a structure for solving design problems and tracking requirements flow through the design effort
- Life-cycle integration that involves users in the design process and ensures that the developed product is viable throughout its life

Each of these elements is necessary to achieve proper management of a development effort. The primary goal of the systems engineering process is to transform mission operational requirements or remediation into system architecture, performance parameters, and design details. The application of systems approach is tailored to the project's needs. A project need not be a system to use a systems methodology. Systems engineering is a tool that consists of iterative processes, such as requirements analysis, alternative studies, and functional analysis and allocation. Integrated Project Teams perform this planning and analysis to develop the subfunctions and

their relationships that are necessary and sufficient to accomplish the desired top-level functions. These subfunctions form the key input for the project's Work Breakdown Structure.

The Work Breakdown Structure should define the total capability to be developed or produced; display the total capability as a product-oriented family tree composed of hardware, software, services, data, facilities and other components; and relate the elements of work to each other and to the end product. The objective of the Work Breakdown Structure is to provide the means to allocate resources, schedule, and control the project at the product level. Work Breakdown Structures with excessive level of effort or activity-based rather than product-based do not provide the insight to the resource load and critical path analysis necessary to ensure that the project is under control. For these and other reasons, product-oriented Work Breakdown Structures are the only acceptable WBS for the acquisition of capital assets.

At each level (system, subsystem, and component), subfunctions are identified based on the functions, requirements, and resulting design decisions from the previous level. As the level of detail increases, the subfunctions are allocated to systems, subsystems, and/or components.

For complex activities, a functional hierarchy diagram may be used to depict the breakdown of functions into subfunctions. Also, a functional flow block diagram may be generated to show the logical relationship of functions or subfunctions at the system or subsystem level. The functional flow diagram may be used to document which system, subsystem, or component performs the function and subfunctions.

A systems engineering management plan may be necessary when the complex systems, plants, or other efforts are envisioned. For small, noncomplex projects, systems engineering may be used as an approach to ensure solutions meet needs. A systems approach is the preferred methodology for analyzing, defining, and designing solutions to meet mission needs.

Value Management

The value management methodology, (also known as value analysis, value engineering, value planning, etc.) is a consideration in all capital asset acquisition process phases. Value Management is defined as an organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life-cycle cost consistent with required performance, quality, reliability and safety. Value management is a technique directed toward analyzing the functions of an item or process to determine "best value," or the best relationship between worth and cost. The Value Management Program is an integral part of the overall project delivery process and is not a separate entity designed to "second-guess" the Integrated Project Team or design authority.

The Department uses a two-tiered approach, as defined in the Federal Acquisition Regulation to implement a viable cost-effective value management program. The two approaches are the "mandatory program" and the "incentive" (also known as voluntary) program.

Value Management Program. OMB allows Agencies to apply value management to achieve the greatest benefit. The minimum requirements consistent with the two approaches described in the Federal Acquisition Regulation, Part 48, are as follows.

One approach, mandatory value management program, is used for all facility construction activities. For maximum benefit, value management should be used as early as possible in the project development and design process so valid recommendations can be implemented without delaying the progress of the project or causing significant rework of completed designs. Value management uses a systematic procedure for analyzing requirements and translating these into the most economical means for providing essential functions without impairing essential performance, reliability, quality, maintainability, and safety. This organized effort is commonly referred to as the Value Methodology Standard. The Value Methodology Standard is the systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall life-cycle cost. All mandatory studies conducted before Critical Decision-2 are accomplished using value management methodology.

The second approach, the value management incentive program, should be used in all contracts awarded on facility construction projects after Critical Decision-2, where the following contract conditions exist.

- The Department or its agents have dictated the specifications, design, process, etc., that the contractor is to follow.
- The contractor's cost reduction effort is not covered under award fee (or any other incentive).
- The contracting officer has confidence in the cost estimate for the work at issue (i.e., confidence the cost estimate is close to normal Federal Acquisition Regulation pricing conditions).
- The contracting officer has great confidence in the contractor's accounting system and/or can separately track costs of value management efforts based upon the contractor's assertions and confirmation from the Department cognizant chief financial officer.
- The proposal, if accepted, requires a change to the contract and results in overall savings to the Department after implementation.

Additionally, it is the responsibility of the Department's Under Secretaries and their respective organizations to develop criteria and guidelines that conform to Public Law 104-106, *National Defense Authorization Act for Fiscal Year 1996*, and OMB Circular A-131, for both in-house personnel and contractors that identify programs and projects with the most potential to yield savings from the application of value management techniques.