Stakeholder and Process Alignment
in Navy Installation Technology Transitions

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Technology Transition Programs (TTPs) are an important tool for facilitating technology transfer from science and technology (S&T) development to operational adoption in the Department of Defense (DoD). TTPs for weapons systems and platforms have formal processes to smooth and speed the path to operational adoption. By contrast, for technologies targeted at installations, there are some special challenges in formalizing the transition process. This article outlines some of the TTPs currently being used in the DoD and proposes a general framework for adapting their best practices to the larger TTP community.

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Stakeholder and Process Alignment Needed

The goal of TTPs is to speed the development of existing and emerging technologies for use in defense applications, and to increase the speed and likelihood of their successful and cost-effective operational adoption. A successful technology must not only perform properly, it must interface smoothly with other systems, meet requirements, be appealing to end-users and other stakeholders, and be compatible with the organization's processes, including planning, budgeting, contracting and technical approvals. For example, an energy-saving technology that has a net operational cost savings over 5 years may still be unable to compete with other projects that support operational requirements such as a hangar modernization or an upgraded pier.

Alternatively, a high-performance technology may not be adoptable simply because the Unified Facilities Criteria (UFC) doesn't allow it. If any of the key stakeholders, including maintenance, safety or cybersecurity personnel, has a technical or operational objection, the technology may not be adopted. These hurdles really do stop adoption. As stated in the 2013 Navy Environmental Sustainability Development to Integration (NESDI) program report:

> We have numerous technical success stories that are not fully integrated because of certain circumstances or conditions—some of which are totally outside the realm of a Principal Investigator. However, these circumstances or conditions must be identified so the appropriate person(s) can take action. Implementation of technology is difficult so you need to have a roadmap in place at the start and ask for directions along the way.

Stakeholder and Process Alignment in TTPs

The Government Accountability Office (GAO) identified the need for a gated review process to smooth the path for technologies transitioning from S&T into "product development" in 2006. By 2013, GAO reported that many DoD TTPs used technology transition agreements, which call for (nonbinding) commitment from stakeholders as a prerequisite for a technology moving through gates in the program. Well-known TTPs such as the Joint Capability Technology Demonstration program, and the Technology Insertion Program for Savings, target existing acquisition programs, generally a specific weapons system or platform.

In the installation environment, the need for TTPs to facilitate transition is similar, but the adoption ecosystem is different. One of the biggest differences between weapons systems and the installation environment is that the end-users are a more diffuse group. This complicates the problem in a number of ways. For example, every installation has a diverse group of facilities in terms of age, use and systems, where some may benefit from reduced power consumption and peak loads more than others, for example by realizing more cost savings.

Examples of TTPs for installation technologies in the Navy are the NESDI program, the Navy Shore Energy Technology Transition and Integration program, and the Energy Systems Technology Evaluation Program . Each of these programs has a multigate project review process to ensure early consideration of stakeholder needs and administrative processes.

General Framework for Stakeholder and Process Alignment

In the facilities context, end-users and operational engineers, such as installation energy managers, are rarely involved in S&T and therefore are not in a position to influence these projects. Within S&T, single-source procurement, installation of software, and hiring may all face much less stringent requirements than in the operational community. Consequently, S&T engineers may not be aware of real barriers to adoption facing operational engineers. Moreover, TTPs in the weapons system and platform acquisition context, usually designate a person to line up stakeholders and approval authorities, but in the installation context this responsibility often falls to the S&T engineers, who may not be properly trained to accomplish it.

Here we present the Adoption Readiness Level (ARL) scale (Table 1) as a tool for S&T engineers to facilitate stakeholder and process alignment. The ARLs synthesize and generalize principles for managing development of technologies for widespread adoption in an installation environment.

In keeping with the need to simultaneously integrate technologies with existing systems, secure stakeholder support and integrate with shore planning and funding, program and process requirements, the ARLs measure progress across three domains: technology integration, stakeholders and processes. Hurdles in any one of these domains will prevent adoption, regardless of the technology's suitability in the other two. Formal documentation and milestones related to all three areas increase the likelihood that important barriers will be recognized and addressed before they substantially delay or even prevent adoption. Conversely, insurmountable barriers that will ultimately prevent adoption will be recognized sooner, minimizing the costs associated with the failed project.

Table 1. Summary of Adoption Readiness Levels

ARL		Component Technology TRL	Systems-Level Technology Integration	Stakeholders	Processes
1	Application Identified	5	Potential to satisfy an existing or anticipated need more effectively than alternatives.	N/A	N/A
2	Demonstration Planning	5	Research plan developed, necessary facilities identified.	Stakeholders identified. Need verified.	Funding budgeted for demonstration phase. Approvals required for demonstration identified.
3	Representative Prototype	6	Demonstrated at representative research site. Performance documented.	Pilot performance validated by stakeholders.	Technical approvals required for operational use identified and documented. Testing or modification requirements documented.
4	Representative Demonstration	7	O&S requirements and any training requirements for O&S documented.	O&S funding levels and personnel requirements for sustainable support in operation estimated.	Process for getting technical approvals for operational use has been documented.
5	Fully Adoptable	8	Operating at representative research site or operational site for relevant time period. Performance requirements satisfied and documented.	Validated and accepted by stakeholders, including budget for procurement and ongoing O&S.	All required technical approvals have been received. Any required updates to Unified Facilities Criteria or Guide Specifications have been made or in process of being updated.
6	Adopted	8	In operational use at multiple installations.	Training and communication programs in place.	Technology installed and in operational use.

Technology

Typically, TTPs support S&T demonstrations of relatively mature technologies—at Technology Readiness Levels (TRLs) of 5 and above, and advance to a TRL 7 or 8. Often a candidate technology will be demonstrated in a research environment—and sometimes in an operational environment on a Navy installation. While S&T personnel generally well understand the technology domain, they may focus primarily on the readiness of the component technology under study. The technology domain encompasses not just the readiness of the technology itself but also its integration with other technologies, including equipment and software. Technology that performs well at a component level may not be suitable for integration into the installation ecosystem.

Operation and support (O&S) is a commonly overlooked element of technology integration. Installation maintenance personnel typically are responsible for many different types of equipment, often from different manufacturers and different vintages—e.g., one building with a brand-new heating ventilation and air conditioning (HVAC) system, and another with a 20-year-old HVAC system. If a new technology is adopted, it does not necessarily replace every instance of an old technology, and the installation may need the capability to maintain both new and legacy equipment for an extended period, requiring distinct expertise, spare parts, tools and other resources. Technology whose use or maintenance requires highly specialized training may not be adoptable for that reason alone. Alternatively, the technology may be adoptable only with additional budgeting—both funding and time—for the training, or contracting for specialized maintenance. The ARLs describe the need for identifying and documenting any training needed during the demonstration project.

Stakeholders

Stakeholders are individuals or entities that have an interest in the adoption of a technology or the ability to influence its success. A common pitfall in demonstration projects is to wait too long to engage all relevant stakeholders, such as facilities engineers, technical approval authorities and maintenance technicians. The ARLs provide a framework for identifying and engaging stakeholders, as well as documenting and meeting their needs.

One of the key functions of TTPs is demonstration: when potential end-users can see a technology in operation, they are much more likely to champion its adoption into their organization. As highlighted in ARL 6, TTPs encourage the S&T teams and motivate users to communicate the results in forums such as the Federal Energy Exchange.

Everywhere in DoD, projects must compete for resources. On the installation side, the trade-offs often are made at the installation level, and in many years projects compete for resources with high-profile priorities. Technologies do need to compete on financials, but they also need to compete for end-user priority. For example, energy efficient lighting must compete for restoration and modernization funds head-to-head with projects like hangar upgrades, pier maintenance, housing and child development centers. In an installation context, TTPs often are focused on a particular strategic initiative, such as meeting federal installation energy mandates. For these TTPs, there may be short- or long-term funding sources that can be targeted to support the technology. For large projects, the technology may be adoptable using an Energy Savings Performance Contract. S&T engineers should identify a credible path to funding.

A further challenge for installation technologies is that the financial analysis may differ substantially across installations. For example, utility costs differ across installations; not only do rates per kilowatt-hour vary widely, but some utility contracts include charges for high peak demands, or power factor charges, while others do not. Therefore, it is not uncommon to see an incorrect preliminary financial analysis by a consultant or an analyst unfamiliar with the details of the specific utility contracts. This can require managers to modify the project before it is able to compete successfully, delaying or even preventing adoption.

Moreover, utility savings often are realized by a different organization than the one funding the investment, and the financial case may need to include allocating future savings from one budget to another. For some technologies, such as renewable energy, there is an ongoing O&S requirement. Often the decision authority for sustainment funding is different from the sponsor for the initial investment. Even for a demonstration project, if it is to operate long term, both types of funding must be available. For a successful operational adoption, the resource manager for sustainment is a critical stakeholder. This highlights the importance of early inclusion of all relevant stakeholders so that the buy-in from those responsible for each budget is supportive. It also highlights the importance of demonstrating a technology in a DoD installation, so that energy managers or other champions can point to a success elsewhere and find a counterpart of each needed stakeholder at the demonstration site.

Processes

The processes domain includes all planning and budgeting processes required to procure a technology, as well as any technical approvals required before a technology may be used at an installation. There is some overlap between the stakeholder and processes domains, as some of the hurdles in the processes domain create stakeholders, such as technical authorities. The stakeholder domain focuses on stakeholders who have an ongoing and operational interest in the technology and who provide funding, while the alignment of stakeholders who are part of approval and authorization processes and whose involvement is not necessarily ongoing after the technology is adopted are addressed in the processes domain.

Even if funding is budgeted, contracting for procurement can still present a hurdle for operational adoption. Federal acquisition regulations may cause delays and prevent adoption. For example, if specifications for a demonstrated technology are too narrow and there are only one or two vendors, it may be difficult to contract. S&T engineers may be unaware of this pitfall, as they may be able to acquire technology for research purposes without the same level of competition and scrutiny.

Safety, environmental, siting, UFC and cybersecurity requirements are all deal-breakers if they are not addressed. For example, the UFC currently prohibit the use of stationary lithium-ion battery systems inside occupied structures. A technology using lithium-ion batteries must get approval or a waiver for testing, evaluation and validation. If the technology is proven successful, then a request to have the UFC modified would need to be submitted for installation and use at other facilities. It is very important for S&T engineers to identify the technical authority and work with them early to identify the requirements and make any adjustments necessary to the demonstration project, and anticipate how a facility manager would handle the same requirements.

Cyber and information assurance authorities should be involved as soon as possible—it is generally much more difficult to fix issues later than early in the development process. If a demonstration project requires a special waiver that would not be readily available in a larger or more permanent adoption, the S&T team should work to identify a path to meeting the requirements in a wider adoption. Some technologies may require changes to the UFC, and this requires working with the criteria managers early on. S&T engineers should also consider whether scale would change the ability of the technology to get approvals—would a larger project trigger a different standard or level of scrutiny? As described for ARLs 4 and 5, S&T teams should document processes, as well as approvals, for reference by future managers who may wish to adopt the technology.

TTPs can greatly facilitate the adoption of valuable technologies. Identification of process hurdles and involvement of stakeholders while a technology is under development as part of a TTP is very important for transition. When stakeholder and process alignment are considered early in each project, technology transfer in TTPs becomes faster, cheaper and less risky. Failing to anticipate stakeholder and process hurdles often leads to situations in which technology cannot be adopted because critical elements were not addressed during the demonstration/validation phase, such as technical approval or identification of a transition resource sponsor and vehicle. The ARLs provide a general framework for anticipating hurdles and developing milestones for demonstration projects in TTPs.

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