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Collaboratorium: A Multi-Stakeholder Approach to Advancing Innovative Defense Acquisition

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Abstract

The U.S. Department of Defense (DoD) faces significant challenges in effectively transitioning innovative technologies from research and development to operational use, a phenomenon known as the “valley of death.” This issue has critical implications for national security, as delays in technology acquisition hinder the United States’ ability to keep pace with global competitors. While addressing these challenges requires a multifaceted approach of updating policies, cultures, and ecosystems, one area worth exploring is how the defense innovation ecosystem engages less-traditional stakeholders, such as civil society, academia, independent researchers, and small businesses. Fostering knowledge sharing and collaboration across these diverse communities allows the DoD to tap into a broader range of perspectives and technical expertise, leading to more effective technology discovery and development. This paper first analyzes the policy, process, personnel, and budgeting hurdles hindering defense technology innovation and then examines current successes and future opportunities for less-traditional stakeholder engagement in the defense innovation landscape. Building on lessons learned from an initiative called “Technology Transfer Days” (TTDs), the paper proposes a framework for a technology matchmaking collaboratorium, the Defense Innovation Discovery and Collaboratorium Platform (DID Collaboratorium), which can provide comprehensive resources for a whole-of-community engagement strategy around defense technology development and acquisition needs.



Key words: valley of death, less-traditional stakeholders, emerging technology, innovation, collaboratorium, technology transfer days (TTDs), technology discovery

Introduction

The well-known “valley of death” phenomena—namely the U.S. Department of Defense (DoD) and its broader investment community spending billions annually on development, only to see a lack of sustained scale-up of new technologies—has been explored at great lengths. The issue presents an urgent challenge for the United States and its global allies, as it hinders the United States’ ability to swiftly transition to and leverage the latest technologies crucial for safeguarding national and international security.

Delays in innovation and technology acquisition across both the public and private sectors are worrying, as competitors such as China continue to make breakthroughs in the technology-military nexus. Historically, the United States has always been a global leader in both public and private sector innovation—fostering a synergy between commercial and public interests to drive breakthroughs across industry, academia, and government (Lawrence, 2023). To push back against today’s most imminent threats, the DoD’s innovation ecosystem must find its footing again and ensure the latest mission-critical technologies are not only integrated into military programming but also arise out of such programming directly. Research and innovation must have a seat at the table.

While the DoD has taken meaningful steps to improve the identification and acquisition of innovative technologies, such as implementing numerous research and commercialization efforts to improve innovation, substantial gaps in technology discovery and acquisition remain. These gaps persist despite private sector interest in engaging with the government around technology research and development in efforts to address today’s foremost global and national security challenges (Defense Innovation Board [DIB] Strategic Investment Capital Task Force, 2023).

This paper explores the following two-part research question:

- 1) How does the U.S. defense community currently integrate knowledge sharing and less-traditional stakeholder engagement approaches to help socialize across silos to innovation?
- 2) How could the U.S. defense community more effectively engage less-traditional stakeholders and communities of interest to undo barriers preventing defense innovation from reaching its full potential?

Given the significant attention already given to this topic, it is important to explore the issue of technology innovation and acquisition across the defense community through a different lens. This paper examines how the U.S. defense community resources innovation across silos, including from less-traditional sources, to apply technology to protect national security interests. By examining the ways in which the defense ecosystem successfully engages a community of less-traditional stakeholders, this paper attempts to better the understanding of the widening schism between private and public sector innovation with the aim of bettering technology discovery, knowledge sharing, and investment.

In this paper, we define less-traditional stakeholder engagement as the practice of engaging and incorporating a multi-disciplinary and multi-dimensional set of stakeholders—including civil society, academia, independent researchers, small-scale startups and businesses, and solo inventors and entrepreneurs—into the identification and decision-making process. These stakeholders are frequently underrepresented across traditional defense communities, causing the DoD to miss out on opportunities to incorporate a broader range of



perspectives and technical knowledge. The broad discovery, amplification, and inclusion of these stakeholders can help facilitate otherwise untapped innovations, as well as provide the diversity of ideas and backgrounds needed to ensure technology is not only practical but reflective and ethical.

By exploring current success stories, as well as future opportunities for the DoD and its investment ecosystem to engage with less-traditional stakeholders, a stronger understanding of the importance of knowledge sharing and fostering communities of interest around emerging technologies can be gained. This in turn can be applied to future technology discovery and development efforts across the defense community.

This paper aims to serve as a key resource in better understanding how public and private sector stakeholders can more effectively engage with each other moving forward to ensure the latest technologies are successfully applied in defense efforts. To achieve this, the paper first explores the policy, process, personnel, and budgeting hurdles that the private and public sectors face when looking to collaborate in the defense market. Using “Technology Transfer Days” (TTDs) as a baseline model and case study, the paper then identifies and evaluates existing mechanisms that have been successful in facilitating innovation and collaboration between the public and private sectors across the technology-defense ecosystem.

The paper finally builds on this analysis to provide a framework for a living, dynamic knowledge environment for fostering collaboration and information-sharing that facilitates innovation. A key element of this framework involves the development of a Defense Innovation Discovery and Collaboratorium Platform (DID Collaboratorium), which would provide crucial resources to enable a whole-of-community engagement strategy around defense technology development and acquisition needs.

Research Methodology

The research methodology for this paper followed a three-pronged approach. First, the authors conducted desk-based research to better understand and identify the underlying challenges in this space, including current factors driving barriers to innovation across the defense community ecosystem. Second, the authors conducted a survey across the defense innovation and acquisition community to gain perspectives on the impact of multi-stakeholder community engagement on defense technology identification, assessment, and acquisition. The 10-question research survey was disseminated across relevant networks in the defense technology innovation and acquisition space from February to March 2024 and resulted in 20 responses (see Figure 1). Third, the authors integrated insights from five primary interviews on defense acquisition and matchmaking.



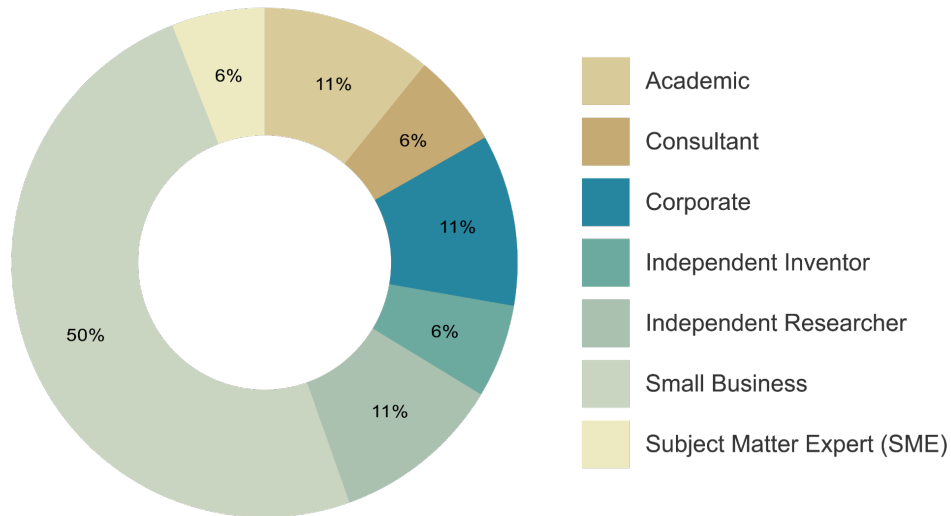


Figure 1. Breakdown of Survey Respondents by Sector

Assessing Internal Barriers to Innovation

What are key aspects of the valley of death?

The United States remains the largest performer of research and development (R&D) globally, with \$806 billion in gross domestic expenditures on R&D in 2021 (National Science Board, 2024). However, while the absolute amount of federally funded R&D increased from 2011 to 2021, the share of the total U.S. R&D funded by the federal government decreased from 30% to 19% during this time period. Moreover, the business sector leads the way in R&D funding for experimental development and applied research, with the business sector funding 87.6% of experimental development compared to the federal government funding 11% (National Science Board, 2024).

The DoD's requirements and acquisition processes were largely designed for a time when the DoD was the largest funder of global research and development. Today, however, many mission-critical technologies are driven by the commercial sector, and the DoD's processes have not adapted to this new reality. In fact, the DoD's industrial base has shrunk by 40% over the past decade (The White House, 2022). The DoD has struggled to effectively leverage new technologies, with the gap between private sector and public sector innovation widening in recent years in areas such as generative AI.

A key aspect of this problem is the lack of engagement with and support for a diverse range of stakeholders, including small businesses and entrepreneurs. The DoD also struggles with engaging other less-traditional stakeholders, such as civil society and independent researchers, two essential voices for ensuring technology development is practical, ethical, and sustainable. Moreover, industry feedback in a survey disseminated by Becera highlighted that the DoD has a tendency to set requirements that are too specific or limited in scope. This can limit the adoption of technologies, even if they feature mission-critical capabilities that are very close to what is needed. It can also lead to wasted time and money developing new technologies when the off-the-shelf solution would have been adequate in meeting the DoD's mission-critical needs from the get-go (DIB Strategic Investment Capital Task Force, 2023).



Barriers in Internal Bureaucratic Processes and Network Access

The unique nature of how the DoD operates and the demands placed on work flows due to internal bureaucratic processes stifles rapid innovation and the ability to keep up with evolving technology. For example, experts highlight the Authority to Operate (ATO) model as a major barrier to accelerating innovation such as AI adoption (Allen, 2023). Under this model, every software system that operates on the DoD's Information Network (DoDIN)¹ and processes government data must receive an official ATO from a certified DoD authorizing official, requiring extensive written documentation demonstrating how the software will comply with various cybersecurity and operational controls.

While having clear controls and standards in place is important for ensuring the integrity of security systems, most DoD components have only a single authorizing official to weigh the benefits and risks of allowing new applications. Moreover, a study conducted by the Center for Strategic and International Studies (CSIS) found that a risk-averse approach has taken root across this ATO process, resulting in long evaluation processes that simply do not keep pace with technology evolution. As outlined by the CSIS, this means the development of, for example, an AI capability cannot begin until the development environment and all the necessary software pieces have received an ATO (Allen, 2023). Contrast this with the commercial and academic sectors, where an AI developer can download widely available open-source AI development frameworks to use with their own datasets.

This reflects a broader trend across the DoD and its bureaucratic processes, which are largely designed and operate under a risk-averse culture. Numerous stakeholders have identified this limitation, including Deputy Assistant Secretary of the Army for Research and Technology William Nelson, who has stated that more experimentation and risk need to be incentivized in order to push forward new technologies and innovation across the DoD (Metzger, 2023). Namely, allowing for more risk would help current processes support innovation and allow for the integration of the latest solutions developed by industry and research.

Additionally, the DoD often imposes excessive security requirements on less-traditional businesses, limiting their ability to showcase their capabilities (DIB, 2024). A DIB study recommends avoiding imposing security requirements on less-traditional businesses in RFPs until the government has a clear understanding of their capabilities, recommending instead that an independent classification system for potential bidders could be created that would allow them to demonstrate their suitability for different types of contracts without revealing sensitive information (DIB, 2024).

Gaps in Data Access and Management

Data-related challenges remain a key barrier to innovation and the deployment of emerging technology across the DoD. While the DoD and wider intelligence community has amassed considerable amounts of data over the last decades, there are key limitations in terms of how this data is organized, stored, and accessed that present obstacles to innovation (Allen, 2023). Often, this data is siloed so that training data is generally application-specific, and there are also issues with the diversity and variety of data due to barriers around acquisition of sufficient data that is diverse enough (Allen, 2023).

There is also the issue of data accessibility, with much of the DoD's data siloed across different levels of classification (Allen, 2023). While classification systems are critical to

¹ According to the U.S. Cyber Command, the DoDIN is a federated environment of 46 combatant commands, services, and DoD agencies and field activities. This includes over 15,000 unclassified, classified networked and cloud environments globally, as well as 23 Cyber Security Service Providers. [Link](#).



information security, this leads to the compartmentalization of information, which in turn hinders the ability to develop, assess, and operationalize new technology. Small businesses, entrepreneurs, and researchers who may lack the knowledge of classification systems or the resources to pursue security credentials can therefore often be left out of the ability to access or use data for technology development or training.

Weaknesses in Talent Acquisition

Innovation requires a workforce equipped with the ability to perform technologically advanced activities and research, with a clear need for capabilities in critical and emerging technologies. From scientific publications to patent activity, leadership in technology development comes directly from the ability to educate, train, and retain talent. However, in recent years, overlapping strategies and entrenched practices have hindered the DoD's ability to recruit and retain technologically savvy employees, creating missed opportunities (Weisner, 2023). Key gaps include lack of mentorship programs and opportunities as well as a culture defined by lack of trust in junior talent (Weisner, 2023). These issues are compounded by bureaucratic processes that slow hiring and make workflows unappealing to those used to operating in fast-paced, dynamic environments characteristic of private sector technology development.

Limitations in Technology Identification and Information Sharing

The DoD also faces issues with its technology identification and matching ecosystem, which hinders its ability to identify and develop technology at the pace necessary to ensure emerging technologies are properly leveraged and deployed. There are issues with the DoD's "commercial technology pipeline" (CTP)² through which innovative commercial technologies are identified. A study by the RAND National Defense Research Institute (NDRI) identified key challenges and gaps in the CTP, including a lack of alignment with stakeholders around shared mission or common goals, objectives, and outcomes (Kotila et al., 2023). The NDRI also found gaps across the incentive structures for CTP stakeholders, as well as a lack of clearly defined metrics or accountability mechanisms to check progress against goals (Kotila et al., 2023).

The NDRI study also found that the CTP lacked both formal mechanisms and requirements for information sharing with stakeholders, including no clear coordination or collaboration across stakeholders (Kotila et al., 2023). This includes the ability to share information around promising emerging technologies, available resources and programs, and ongoing research across stakeholder groups. These limitations reflect a larger issue across the DoD of not adequately engaging less-traditional stakeholders to identify new technologies, which impedes collaboration and contributes to the valley of death problem.

Burdensome Approach to Dual-Use Technology

A DIB study examined the DoD's ability to acquire dual-use technologies and determined it encounters significant self-imposed obstacles, including limiting investment in startup research and development and creating a burdensome acquisition process for less-traditional companies (DIB, 2024). More effectively supporting the identification of and investment in dual-use technologies will help provide more resources and opportunities for innovation. Engaging less-traditional stakeholders is a key component of this, as it removes constraints around who may be a beneficial collaborator for the DoD.

² The RAND National Defense Research Institute (NDRI) defines the CTP as the activities, functions, and processes around the DoD's identification, development, and transitions of innovative commercial technologies from the private sector to DoD for military use. [Link](#).



Assessing Private Sector Barriers to Engagement With the DoD

How does the private sector view opportunities and challenges in the defense innovation ecosystem?

Small businesses and start-ups frequently offer innovative emerging technologies that are potentially mission critical for the U.S. defense community, but they face uphill battles transitioning to sustain DoD operations at scale. Small businesses and start-ups typically lack the resources of more established businesses, making it difficult to overcome resource-intensive government requirements and a disconnected ecosystem (Marinelli, 2023; Mcnamara et al., 2024). Due to uncertainty of the viability of contracting with the DoD, many opt to pursue less risky commercial opportunities instead. Some businesses that achieve commercial success will later seek to contract with the DoD, but others will not. This can result in the delay or full separation of potentially mission-critical technologies from warfighters (Mcnamara et al., 2024; Tucker, 2024).

Limited Opportunities for New Entrants

Industry feedback in the authors' survey highlighted that small businesses face significant hurdles in securing even minimal funding when seeking to contract with the DoD. Acting as the DoD's venture fund, the SBIR and Small Business Technology Transfer (STTR) programs serve as crucial entry points for small businesses (DIB Strategic Investment Capital Task Force, 2023). However, these programs have increasingly been constrained by lock-in, creating a highly competitive landscape with limited funding opportunities for new entrants. The DoD's preference for closed, proprietary systems limits interoperability and the implementation of innovative technologies. These closed-system architectures severely hinder small businesses and new entrants, favoring a small number of repeat private sector partners (Mcnamara et al., 2024).

Additionally, because some businesses receive multiple SBIR/STTR awards each year, a disproportionate share of funding has consistently been allocated to a small number of awardees. Between 2010 and 2019, 90% of Phase I SBIR/STTR funds were awarded to previous contract awardees (Bresler & Bresler, 2020). Between 2012 and 2021, the top 5% of businesses receiving the most Phase I/II SBIR contract awards received 49% of the DoD's Phase I/II SBIR/STTR funding. Additionally, of the mere 16% of Phase I/II awardees that received Phase III contracts, 61% made less in Phase III contract revenue than they did in Phase I/II funding (Bresler & Bresler, 2023).

Resource Demands Make Engagement Non-Viable

Steep resource demands imposed by burdensome requirements compound the negative ROI from Phase I/II to Phase III, representing a significant barrier to private sector business engagement with the DoD (Bresler & Bresler, 2023; Decker & Sheinbaum, 2024). DoD qualifications such as reporting requirements, technical certifications, cybersecurity certifications, licensing, and security clearances can be cost-prohibitive and time consuming for small businesses, delaying awards and taking time away from actual work. Many required licenses and certifications require a contract despite contracts first requiring licenses and certifications, favoring existing awardees.

There is also a large backlog of the DoD's complex individual and facility security clearance applications, hindering new entrants from accessing classified environments and information critical to progressing their work for the DoD. Additionally, larger businesses are prioritized in DoD testing facilities, causing further delay to already burdened small businesses (Mcnamara et al., 2024; Decker & Sheinbaum, 2024). Businesses often wait up to four years for the DoD to finalize funding and contracts, during which time they often are unable to engage in and profit from commercial business due to the DoD's strict intellectual property requirements



(Mcnamara et al., 2024; Decker & Sheinbaum, 2024). These demands ultimately are cost-prohibitive, pricing out many small businesses from working with the DoD due to the risk of going out of business during the acquisition process (Marinelli, 2023; Decker & Sheinbaum, 2024).

Barriers Around Government Requirements and Framework

The bureaucratic DoD acquisition process is “a complex web of entry points and intricate regulations” that small businesses and new entrants struggle to navigate (Tucker, 2024). While there are many entry points to the DoD market, this information is obfuscated by its complexity and lack of centralization. This causes businesses to struggle with a lack of awareness of the value of their tech for the DoD, potential opportunities, and the requirements they must meet (Kotila et al., 2023). Even when aware of entry points, industry feedback in Becera’s survey revealed that many private sector businesses find DoD application portals and opportunity postings confusing and difficult to follow. This confusion can discourage new entrants who forgo the DoD’s bureaucratic barriers in favor of less complex commercial markets. Unprepared businesses may fail to complete the acquisition process due to an inability to complete the requirements or by running out of funding, rather than failing due to their tech lacking value to the DoD’s mission (Kotila et al., 2023). This results in missed opportunities for innovation and collaboration with the DoD and wider defense community.

Disconnect Between the DoD and Private Sector

A disconnect between the DoD and the private sector has created significant barriers to collaboration and led to failed innovative tech acquisitions. Without a clear understanding of what all parties need and a common goal, it becomes challenging to achieve effective and meaningful collaboration (Decker & Sheinbaum, 2024). Compared to repeat contract awardees, small businesses and new entrants are more susceptible to suffer from this disconnect due to a lack of experience and connections (Kotila et al., 2023).

Within the DoD, there are multiple levels of stakeholders across the defense innovation ecosystem who do not share a mission or consistently share information amongst themselves. This fragmentation has led to businesses receiving inconsistent guidance, creating significant confusion and misunderstandings that can delay contracts or cause businesses to fail to complete the acquisition process (Kotila et al., 2023). Businesses may communicate with program managers, but the actual purchasing power lies with other parties who handle contracting. Businesses typically have minimal contact with end-users, the warfighters, and instead must make their product appeal to those with actual buying power who may not understand end-users’ actual needs or the technology itself.

Consequently, businesses may create a product that meets warfighters’ mission-critical needs but fail to be adopted due to their products not meeting the contracting party’s requirements. Or businesses might create a product that appeals to the contracting party’s requirements and may get adopted, but it fails to meet warfighters’ actual mission-critical needs (Ferry, 2024). This lack of clear communication and disconnect harms private sector trust in the DoD, deterring engagement with the DoD and hindering innovative technology adoption (Kotila et al., 2023).

Recognizing these concerning trends, the DoD has made meaningful progress through measures such as its recent empowerment of the Defense Innovation Unit (DIU; Blank, 2024). While the DoD has begun moving in the right direction, change has been slow. To ensure the United States does not fall behind in global power competition, it is critical that the DoD address



the challenges that perpetuate the valley of death with expedience. The sections that follow highlight ways to leverage the opportunities that exist.

Power of Innovative Stakeholder Engagement

What are the opportunities for the defense community in leveraging less-traditional stakeholders to enhance innovation?

Enhanced Knowledge Sharing and Communication

A lack of holistic and widespread stakeholder engagement hampers communication, collaboration, and knowledge sharing, which are all essential elements for ensuring innovation can take root. Many agencies have a “wait-and-see approach” before diving into new terrain, adopting a risk-averse approach largely out of necessity. Yet, engaging stakeholders who have already conducted research on security, policy, and ethical considerations can help mitigate the pitfalls of such an approach. Creating more spaces that allow for engagement with civil society, academia, and organizations that have strong knowledge sharing ecosystems already in place can help the defense community enhance their own knowledge sharing capabilities. Engaging less-traditional stakeholders can help encourage cross-functional learning and communication to bridge these gaps and address many of the issues which make a culture of risk-averse investment necessary. Workshops, for example, help to provide a mechanism through which individuals can share information at both a technical and multi-disciplinary level.

Knowledge sharing networks, environments, and ecosystems can also help encourage the sharing of open-source technologies and technical knowledge that could help with infrastructure enhancement. This can build upon existing “open innovation” methodologies, refining them for trust, security, and IP protection to ensure they adequately meet government requirements. Moreover, stakeholder initiatives can help those less familiar with defense requirements and expectations better understand these needs (see Figure 2).

Of respondents, 76% felt that the initiatives helped them understand defense requirements or needs

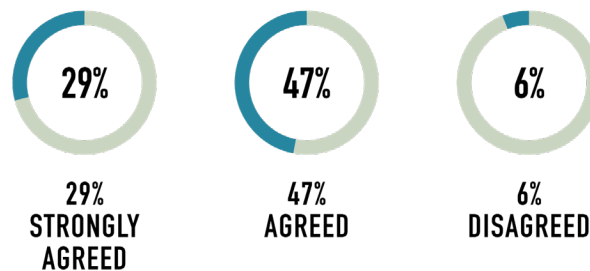


Figure 2. Select Respondent Feedback³

Enhanced Data and Information Accessibility

It is important to have access to quality data at a large scale to develop and operate new technologies such as AI systems that use machine learning. Engaging with stakeholders can help ensure there is adequate access to data that reflects operational environments. It is

³ In Figure 2, the 76% referenced combines both “strongly agreed” and “agreed.” The 6% referenced combines both “strongly disagreed” and “agreed.”



important to keep in mind data privacy and protection requirements and ensure data is sourced and used ethically. Eliminating unnecessary complications can help bring less-traditional stakeholders into the fold.

There are positive lessons from across the DoD that serve as valuable lessons of how data and information sharing restrictions can be decreased to help foster more collaboration and innovation. In 2024, the Pentagon updated its classification policy for space programs to reduce the information-sharing restrictions that make it hard for collaboration with allies, industry partners, and other stakeholders (Albon, 2024). The policy changes focused on updating out-of-date policies around what information could be shared around certain programs to reduce the overclassification of things to the point where collaboration was severely restricted. While this specific example was aimed more at interagency and foreign government engagement, it provides an example of how new policies can help decrease barriers to information sharing, thereby making it easier for stakeholders to engage.

Task Force 59 offers another success story (Vincent, 2023). It is being undertaken under a data-as-a-service model, or a contractor-owned contractor-operated model. This approach means that the data that the system generates is unclassified and can therefore live on a commercial network and move at the speed of commercial development. Due to this unclassified nature, however, all the development is taking place without classified data sources, which is a key gap in development and future deployment and integration.

Incentivizing Private Sector Engagement

Engaging less-traditional stakeholders can also help foster new opportunities for small businesses, civil society, and independent researchers who otherwise may feel a disconnect between their work and government opportunities. This thereby can help incentivize more private sector engagement, breaking down current barriers to public-private partnerships. Less-traditional stakeholders can also help identify and overcome miscommunication and misconceptions.

The DoD has introduced several initiatives that show the positive outcomes of efforts to engage small businesses, including the establishment of the Innovation Pathways gateway for small businesses to engage with the Pentagon on new systems, as well as the Rapid Defense Experimentation Reserve, which offers edge experimentation to new equipment to move prototypes through validation to production (DIB, 2024). The Pentagon's Office of Strategic Capital will also employ financial tools such as loans and guarantees to support startup-built solutions (DIB, 2024).

The DoD and its wider investment community can engage the commercial sector and entrepreneurial community, such as VCs and founders, by leveraging existing networks to gain feedback and identify common interests and goals that can lead to collaboration and cooperation, thereby increasing incentives for the private sector to want to engage the DoD. The DIB study recommends that the DoD develop a flexible and agile approach to acquiring commercial dual-use technologies by ensuring the research and development stage is connected to the acquisition stage to alleviate the pressure from startups involved in dual-use development to first need to demonstrate commercialization of products (DIB, 2024).

Stronger Technology Identification and Matchmaking

Strengthening less-traditional stakeholder engagement can help create an ecosystem for technology identification, matchmaking, assessment, and deployment, which the DoD currently struggles with. The DoD must go beyond its normal community of stakeholders and investment ecosystem to ensure that collaboration is fostered across less-traditional stakeholders as well,



such as academia, civil society, startups, small business, and individual technologists and entrepreneurs.

As outlined earlier, the federal government is falling behind the business sector in funding experimental development. Moreover, the private sector is engaging other aspects of the economy and civil society in a more strategic and holistic way, allowing considerable innovation to emerge from collaboration not necessarily seen 30 or 50 years ago. For example, U.S. universities are frequently leveraging their intellectual property by licensing protected discoveries to outside entities, including startups and small companies; in 2021, U.S. universities executed around 8,000 new technology licenses; 78% were executed with startups or small companies (National Science Board, 2024).

Venture capital also plays a substantial role in innovation and technology matchmaking through the investment in startups, with the U.S. venture capital market investing more than both the European and Chinese venture capital markets as of 2022 (National Science Board, 2024). The federal government can more effectively leverage these invest and collaboration ecosystems to ensure they are identifying the most promising and innovative technologies.

One key area for engagement is facilitating introductions between industry, academia, civil society, small business, and the DoD to create a matchmaking process where new conversations and relationships can be built. Stakeholder engagement initiatives can help both public and private sector actors identify technologists and entrepreneurs to partner with, providing a valuable mechanism through which collaborations can develop (see Figure 3). This can in turn help the DoD to identify technology it otherwise may have missed, as well as provide an ecosystem where all stakeholders are engaged from the beginning to ensure technologies are assessed and deployed to the best of their ability.

Of respondents, **76%** felt that the initiatives introduced them to a network of entrepreneurs or partners

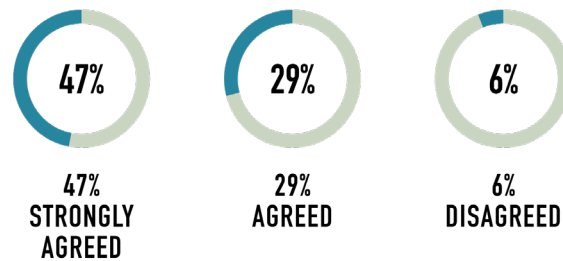


Figure 3. Select Respondent Feedback⁴

Beyond more informal engagement and matchmaking, the defense community can leverage frameworks and platforms, such as the potential DID Collaboratorium, that provide more formalized technology matchmaking. For example, technology matchmaking platforms that bring government users together with private sector, academia, and civil society technologists can help identify, test, and apply emerging technologies to address specific operational and administrative challenges. While current platforms such as Vulcan provide technology scouting and collaboration, more collaboratorium-oriented platforms engaging less-

⁴ In Figure 3, the 76% referenced combines both “strongly agreed” and “agreed.” The 6% referenced combines both “strongly disagreed” and “agreed.”



traditional stakeholders can go beyond simply identifying technologies, helping to facilitate data and information sharing, as well as address barriers around technical hindrances and risk-exposure.

By connecting the public and private sectors, these platforms provide a mechanism through which stakeholders can communicate effectively with federal government end-users, as well as come to a mutual understanding of the challenges faced across specific areas and the breadth of solutions available to address them. A successful example of one such technology matchmaking collaboratorium was a Department of State–funded platform that brought together government and civil society stakeholders with technology companies and entrepreneurs offering solutions around information integrity.

Opportunities for Iterative Technology Development and End-User Prioritization

End-user feedback is essential for ensuring technology development meets operational needs and goals. Removing barriers to the DoD’s acquisitions of innovative technologies requires a fundamental shift towards prioritizing end-user needs and improving communication among stakeholders. Presently, higher-level management within the DoD serve as decision-makers in the acquisition process. This is the market that private sector businesses must appeal to in order for their technology to be acquired. However, these parties are typically far removed from technology end-users and lack a clear understanding of their actual needs. This disconnect impacts all stakeholders in the wider defense innovation ecosystem, deterring private sector engagement with the DoD and hindering effective innovation adoption (Ferry, 2024).

End-user input should be prioritized in all stages of the acquisition process, as they represent the community that acquired technologies are meant to serve. Unlike higher-level management, end-users have firsthand knowledge of their own needs, preferences, and what technologies are mission-critical. This makes their feedback invaluable to DoD decision-making and technology implementation success. Early involvement in research and development would enable faster identification of technologies of value to the DoD and more effective communication with the private sector businesses that possess them, increasing the chances of timely and impactful innovation adoption (Office of Public Health and Science Health and Human Services Department, 2011; Husted et al., 2021). By testing prototypes and providing other ongoing feedback during research and development, end-users can make businesses aware of the adjustments necessary for products’ successful implementation or enable the DoD to pivot to other options earlier. Ultimately, a shift in market prioritization to end-users would preserve resources, allow for more timely implementation of innovation, and increase the DoD’s strategic military advantage (Metzger, 2023; Leonard-Barton & Kraus, 1985).

In addition to making end-user input central in the acquisition process, the DoD should implement a participatory model. This model would emphasize valuing all stakeholders’ participation in order to leverage their unique skills and expertise to find optimal solutions (Office of Public Health and Science Health and Human Services Department, 2011). Decision-makers should utilize a cyclic iterative process to repeatedly collect insights and analysis from all stakeholders throughout the acquisition process to ensure their needs and priorities are understood (Leonard-Barton & Kraus, 1985). As part of this iterative process and continued collaboration among stakeholders, the DoD should establish formal means of information exchange and consider mechanisms such as establishing focus groups, holding frequent meetings, and conducting surveys (Husted et al., 2021). These changes would foster increased communication, collaboration, trust, and creativity among the defense community and private sector stakeholders and ultimately would improve technology adoption outcomes (Office of Public Health and Science Health and Human Services Department, 2011).



Improved Talent Recruitment and Public-Private Partnerships

The DoD can break down silos that impede growth by fostering a culture of multi-stakeholder collaboration through targeted outreach and training. The DoD can help create an ecosystem informed by and incorporating less-traditional stakeholders by leveraging training and awareness building programming that integrates diverse perspectives, methodologies, and knowledge bases, leading to a more comprehensive understanding of technologies and problem areas. Such programming has the potential to help improve upon existing paradigms and solutions, foster unconventional ideas and research, and help both public and private sectors to overcome operational ruts.

Public-private partnerships help draw the talent needed to ensure a capable, innovative base for a resilient workforce, especially in areas such as AI where the private sector has adopted a clear leadership role in innovation. As outlined by the Under Secretary of Defense for Acquisition and Sustainment, recruiting a trained and skilled workforce to the defense industrial workforce requires public-private collaboration at all levels to build a robust talent pipeline, starting at the local levels (Clark, 2023). A key element of this is also ensuring that recruiting networks incorporate less-traditional stakeholders who can help foster appealing and welcoming environments.

Moreover, stakeholder initiatives and public-private partnerships can help new entrants across the defense innovation community make valuable contracts with government counterparts (see Figure 4). For example, events that focus on introducing small businesses and individual entrepreneurs to government and military contacts can help provide new opportunities for these stakeholders. Such events also benefit government participants as they are exposed to new businesses and technologies, as well as a new pool of potential talent for future recruitment.

Of respondents, 82% felt that the initiatives introduced them to valuable contacts within the government or military

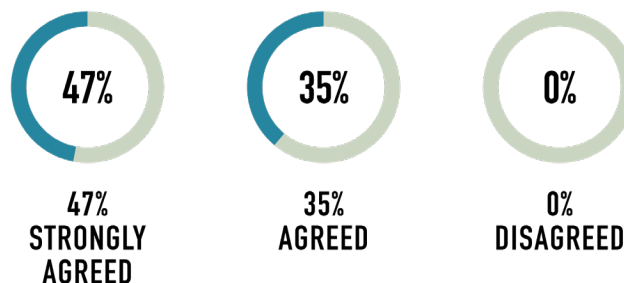


Figure 4. Highlighted Respondent Feedback⁵

Building Towards Cultural Shifts

Implementing changes to defense acquisition frameworks cannot be successful without first addressing the culture issues internal and external to the DoD that would undermine these efforts. Different stakeholders in the commercial acquisition pipeline face unique cultural

⁵ In Figure 4, the 82% referenced combines both “strongly agreed” and “agreed.” The 0% referenced combines both “strongly disagreed” and “agreed.”



challenges, but the most pressing and pervasive challenge is a culture of risk avoidance. In order to obtain the best innovative technologies for its warfighters, the DoD must embrace a culture of experimentation and risk-taking (Velte, 2023). This culture would promote continuous improvement and creative problem-solving and enable the U.S. military to swiftly adapt to evolving challenges so that it may maintain an edge in the global power competition.

This culture of experimentation and risk-taking should be informed by a wartime-like sense of urgency. It is necessary that the DoD acquires innovative mission-critical technologies in a timely manner. Industry feedback in Becera's survey highlighted a need for greater agility, risk tolerance, and an acceptance of short-term failure within the DoD. It is important that stakeholders within the DoD take on the attitude that risk and short-term failures are a necessary part of a timely technology acquisition process, not something to be feared (DIB Strategic Investment Capital Task Force, 2023). The quicker a technology fails, the quicker improvements can be made to that technology or resources can be shifted to a different product. Long term, this minimizes lost time and funds and allows the DoD to obtain superior technology and resources (Metzger, 2023).

To enable this culture shift, the DoD should move away from excessive oversight, processes, and requirements that undermine timely technology adoption. Rather than the Pentagon, management closer to the field should be granted more flexibility and decision-making power, with safeguards in place to ensure prudence and accountability remain (DIB Strategic Investment Capital Task Force, 2023). DoD budgets and acquisition processes should be simplified and modernized to allow for greater risk-taking and adaptability to evolving end-user needs and technology capacities (Mcnamara et al., 2024).

Defense innovation stakeholders should be united by the shared mission of timely adoption of mission-critical technologies, coordinating and collaborating to ensure success (Kotila et al., 2023). This mission must apply to not just higher-level management, but also middle and lower-level leadership (Tucker, 2024). The DoD should strive to appoint leaders with an understanding of innovative technologies and military applications to avoid missing opportunities due to ignorance. This can be achieved through talent acquisition, training, and engagement with private sector businesses (Mcnamara et al., 2024; Clark, 2023).

Management within the DoD that embraces this culture and prioritizes results should be incentivized with increased budgets and other rewards. Conversely, risk-avoidant management that obstructs progress should face disincentives such as budget cuts and removal if they are unable or unwilling to adapt (DIB Strategic Investment Capital Task Force, 2023). Cultivating strong leadership united by this shared mission is crucial to ensuring the DoD market is conducive to innovation and that the U.S. military maintains its competitive advantage.

Moreover, fostering a collaboratorium bringing together more traditional and less-traditional stakeholders can help break down some of the barriers around communication and accessibility between the defense community and technologists who have never worked with the federal government. Becera survey respondents found that by engaging in TTDs, they were able to become more fluent in terms of what DoD expectations and processes meant. Individuals found such events help them to navigate the defense communities' complex bureaucracies more effectively.



Case Study: Technology Transfer Days

Technology Transfer Days (TTDs) are outreach and engagement events that create converged collaborative learning and discovery environments for stakeholders outside of traditional defense environments. As informal meetups, TTDs have focused on providing accessible, diverse, and inclusive environments for participants to collaborate, experiment, and network around complex defense innovation problems.

TTDs were originally inspired by conversations with stakeholders across the DoD, including from USCENTCOM, JIFX, NPS, USSTRATCOM, USSOCOM, and USINDOPACOM, in recognition of the value add in expanding the ecosystem of defense innovation participants. In addition to engaging the usual defense, government, academic, and industry stakeholders, TTDs have prioritized engaging participation from less-traditional stakeholders. These include small businesses, start-ups, incubators, accelerators, community organizations, subject matter experts, legal experts, veterans, inventors, nonprofits, and public-private partnerships.

TTDs are traditionally free, multi-day events held bi-annually or annually that convene around 150–200 participants in hybrid settings. The participants tend to be a mix from diverse technology sectors who leverage opportunities to mingle with each other and with the local, state, federal government and defense stakeholders also in attendance. A committee of volunteer community advisors serve as meetup leaders, mentors, and provide outreach amplification via their networks. Government and defense participants are invited through email invitations, networking, and relationship development, while other participants are invited through email invitations, extensive networking, and relationship development with local accelerators, incubators, startup groups, universities, research laboratories, and professional associations.

TTDs have been positively reviewed by hundreds of participants who have experienced the benefits of collaborative learning models for sharing experiences, building relationships, and accelerating development. Future iterations aim to build on successes of these models by: 1) scaling the outreach strategy to reach more technology stakeholders outside of traditional engagement circles, 2) incorporating pre- and post-event tech matching to augment in-person collaborative learning, and 3) increasing focus on requirements and needs for more experiments and research. Further information on TTD origins and development can be found in Appendix A.

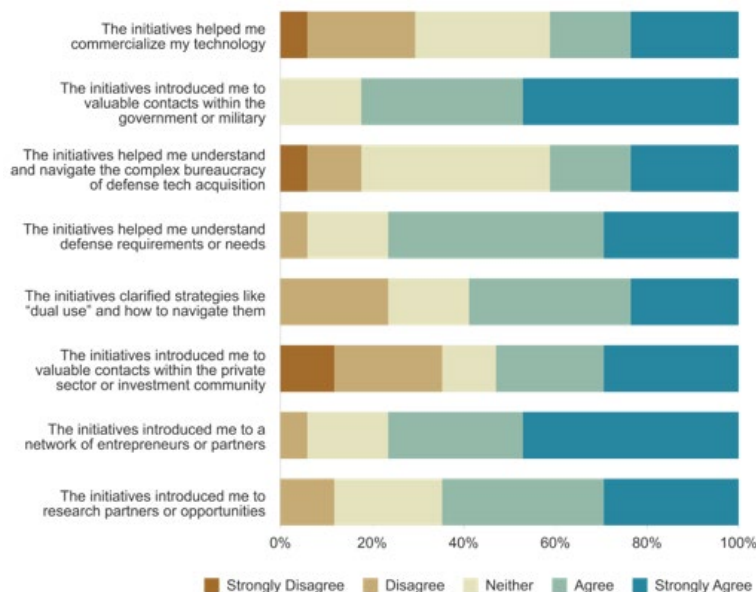


Figure 5. Respondent Feedback



Framework

How can a centralized Defense Innovation Discovery and Collaboratorium Platform help identify and overcome the valley of death?

No one solution can address the complex web of challenges in identifying, developing, and integrating cutting-edge defense technologies, which inherently requires discovering and engaging a diverse range of sources. However, guided by the literature, Becera survey responses, and stakeholder interviews, and building on the elements outlined previously, this section offers an operational and actionable framework for addressing stakeholder engagement gaps in a comprehensive manner. The framework specifically focuses on the elements necessary for a cross-functional discovery and collaboration platform, namely a DID Collaboratorium, that brings together traditional and less-traditional stakeholders in a secure, user-friendly environment. Such a platform would enable technology matchmaking, facilitate knowledge sharing, sustain a community of interest, and foster collaborative development of innovative solutions to critical defense challenges. Providing this DID Collaboratorium that reduces barriers to entry and accelerates the adoption of new technologies would be a complex but feasible endeavor.

In addition to the recommendations gleaned from Becera desk research, survey, and primary interviews, the following section incorporates lessons learned from the authors' previous experience building discovery and matchmaking platforms for defense-related technologies.

Creating a Defense Innovation Discovery and Collaboratorium Platform

- 1) Showcase technologies in a centralized location:** As several Becera survey respondents noted, a centralized platform where technologies can be discovered and showcased is essential for facilitating collaboration. Technology providers can fill out a profile page, sharing as much information as they're comfortable with. For those companies who choose to have fully public profiles, the platform can automate the process of keeping their profile pages up-to-date by pulling in updated information from their websites, social media, and news articles. To expand towards a fuller Collaboratorium experience, other stakeholders besides those with market-ready technologies can be offered a profile page. For example, stakeholders at academic or research labs, independent entrepreneurs working on prototypes, and venture capitalists or incubators can leverage the platform to showcase their projects, missions, or portfolios.
- 2) Identify stakeholders outside of traditional defense circles:** To broaden the pool of potential innovators and solutions, it is crucial to proactively identify and engage with stakeholders beyond the traditional defense industry. As Becera survey respondents suggested, this involves advertising opportunities to early career academic researchers, independent researchers, civil society organizations, non-profits, and the wider community. Advertisements should not be limited to defense-related publications, outlets, or forums. They should be posted broadly in non-defense channels to identify stakeholders with valuable solutions not traditionally engaged by the defense community. Proactive engagement also requires initiating more local events that bring together technologists, researchers, and others around specific defense tech topics. Organizing and implementing in-person events are valuable opportunities to build meaningful connection points, but virtual events can be equally beneficial, particularly when bolstered by extending an invitation to join the DID Collaboratorium and maintain new networks. As primary interview feedback revealed, engaging more less-traditional stakeholders and sustaining their participation will require thoughtful and deliberate



outreach, information delivered in an accessible format free of defense jargon, and clear communication of the value proposition for participating in defense innovation efforts.

- 3) **Match technologies to defense requirements:** To ensure that innovative technologies are effectively aligned with defense needs, Becera survey respondents emphasized the need to establish processes for centralizing information on the immediate, mid-term, and long-term needs of various defense programs and then matching solutions to those requirements. The DID Collaboratorium can automate the centralization of this information by pulling information from SBIRs, STTRs, Broad Agency Announcements, and other similar requirements documents. Requirements can then be matched to existing technology capabilities as identified in the platform, alerting relevant stakeholders to the existence of potential matches to explore. As input from primary interviews noted, to initiate a secure sharing of information, the platform can employ a double-blind feature, wherein technology provider information on capabilities is not linked to their name, nor are defense requirements detailed or linked to specific offices until the platform makes the match. In this context, the platform can leverage AI to facilitate this matchmaking process. Defense stakeholders can then create a tiered filtering and assessment system to determine which of the automated matches they want to pursue. For example, for those end-users who have established profiles and indicated which requirements relate to their missions, the first tier of automated matchmaking would send them a list with every technology showcased on the platform that is a 50% or above match. For the second tier of facilitated matchmaking, end-users could be prompted to send a brief questionnaire template to the technology providers they think best fit their parameters. Based on the responses, end-users can then schedule a call for further clarifications with the technology providers deemed as prospective fits. Every initial tier of matchmaking can be automated to reduce burden on both the end-user and technology provider.
- 4) **Link technology providers to program officers and end-users:** Facilitating direct connections between technology providers, program managers, and end-users is crucial for fostering collaboration, gathering feedback, and ensuring that innovations are tailored to operational needs. While this can be achieved through in-person meetups, virtual events, and other networking opportunities that allow small businesses and innovators to engage with defense stakeholders, it can be sustained through a directory feature on the DID Collaboratorium platform. To prevent program managers and end-users from being inundated with questions, these stakeholders can upload an FAQ to their profile pages that shares information like deadlines, processes, and preferred methods of engagement. If users type in questions for specific end-users and program managers that have been asked and answered previously, the platform can surface the relevant information. Questions that still remain can be sent directly to the program manager or end-user, who will then be prompted to update their individual FAQ accordingly or to respond to the inquirer directly. Aspects of this engagement feature can also be gamified to encourage responses. For example, the platform can show how quickly a program manager or end-user typically takes to respond to direct messages or update their FAQs upon receiving questions. The platform can then compare their response rates across their peers, thereby eliciting friendly competition to ensure that information is kept timely and up-to-date.
- 5) **Build a networked community of interest to share information, ideas, and contacts:** Fostering a vibrant, collaborative community of interest is essential for connecting silos, facilitating knowledge sharing, and catalyzing collaboration and innovation. Moreover, all stakeholders require clear, accurate, and up-to-date



information about available programs, requirements, and processes. As highlighted in Becera survey feedback, both goals can be achieved through the DID Collaboratorium platform on a specific information forum that offers guidance, FAQs, and resources on topics such as dual-use technologies, acquisition pathways, and security requirements. Through such a forum, users can ask questions, post lessons learned, and share information on events and opportunities. The forum would also enable direct chats with other users who opt in to having their individual profiles shared publicly. The information forum can then incorporate features like upvoting and downvoting to separate signal from noise and surface the most helpful responses and information. It can also incorporate a feedback mechanism whereby users can indicate what further information would help clarify certain topics. A comprehensive and dynamic forum of this nature provides the sense of continuity between stakeholders, resources, and organizations that one primary interviewee said was essential for defense innovation efforts. It also addresses some of the engagement limitations that exist in current defense innovation platforms like Vulcan, as primary interviews revealed.

- 6) **Facilitate a flexible funding pool:** To support the development and maturation of promising technologies, it is essential to establish a flexible funding pool that can close transition gaps and prevent innovations from stalling in the valley of death (Kotila et al., 2023). Becera survey respondents suggested that funding can be made in small amounts to mitigate risk aversion and should be accessible through a simplified application process, with initial funding separated from classified activities to minimize bureaucratic hurdles. Leveraging AI, the DID Collaboratorium can also provide an aggregate of other funding opportunities such as U.S. federal grants to help stakeholders identify and navigate relevant opportunities that otherwise would take additional resources to find. The platform can also provide resources to provide clarity on some of the nuances of federal grant applications and help break down some of the barriers identified around communication and clarity around funding processes. As Becera survey respondents noted, providing timely, risk-tolerant funding that accepts short-term setbacks as learning opportunities will enable the defense innovation ecosystem to help promising technologies reach their full potential and transition into operational use.
- 7) **Provide professional development opportunities:** Semantic, cultural, and technical differences yield misunderstandings and result in valuable collaborations being lost in translation. A comprehensive platform should offer professional development opportunities that enable policymakers to become more technical and technical stakeholders to become more policy- and business-aware. The collaboratorium would therefore offer a collaborative learning environment where professional associations and academic institutions could provide their various credentialing opportunities in emerging technology learning opportunities. The platform can also offer technology exercises and wargaming scenarios to bring together technologists and the defense community, helping to operationalize any collaboration that arises from these professional development opportunities. Another feature could be a dedicated section for talent acquisition, a key gap identified in research. Separate but related to professional development, a job opportunities and candidate forum can offer a centralized place for individuals from across the defense innovation ecosystem to understand what opportunities exist in multiple sectors.
- 8) **Measure outputs and outcomes:** The benefit of a centralized platform like the DID Collaboratorium is the ability to track progress in real time. Transparent efforts to ensure that defense innovation and engagement efforts are delivering tangible results will



encourage continued use of the platform while building trust in the process. Becera survey respondents suggested that a centralized platform should measure metrics including tracking the success of dual-use companies in finding long-term success in the defense ecosystem, demonstrating the impact of new capabilities on mission needs, and understanding what factors contribute to the successful integration of novel technologies into operational use cases. Rigorously evaluating the performance of defense innovation initiatives and sharing insights with stakeholders allows the ecosystem to continuously improve its effectiveness and adapt to evolving challenges and opportunities.

Conclusion

Research and practice make clear that the defense innovation ecosystem faces significant challenges in effectively identifying, developing, and integrating cutting-edge technologies from a diverse range of sources. In addition to traditional defense acquisition processes struggling to keep pace with rapid technological advancements, methods of stakeholder engagement are excluding those outside of traditional defense circles. This is resulting in missed opportunities to leverage potentially game-changing innovations and leaves the defense sector at risk of falling behind in an increasingly complex and competitive global landscape. Existing innovation practices and the lessons they have yielded offer much hope, however. Building on the realities of continuous and dynamic innovation, a DID Collaboratorium offers a broadly encompassing platform that convenes the people, processes, and procedures necessary to ensure an effective defense technology ecosystem.

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