

## Architecture Support to Decision-making

Appropriate architectural descriptions can decisively inform management decisions as to whether a given program qualifies to pass a specific milestone. An organization can choose to define the milestone acceptance criteria themselves in terms of the achievement of a pre-determined “passing grade” with respect to the content, completeness, and consistency exhibited by its program-level architectural description. Architectural descriptions can support -specific, technical sub-decisions, to include whether:

- **...All of the system’s proposed functional requirements are, in fact, justified by their support to some work activity.** Each requirement in the architectural description should map to one or more specific activities.
- **...All valid functional requirements have been allocated to a development item(s).** The architectural description should include a mapping of all functional requirements to the system component(s) or service(s) that will fulfill them.
- **...All requirements are subject to validation.** The architectural description should map each requirement to one or more methods of validation (i.e. test, analysis, etc.) in a Requirements Validation Matrix.
- **...The interfaces, transactions, and system components depicted in the architectural description comply with mandated technical standards where appropriate.** The description should trace each system design element to the standards – if any -- with which it complies.

Architectural descriptions are potentially useful to decision-makers in other ways as well, among them:

- **Support to the Calculation of Costs and Benefits.** An architectural description can help estimate long-term operations costs, the costs of specific system components and development tasks by means of Activity-Based Costing and/or dynamic simulation. Conversely, it can capture expected benefits through activity performance engineering and traceability from activities to strategic objectives. Comparing costs with benefits allows management to select among alternative concepts for system implementation.
- **Support to Net Assessment/Trade Studies.** With the results above in hand, managers must decide whether the projected benefits of an effort (in terms of the enhancement it promises in the prospects for mission/strategic success) justify the investment. They can use architecture-supported methods to evaluate the costs and benefits offered. Analysts begin by establishing a simple trace from system function to mission activity to strategic objective, respectively, proceed through the dynamic simulation of key business processes, and end by employing constrained optimization techniques that compare *combinations* of investments to discover the *best overall balance* between cost and benefit.
- **Support to Risk Management.** Reviewers can refer to the architectural description to determine whether the effort’s Risk Management Plan continues to appropriately evaluate technical risk. They can come to a first-order approximation of the amount and severity of technical risk present with

which the system presents the development effort by examining such things as the complexity of information flows, the stability and performance of services and re-usable components, and the capacity and throughput requirements depicted in the system's architectural description. More detailed risk assessments can, of course, subsequently be conducted upon individual services, components, and sub-systems in isolation.

- **Promoting Efficiency in Development.** Does a planned capability unnecessarily duplicate existing capabilities, or ones provided under another program? Architectural analysis can help identify such duplication in activities, data, or system capabilities. These analyses compare definitions directly, and map to a reference model (with respect to both functionality provided and data flows) to determine the degree of overlap of two or more capabilities. Reference to an architectural description can also suggest whether an already-fielded solution has achieved enough to justify continuing it -- if the description includes (or links to) actual values for performance measures, it may be possible to "read off" directly the utility of the legacy solution vis-à-vis a proposed one.
- **Validating a Concept's Scope.** By defining information flows and other logical relationships among activities, organizations, systems, and system components, an architectural description supports evaluation of the **coupling** (degree of dependency) across concept boundaries, as well as its cohesion (degree of logical focus and manageability).
- **Determining Acquisition Sequence.** Portfolio managers can use dependencies among all the systems and services that contribute to an architecture to place them in the proper time order in the sequencing plan. The architectural description can also help trace the ripple effect on other programs if the schedule for given one must change (slip).