Planning for Technology Transition

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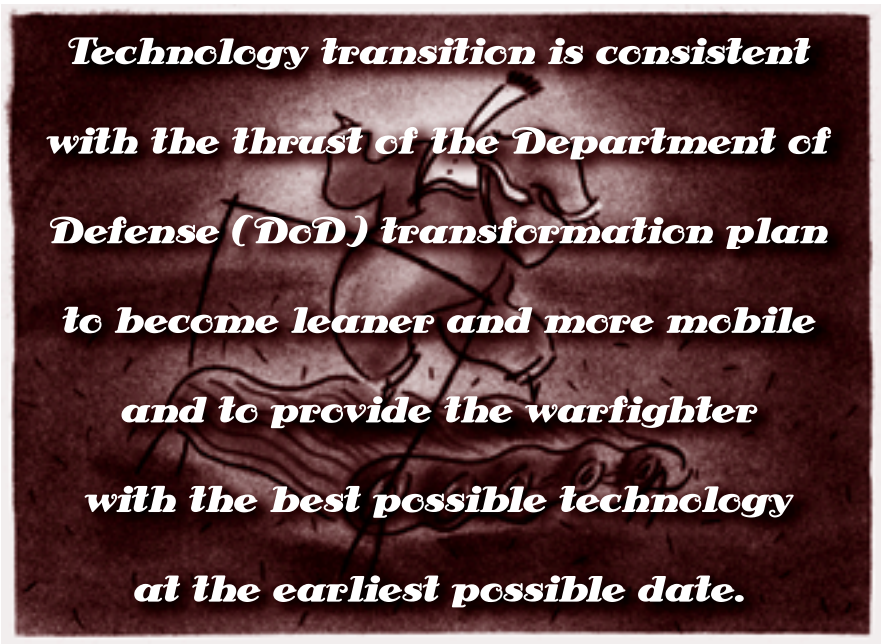
Before we can understand the importance of planning for technology transition, we must understand what technology transition means. What is the difference between technology *transition* and technology *transfer*?



Technology *transition* is the process by which technology deemed to be of significant use to the operational military community is transitioned from the science and technology environment to a military operational field unit for evaluation and then incorporated into an existing acquisition program or identified as the subject matter for a new acquisition program. This is different from technology *transfer*, which is a technology partnership between government and industry by means of which, technology developed by one party is transferred to the other party for development and use, often with residual rights to the transferring party. The government may develop a technology in one of its labs and transfer it to industry, the government holding rights of some kind to the developed products. The reverse is also possible.

Why Do Technology Transition?

The objective of technology transition is to make the desired technology available to the operational units as quickly as possible and at the lowest cost. Technology transition is consistent with the thrust of the Department of Defense (DoD) transformation plan to become leaner and more mobile and to provide the warfighter with the best possible technology at the earliest possible date. Systems provided to the operational community for evaluation remain with those operational units upon completion of the evaluation and are called "residual units."

Where Does the Transitioned Technology Originate?

The laboratory environment that produces the technology may be either a government laboratory or an industry research and development facility, and the technology of interest may be specifically for military use or may be dual-use technology (usable by both military and civilian organizations). The military applications may require some additional refinements not available in the civilian counterpart.

Technologies available for transition usually come from either the ATD (advanced technology demonstration) process or an ACTD (advanced concept technology demonstration) program. Because technologies that are targets for transition are often not already part of the program objectives memorandum (POM) for a target acquisition program, a reduced level of documentation and oversight can sometimes leave these candidate projects at risk for successful transition. Good transition planning is, therefore, essential.

The Role of User Evaluations

The military user evaluations have several possible outcomes in terms of recommendations: acquisition of the technology; return of the technology for further development; termination of the project; or acceptance of the residual capability provided as fully satisfying the user need without the necessity for acquisition of additional products. Because the technology must be mature enough to use in an operational environment, the technology readiness of an ACTD, expressed in terms of a technol-

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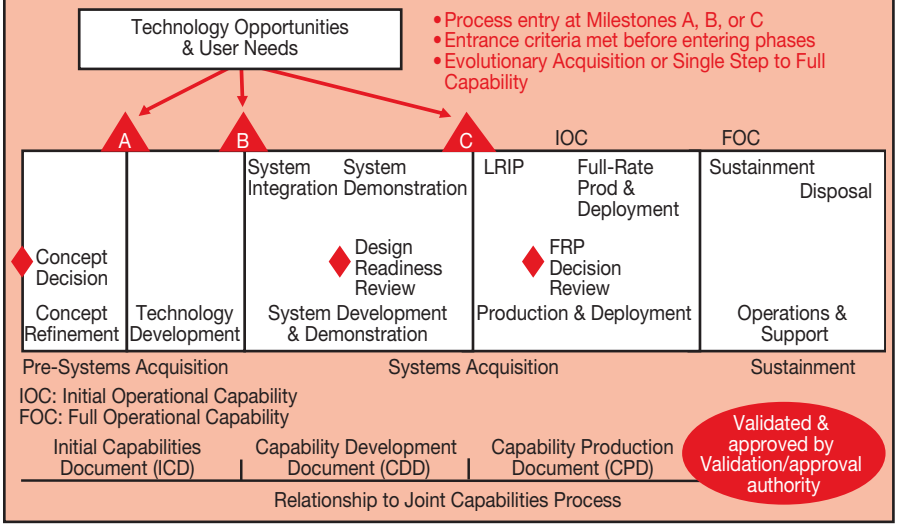
FIGURE 1. **Acquisition Model Based on the Revised DoD 5000 Process**



ogy readiness level (TRL), must be at the high end of the TRL scale.

ACTDs are reviewed by both the Office of the Secretary of Defense (OSD) and the Joint Requirements Oversight Council (JROC), and they are funded in part with OSD funds. The deputy under secretary of defense for advanced systems and concepts (USD(AS&C)) is responsible for the selection and approval of ACTDs. ACTD management planning includes designing for producibility, developing requirements for sustainment, and transition planning.

What is Technology Transition Initiative?

Technology Transition Initiative (TTI) is a new program, created in FY2002 and included for the first time in the FY2003 National Defense Authorization Act. TTI provides limited funding for selected technology transition projects. The technology may be an ACTD but can be any mature technology needed by the warfighter. An ACTD that executes according to a good management plan will usually transition without the help of TTI funds. The objective of TTI is to accelerate transition of new technologies into acquisition so they can become an operational military capability. The technologies selected for TTI funding are chosen from a set of proposals submitted by the Services. The TTI program supplements, but does not replace, existing Service and defense agency funding. A primary goal of the TTI program is to help bridge the 18- to 24-month gap between the completion of user evaluation of a technology and the time when it can be funded as part of an acquisition program—a period that is sometimes referred to as the "valley of death."

Transition of Technology to Acquisition Programs

Technology transition into acquisition requires planning beyond that required for initial technology development. Acquisition programs involve a significant level of oversight, planning and milestone reviews, and measures of performance typically not found in the laboratory environment. The overall acquisition process is governed by policy issued from the USD(AT&L). Figure 1 shows the present acquisition model based on the revised DoD 5000 process.

Transition Strategy

An important component of good transition planning is a documented transition strategy that addresses a number of issues to the extent they are relevant to the particular technology, including but not necessarily limited to:

- Intended use of the technology
- Operational capability elements supported
- Concept of operations
- Key stakeholder identification and involvement
- Initial cost estimates
- Modeling and simulation requirements
- Residuals use plan
- Planned acquisition phase insertion point
- Convergence of the ACTD transition strategy and the acquisition strategy
- Contracting strategy
- Percent of COTS, if any.

The Transition Plan

Although there is no policy or other requirement specifying the contents of an ACTD transition plan, it should address elements specific to the technology being transitioned and how the technology will merge into the acquisition process of an existing program or how it will transition as a new-start program. The transition plan should be an element of the overall ACTD management plan and should reflect the transition strategy. It should specifically address the transition issues and elements relevant to the specific technology being transitioned, including planning for operational user evaluation.

Requirements Development

Although there is no policy requiring a formal statement of operational requirements for an ACTD, the transition manager should work with the user community identified as the evaluator of the ACTD to formulate a joint statement of operational need and understanding of the intended capability of the ACTD, including the various operational environments. ACTDs are often initiated based on broad statements of user need. However, when made a part of an acquisition program, the statement of requirements will be consistent with the new CJCSI 3170.01, signed and released in FY2003. These documents codify the requirements development process for acquisition programs.

Transition Integrated Product Team

Part of an effective transition plan and transition management process is the formation—often by the ACTD demonstration manager—and activation of the transition integrated product team (TIPT). The TIPT provides the most natural means for bringing the key stakeholders together to review strategies, serves as a bridge between the initial ACTD management planning activity and the transition decisions, assists in identifying and resolving transition issues, and coordinates other transition planning activity. The receiving acquisition program office should be represented on the TIPT, as should contractors where appropriate.

Overarching IPT

As the time for completion of the ACTD approaches, an overarching integrated product team (OIPT) should be formed as a successor to the TIPT. The OIPT completes the remainder of the transition reviews (cost, schedule, and performance) in preparation for transition to acquisition. The OIPT ensures that all of the necessary elements and documentation are in place for the ACTD to transition into the acquisition program at the appropriate point in the acquisition life cycle. The OIPT will also prepare for a formal program review by the defense acquisition executive.

Understanding the Technology Readiness Level

One of the elements of the technology transition plan should be a description of the TRL of the program and how the product meets the criteria for the identified TRL. The pertinent TRL hierarchy for ACTD transition is as follows:

- TRL 6: System/subsystem model or prototype demonstration in a relevant environment (ground or space)
- TRL 7: System prototype demonstration in an operational environment
- TRL 8: Actual system completed and operationally qualified through test and demonstration (ground or space)
- TRL 9: Actual system operationally proven through successful mission operations
- The TRL level of the ACTD will determine when it is ready to go to the field for evaluation and where in the acquisition process it can be inserted.

Acquisition Funding

Acquisition funding availability is a critical element of success. Although science and technology (S&T) funding is multi-year, procurement funding is single-year. Elements of an acquisition program have to be factored into the POM process and planned for in advance, and the resultant appropriation has to include the requested technology. If a smooth transition of an ACTD into acquisition, including the availability of funds, was not fully planned, the ACTD can be overcome by other demands on the budget from other acquisition program elements whose need is more evident and immediate. To alleviate the "valley of death" situation, the TTI program was initiated. Accomplishing the activities necessary for the ACTD to be included as an acceptable TTI program, if appropriate, is another duty of the OIPT.

Contracting Strategy

When a technology transitions into acquisition, there will be some form of contracting activity involved. The technology may be inserted into an existing contract whose terms and conditions will apply to the new technology; it may enter acquisition as a major upgrade to an existing system and may require a separate contracting effort; it may also enter acquisition as a new program, in which case there will clearly be a new contracting effort. This transition process can be made much easier if the OIPT works with the acquisition community to ensure that a proper contracting strategy for the new technology is in place and that the contracting strategy makes sense for the particular technology and for the existing acquisition program. There are many different contracting strategies, and having a liaison with the acquisition manager for the program into which the technology will transition will significantly ease the transition process.

Transition Milestone Events

As part of the ACTD management and transition planning, a schedule should be developed and executed to reflect critical milestone events for the developing technology as it progresses from a lab environment to a transition event. These critical milestone events should include regularly scheduled technical and management reviews whose purposes are to give the manager insight on how successfully the program is progressing toward transition. Each of the reviews should, wherever feasible, be supported by quantitative data, and each should have exit criteria to help determine if the technology is ready to proceed to the next phase. Typical reviews should include:

FIGURE 2. **Milestone B Requirements**

- Requires an approved capability development document (CDD)*
- A PM has been assigned
- MDA approves:
  - Acquisition decision memorandum
  - Entry to system development and demonstration phase
  - Program initiation
  - Acquisition strategy
  - Acquisition program baseline
  - LRIP quantities
  - Exit criteria for next phase

*ORD is required until CJCSI 3170.01 is revised

- Technical reviews
- Cost reviews
- Performance reviews
- Baseline document reviews
- Risk management reviews.

Critical Elements of the Management Plan

The management plans for ACTD development and transition should include a number of elements or sub-plans that can significantly ease the overall process. These sub-plans are considered critical to successful acquisition programs. This should not be taken to mean that the same level of formality required for a full acquisition program is necessary. However, to ignore the value such reviews can provide—however informally they may be conducted—would not be wise. The sub-plans include:

- Supportability and sustainment management plan
- Risk management plan
- Configuration management plan
- Product test plans
- Product improvement and maturation plan
- Training plans.

Military User Test and Evaluation

Field use is a critical end-state activity of the ACTD transition process. Well in advance of the actual scheduled time for operational field use and evaluation, the transition manager should identify the operational users who will evaluate the product or products. To the extent possible, representatives should be included as members of the TIPT. The contractor or lab that is producing the evaluation units should also be involved in these discussions since the number of units required as residual units to be left in the field must be determined sufficiently in advance that time is allowed for their production.

Military User Assessment (MUA)

User feedback reports following test and evaluation, are critical to the final steps of transition to acquisition. A primary purpose of the user evaluation is to determine whether the system is of military value, and if it is, to provide a description of that value. Some of the elements that should be requested as part of the feedback report are:

- Importance to overall warfighting capability
- Effectiveness and suitability assessment and measures
- Operational value of residual system
- Predicted results versus observed results.

Defense Acquisition Executive Review

As the technology is prepared for insertion into acquisition, the program will be subject to a defense acquisition executive review. This is a high-level review that focuses on a few key issues to make sure all the essential elements for OSD and congressional support for the system are in place. Some of the primary areas of interest are as follows:

- Dual-use identifications
- International identifications
- Joint program identifications
- Lead Service identification
- Transition PEO identification
- Actual acquisition insertion point and TRL
- Transition target program identification
  - –target program info–name, Service, acquisition PM
  - –funding resolutions completed.

The identification of the actual technology insertion point is sometimes a complex issue; the transition manager should have a good understanding of what may have been happening in the acquisition target program prior to insertion. Each milestone insertion point has certain requirements, including documentation requirements. Figure 2 shows, as an example, what is necessary for entry into a program at Milestone B.

Are Metrics Necessary?

Yes, metrics are critical, and they are an often-overlooked part of the ACTD development and transition process. It is difficult to manage any part of the process successfully without some level of quantitative data to assist the managers and technical personnel in determining the correct status of the project. Without good data, it is impossible for managers to plan future milestones for the program. Predictive assessments are only guesswork without good metrics information to support them. Some basic metrics that should be captured for almost any program are:

- Effectiveness
- Suitability
- Cost
- Schedule
- Quality
- Reliability
- Producibility
- Supportability.

Bottom Line

In summary we can say that good transition planning requires involvement and coordination among several people, establishment of IPTs, and the use of proper metrics; and while not always easy, it is critical to the success of technology transition.

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