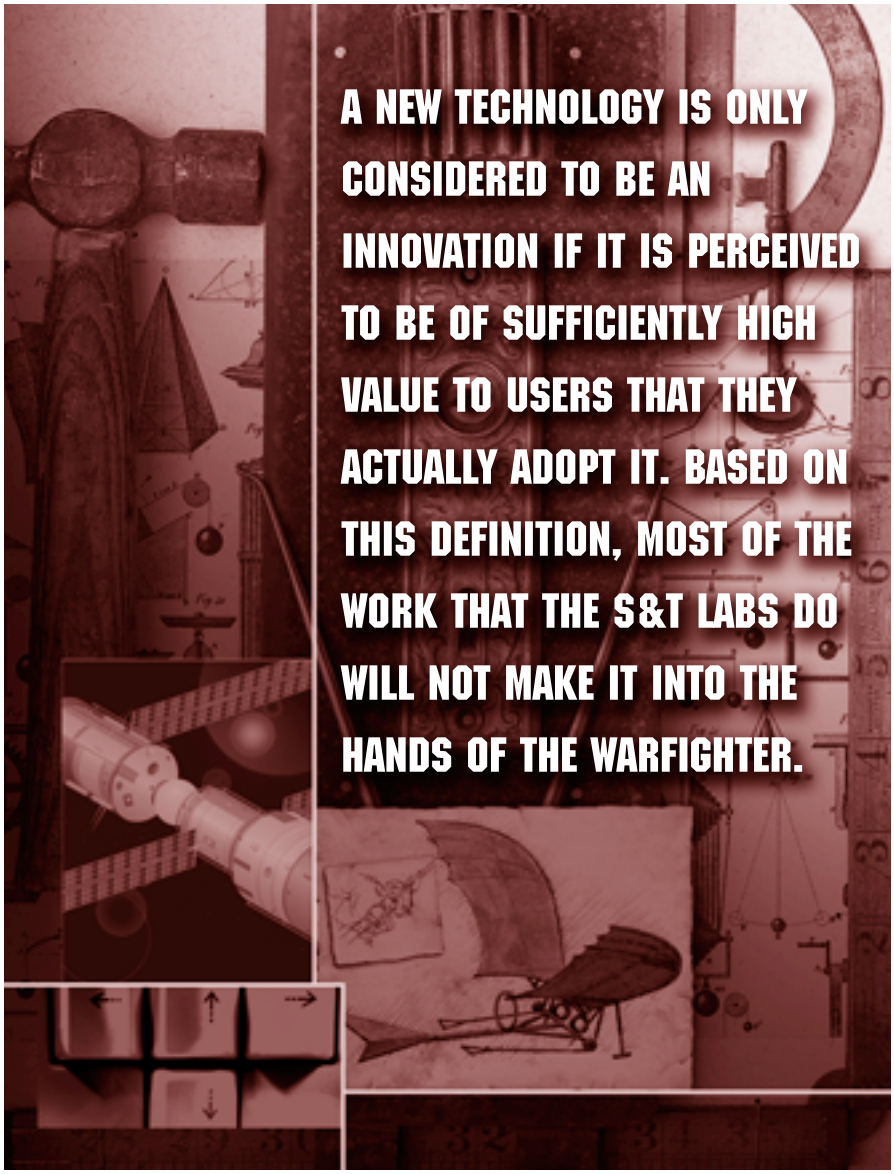
Technology Scouting

A Transformational Role for the Science and Technology Community

Mark T. Dertzbaugh

The goal of the DoD's science and technology (S&T) community is to maintain the nation's military technical superiority by providing innovative solutions that meet the warfighter's needs. One aspect of the innovation process involves identifying new concepts or developing new technologies, and the S&T labs are replete with bright and knowledgeable people who are very good at doing that. However, by definition, a new technology is only considered to be innovative if it is perceived to be of sufficiently high value to users that they actually adopt it. Based on this definition, most of the work that the S&T labs do will not make it into the hands of the warfighter.



Problems and Challenges

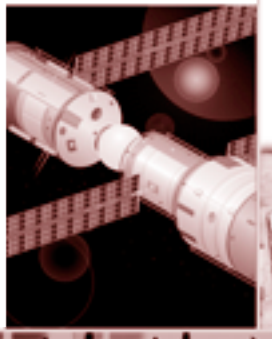
Why is that? Let's look at it from the perspective of the S&T and the acquisition communities. From the S&T community, one often hears, "The acquisition guys never transition our technology!" From the acquisition community, one often hears, "The S&T guys never provide me a useful solution!" The reality is that both are right! The problem lies in how the acquisition process is defined in DoD 5000.

The first challenge lies in a gap in timing between technologies that the S&T labs are working on and the point at which requirements get sufficiently defined to articulate a need. A key role for the S&T labs is to do cutting-edge research. However, this means that the labs are often working on technologies in the early concept refinement phase of pre-systems acquisition for which an initial capabilities document (ICD) has not yet been defined. As a result, most of the technologies the S&T labs are working on will never be identified as meeting a requirement as defined by the user community. Some wonderful technologies may have been developed by the S&T

Dertzbaugh *is the chief of business plans & programs at the U.S. Army Medical Research Institute of Infectious Diseases. He received his doctorate in microbiology and immunology at Virginia Commonwealth University.*

labs, but the acquisition customer simply doesn't have a need with which to justify allocation of funds for their transition.

The second challenge can be attributed to the DoD 5000-mandated hierarchy of materiel alternatives, which gives priority to consideration of commercial solutions. Based on this hierarchy, materiel solutions developed by the S&T lab are considered to have lower priority. Therefore, technologies developed in-house by an S&T lab will seldom get transitioned into an acquisition program unless a solution cannot be found elsewhere or the technology is transferred to a commercial entity for development. This makes it very difficult for the S&T community to show value-added to the warfighter.



BETTER INTEGRATION OF THE S&T COMMUNITY WITH THE ACQUISITION AND REQUIREMENTS COMMUNITY IS ESSENTIAL FOR SUCCESS.

Looking for Solutions

Integrate

An essential component of making this process work is to leverage everyone's strengths. Better integration of the S&T community with the acquisition and requirements community is essential for success. The requirements community is best able to articulate warfighter needs, but they may have difficulty translating those needs into specific functional requirements. The S&T community is best able to identify potential technology solutions, assuming that needs have been clearly defined, but they are usually not the best qualified to make business decisions related to development of the technology or issues related to manufacturing of the product. The acquisition community is best qualified to ensure the development and procurement, but they may not be the most knowledgeable about the technology and its limitations. What we have often seen in the past within the Joint Medical Biological Defense Program is that there has not been good coordination between these three communities. The S&T program manager has often gone off in one direction, without confirming with the requirements community or the acquisition community that a need exists for technology, or that the acquisition program manager will accept the technology if it is successfully developed. In this scenario, the outcome of the S&T program is predictable: usually some interesting technical information is reported, but no tangible product that directly benefits the warfighter is produced.

Define the Requirement

To give the S&T community a fair chance to meet a requirement, it is essential that an ICD be established in the very early concept refinement phase of the pre-systems acquisition, before the S&T program begins investing funds in an effort. There is frequently finger-pointing among the three communities regarding who is responsible for articulating these early requirements. In fairness to the requirements community, they are usually not sufficiently knowledgeable about the technology options available to define the specific materiel solution. However, it is essential that they articulate the general needs of the warfighter in sufficient detail so that the S&T community can focus their efforts. Once the basic level of needs is articulated, the S&T and acquisition communities can work on translating them into possible materiel solutions. For example, in the DoD Biological Defense Program, we have seen a shift in the requirements community towards defining broad-based generic capabilities. However, the capabilities are *so* broad and nonspecific that the acquisition and S&T communities don't know the specific threat agents towards which they should prioritize their efforts or what some key performance parameters are for each type of materiel solution that, if developed, the warfighter would find acceptable. Without this information, the S&T and acquisition communities will be using a shotgun approach to developing a materiel solution, resulting in a dilution of effort. Again, the key to developing a good ICD early in R&D is to have a close dialog between the requirements, S&T, and acquisition communities; otherwise, efforts and funding will be wasted.

Make the S&T Community Technology Scouts

In the past, we have observed a tendency in acquisition programs to ignore the valuable technical resource the S&T community offers. This is in part due to the fact that the S&T labs are often competing with other commercial entities for transition of their technology into an acquisition program and the general lack of interest on the part of many researchers in supporting product development efforts. As a result, acquisition program managers often view the S&T community as being, at best, uninterested in their efforts, and, at worst, biased in their evaluation of technologies under consideration. But what if the S&T labs could be more closely connected to the acquisition

LETTERS.
We Like Letters.

You've just finished reading an article in *Defense AT&L*, and you have something to add from your own experience. Or maybe you have an opposing viewpoint.

Don't keep it to yourself—share it with other *Defense AT&L* readers by sending a letter to the editor. We'll print your comments in our "From Our Readers" department and possibly ask the author to respond.

If you don't have time to write an entire article, a letter in *Defense AT&L* is a good way to get your point across to the acquisition, technology, and logistics workforce.

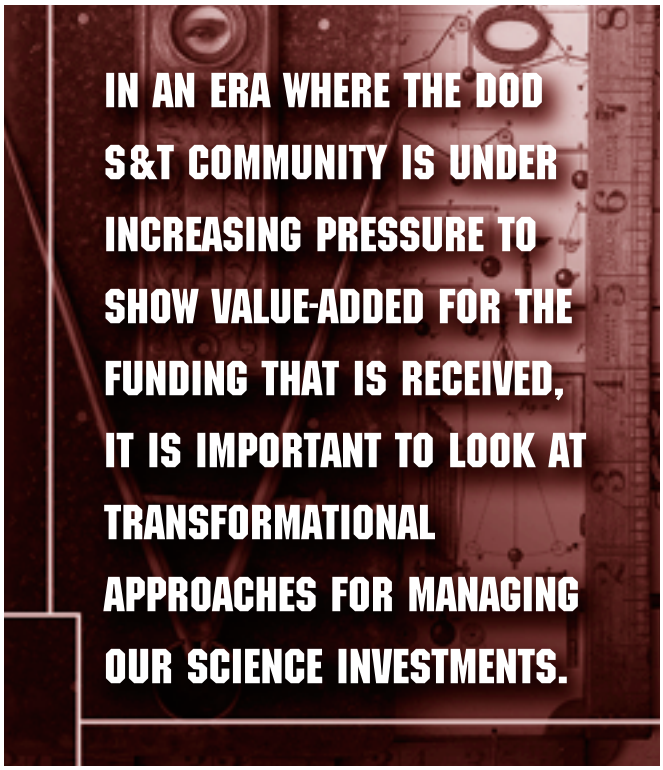
E-mail letters to the managing editor: defenseat&l@dau.mil.

Defense AT&L reserves the right to edit letters for length and to refuse letters that are deemed unsuitable for publication.

programs and used as the scouts for new technologies that meet user needs? Sounds heretical? There is precedent for doing this.

Implement Customer-focused Technology Planning

Based on a recent analysis by the American Association for the Advancement of Science, less than one-fourth of all R&D funded by the federal government is performed in intramural laboratories. This means that the majority of the technological innovation will occur outside the DoD S&T laboratory system. However, for the DoD to harness these investments, there must be a way to systematically identify technologies that address user needs. One method for doing this is called customer-focused technology planning (CFTP), described in detail by Jay A. Paap at <www.jaypaap.com/articles/CFTP-09-2002-mod.pdf>. Developed and refined over the last three decades, the origins of this approach are rooted in the model of innovation developed by Don Marquis at the Massachusetts Institute of Technology; the model is currently used within a broad range of industries. The goal is to increase the innovation potential of an organization by using a systematic approach for comparing and evaluating technologies for their fit to customer needs. Many of the principles are grounded in fundamental concepts used in systems engineering, but they have been adapted to be more amenable for use in an S&T organization. Basically, the process involves translating general user needs into specific functional requirements. The S&T community is probably best equipped to know the latest technologies out there and how they could best address a user



need. This approach requires the S&T community to abandon a "not invented here" mentality and look at all the options and sources of technologies that are available. These options then get ranked by "fit" to functional requirements, technical maturity, and risk. Once a prioritized list of technologies is established, the S&T community can gain consensus from the requirements and acquisition communities on the technology options being considered. This includes such downstream issues as affordability, producibility, and supportability.

The CFTP process provides a framework for S&T managers to integrate various sources of information in a way that allows them to make informed decisions regarding investments in technologies. The process is based on the following steps:

- Identifying who are your key customers and why
- Determining the needs of the customer, in order of perceived priority to them
- Identifying the technology options that best address or improve upon these needs
- Assessing opportunities for investing, leveraging, and/or maturing these technologies.

An important aspect of this approach is to ensure that S&T managers consider user needs that cannot be articulated directly by the users themselves, but that are felt to be critical to enhancing the innovative value of the product. This is where the S&T community must apply some insight and interpret user needs beyond those that the users can readily describe.

The CFTP process can be tailored to provide the key information needed by S&T planners to be able to make an informed decision. The real value of the approach is that it allows different and/or competing technologies to be compared for their fit and impact on user needs. It also allows other issues to be considered, such as the relative maturity of the technology, competing sources of the technology that may be available, and their relative strengths. For example, such information would be invaluable for managers in the Joint Biological Defense Medical S&T Program to use as they weigh what technology options to invest in for countermeasures. In those cases where multiple companies have similar competing technologies, it would provide the S&T managers a tool for comparing and evaluating technologies that would best meet user needs.

Align the S&T Program Investments to Match Priorities

Once the requirements and acquisition communities have bought in, the S&T program manager can develop a strategy for evaluating and comparing lead technologies within the S&T laboratories. The maturity and risks associated with each of the lead technology options can also be assessed. Technical personnel in the S&T laboratories who have gained first-hand experience working with the technologies can act as advisors to the acquisition program manager, allowing the DoD to make good investment decisions based on their assessment of the technologies during the concept refinement phase of pre-system acquisition. The result is a greater probability that a technology option identified in the concept phase gets transitioned to the technology development phase of pre-system acquisition, and closer integration of the S&T laboratories with the rest of the acquisition community.

Support Technology Development Efforts

There are several ways in which the S&T community can continue to provide support to the acquisition community once a technology has transitioned from the laboratory. Many of the DoD intramural S&T laboratories have unique facilities and capabilities that would be difficult to duplicate in industry. The key selling point in the S&T laboratories' favor is their ability to act as the independent and unbiased evaluators of technologies offered by competing companies that the acquisition customer is considering. Such a role would be particularly important during the technology development phase of pre-system acquisition, where down-selection of technology options would be important. Another important role for the S&T community is to anticipate and provide the underlying science base required to support the development of the technology. The objective of such efforts is to reduce technical risk, make improvements to the technology, and ensure that it meets key performance and/or regulatory requirements. For example, to license medical biological defense countermeasures with the Food & Drug Administration, the efficacy of the product may need to be demonstrated in a relevant animal model of the human disease. If the underlying science on characterization of the animal model has not been done in parallel with development of the product, licensure will be significantly delayed. To avoid this downstream problem, it is critical for the S&T program manager to coordinate with the acquisition customer and ensure that the underlying science base is there to support development of the technology.

Importance of Transformational Approaches

The S&T community has an important role to play within the DoD acquisition community. However, in an era where the DoD S&T community is under increasing pressure to show value-added to the warfighter for the funding that is received, it is important to look at transformational approaches for managing our science investments and securing the long-term future of the DoD S&T community.

The author welcomes comments and questions. He can be contacted at mark.dertzbaugh@us.army.mil.