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of Innovative Technology Throughout the
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Bridging the Gap: Improving DoD-Backed Innovation Programs to Enhance the Adoption of Innovative Technology Throughout the Armed Services

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Abstract

For over 60 years, Department of Defense (DoD)–backed innovation programs have played an outsized role in the narrative surrounding military innovation. While these programs provide valuable benefits, this paper specifically evaluates their effectiveness as a means of enhancing the adoption of innovative new technology throughout the armed forces. To assess how companies that participated in DoD-backed innovation programs performed in the defense sector subsequent to program completion, we compiled a data set of more than 1.29 million defense contract awards over seven years and analyzed the distribution of these awards across a data set of more than 8,000 DoD-backed innovation program award recipients. The results demonstrated that nearly half of participants achieved no meaningful growth in their defense business after program participation; and the small, innovative companies that did successfully bridge program participation into additional DoD business rarely contracted with customers outside of their initial branch sponsor. Through surveys and interviews of key stakeholders, we identified several causes for the low rate of adoption of participants' technology across the armed forces, and we present concrete recommendations for how the Department can address these problems to better leverage DoD-backed innovation programs as a means of enhancing force readiness.

Introduction

America emerged from World War II as the world's leading economic, political, and technological superpower, and this position remained largely uncontested for the duration of the 20th century. Post 9/11, however, the global landscape began to shift. Intensified competition with rival powers, including Russia and China, the advent of information warfare and a proliferation of threats, and the Global War on Terror and conflicts in the Middle East now pose acute challenges for both American hegemony as well as national security. Additionally, while in decades past Department of Defense (DoD) research often produced revolutionary technological breakthroughs for the civilian sector, commercial innovation now increasingly outpaces the DoD. The Department must therefore attempt to modernize as a whole, while it simultaneously competes to identify and integrate the most cutting-edge technological innovation. Furthermore, as elucidated by Defense Secretary James Mattis in the 2018 National Defense Strategy, "Success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting" (DoD, 2018). To maintain a strategic overmatch demands mission planning and execution across the forces and requires unprecedented levels of Department-wide cooperation and communication. Just as innovation can serve as a force multiplier, it can also severely degrade military productivity and lethality if it is siloed within a single service



branch or command structure. The DoD, therefore, faces a dual challenge today: it must not only identify and attract innovative and modernizing solutions providers, but also integrate revolutions in military technology across the forces as quickly and seamlessly as possible.

The DoD has widely acknowledged that the prowess and success of America's armed services demand ongoing, supported collaboration with private sector innovators, and increasingly so in light of 21st-century military and national security challenges. For more than 60 years, DoD-backed innovation programs have played an outsized role in the narrative surrounding military innovation. They consume billions of taxpayer dollars annually; enable thousands of disruptive technologies to enter the highly adaptive, risk-averse DoD ecosystem every year; and produce a network of companies with a rare combination of innovative prowess and DoD past performance.¹ Given that a competitive advantage in today's mission environment demands rapid, force-wide integration of innovative technologies, it is essential that these programs also connect the capabilities that they foster to as many prospective DoD customers as possible. However, while these programs implicitly and explicitly market themselves as "points of entry" for small, innovative companies into the overall DoD market, limited scholarship exists to evaluate how participant companies perform in the defense sector in the years following program completion, and if their capabilities are leveraged by the military at large. Our research sought to fill this gap; specifically, we were interested in understanding if and how DoD-backed innovation programs have evolved to ensure that the military remains flexible, agile, and advanced in an environment where rapid integration is essential.

DoD Innovation Programs

To evaluate DoD-backed innovation programs as a means of enhancing the adoption of new technology across the forces, it is important to first understand their history, how the largest are structured, and where they fit within the broader landscape of DoD innovation. The history of America's DoD-backed innovation programs begins in 1957, when the Soviet Union's surprise launch of Sputnik left the American people and its leaders fearful that the United States had lost its technological edge. President Eisenhower responded by creating the Advanced Research Projects Agency (later renamed the Defense Advanced Research Projects Agency, or DARPA) the following year. According to the DARPA website, it has a "singular and enduring mission: to make pivotal investments in breakthrough technologies for national security." Today, DARPA runs over 250 research and development (R&D) programs, all designed to further their core mission (DARPA, n.d.). DARPA is unique in the DoD innovation community as it exists as a stand-alone research agency that funds innovative research within industries and also conducts its own research. DARPA uses contracting authorities to solicit solutions directly and participates in the Small Business Innovation Research program (SBIR) and the Small Business Technology Transfer program (STTR) to fund research conducted by small businesses.

¹ In the Department of Defense's Fiscal Year 2019 Budget Request, \$13.6 billion has been earmarked by the DoD for Science and Technology research in FY19. Over \$286 billion has been requested for modernization efforts across the Department (Office of the Under Secretary of Defense, 2018).



The Small Business Administration (SBA) launched the SBIR program in 1977 to “support innovation through the investment of federal research funds in critical American priorities to build a strong national economy” (Small Business Association, n.d.-a). It established its identically-structured sister program, the STTR program, in 1992, designed to help further scientific research with potential for broader commercial benefit. SBIR/STTR programs run in three phases, all of which are restricted to small businesses.² In Phase I, companies establish the technical merit, feasibility, and commercial potential of their project over the course of one year in exchange for \$150,000 in federal funding. For Phase II, participant companies continue to grow and develop their technology with additional funding not to exceed \$1 million over a two-year period. A product with “commercial potential” may then proceed to Phase III. SBIR/STTR does not fund Phase III directly, but many federal agencies with SBIR/STTR authority provide follow-on contracts or funding to support this additional development. Phase III is intended to be the primary means of transitioning new technologies into the broader service branches or agencies that need them. The armed services and defense agencies each run their own SBIR/STTR programs and define the topics for which they are seeking small business applicants.

Based on the success of SBIR/STTR and the need to accelerate the fielding of innovative technology, the DoD created the Rapid Innovation Fund (RIF) in 2011, marketed on the DoD’s Defense Innovation Marketplace site as “a collaborative vehicle for small businesses to provide the Department with innovative technologies that can be rapidly inserted into acquisition programs that meet specific defense needs.” Much like SBIR/STTR, the armed services and various defense agencies run their own RIF programs and define their own project specifications. However, unlike SBIR/STTR, and despite its mission statement, RIF permits companies of any size to participate. The RIF process starts with a Broad Agency Announcement (BAA) and the request for companies to submit a white paper. The sponsoring agency reviews all submissions and invites shortlisted companies to submit a full-scale proposal. The company with the most competitive proposal receives the RIF award. One of the primary objectives of RIF is to better and more rapidly connect research and technologies developed in the SBIR/STTR program to a wider audience within the DoD. As such, from 2011 to 2015, RIF awarded more than half of its \$1.4 billion in contract awards to companies that had previously participated in SBIR/STTR (Bujewski & Purdy, 2017).

In 2015, Secretary of Defense Ash Carter established Defense Innovation Unit Experimental (DIUx) in support of the Third Offset Strategy initiated by Chuck Hagel in 2014. DIUx, like its predecessors, is designed to fund innovative companies with the purpose of solving national defense problems. It determines project specifications and areas of interest in concert with DoD entities. Companies of any size can respond to a DIUx solicitation by submitting a solution brief. According to DIUx’s website, briefs are typically evaluated within 30 days, and shortlisted companies are then invited to submit a full-scale proposal and begin negotiations for a pilot contract. Unlike the other DoD innovation programs, however, DIUx utilizes “Other Transaction Authority” (OTA), a contract vehicle that streamlines the funding process and according to the DIUx website, enables them to fund projects in 90 days or fewer. According to U.S. Code 10 2371b, OTA funds include a designation for

² The SBIR size compliance guide defines a *small business* as “a business with 500 employees or fewer.”

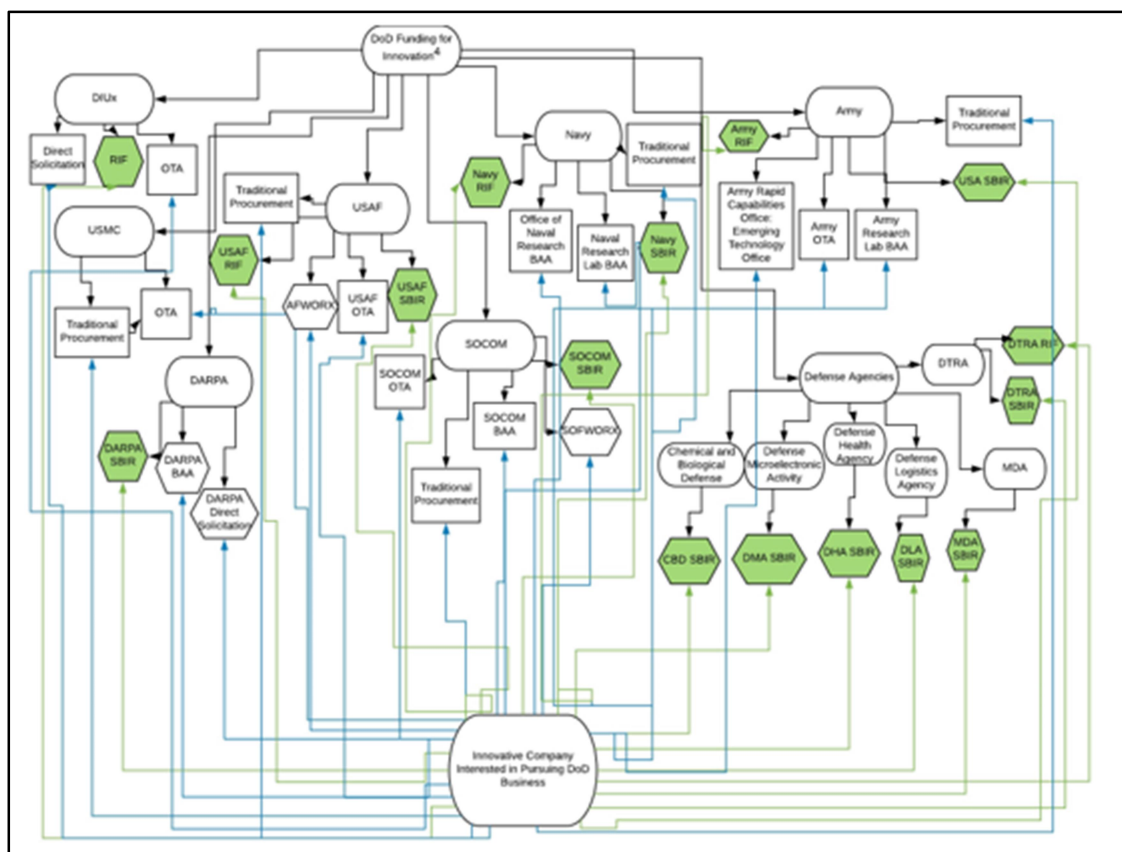


prototype projects deemed critical to enhancing the mission effectiveness of the military or to improve systems already in use by the armed forces. The armed services may contract up to \$250 million annually for projects that meet OTA criteria, provided the primary awardee for a given project represents a “nontraditional defense contractor” or a small business. As such, OTA also affords DIUx greater latitude in allocating funding, making it more agile and more appealing to nontraditional solutions providers.

In addition to these five DoD-backed innovation programs, the DoD has approximately 50 additional external funding programs, 20 of which are designed to rapidly integrate technology (Small Business Technology Council, 2014). The DoD also continuously stands up new DoD-backed innovation programs and utilizes OTA funds independently to support internal innovation efforts.³ This process compounds across the DoD, and innovative companies interested in pursuing the defense market—and the service branches and Departments that seek to collaborate with them—face a paralyzingly complex web of prospective routes and access points, as shown in Figure 1.

³ Since January 2015 alone, the DoD has created DIUx, the Warfighting Lab Incentive Fund, AFWERX (an Air Force innovation initiative), SOFWERX (SOCOM's innovation initiative) among others (Gibbons-Neff, 2016; Kaplan, 2015; West, 2018).





Note. Programs reflected in our data set are highlighted in green.

Figure 1. Access Points for Innovative Companies into the DoD

This bloated, hyper-bureaucratic system also elucidates the Department's cripplingly risk-averse culture, one of the most acute obstacles thwarting DoD innovation efforts. Paralyzed by a "fear of failure," decision-makers are unwilling to experiment, collaborate, and take risks. This culture has resulted in countless "stove-piped" initiatives that are developed without cross-communication and operate in parallel. Given the Department's ongoing struggle to modernize and remain innovative, it should invest in building robust, long-term relationships with the innovative companies that do manage to navigate this web successfully and achieve proven DoD past performance. Consequently, rather than evaluating the effectiveness of innovation programs as a means of addressing singular, branch-specific requirements, our research sought to evaluate if and how the largest and most prominent DoD-backed innovation programs improve the rate of adoption of innovative technology force-wide.

Program Participants

In order to determine whether the companies fostered in DoD-backed innovation programs achieved force-wide adoption, we first looked at how those companies performed in the defense sector after program completion. Although there is no data available to determine the results of these programs in general, one indicator of a company's DoD performance is the number of defense contracts that it wins. Thus, we began by examining the number of defense contracts won by DoD-backed innovation program participants in the years following program participation. We focused our quantitative research on SBIR/STTR and RIF for several reasons: they are the largest of the DoD-backed innovation programs

and the only hubs that publish complete lists of their program participants, which made it possible for us to gather a significant data set; and because all branches of the armed forces and all defense agencies participate in both SBIR/STTR and RIF, the data set is not only large but also comprehensive.

We first combined the publicly available lists of RIF project award recipients between 2011 and 2015 (103) and DoD-sponsored SBIR/STTR award recipients between 2013 and 2016 (8,158) from the SBA database. Both RIF and SBIR/STTR are rife with serial users, which means there were dramatically fewer unique companies in this ecosystem relative to total awards. For instance, from 2013–2016, the Physical Optics Corporation received 236 DoD sponsored SBIR/STTR awards, and Charles River Analytics received 129. Intelligent Automation received 138 SBIR awards from 2013–2016 and won seven RIF contracts from 2011–2015.⁴ As such, we adjusted the 8,261 total awards to control for repeat usage and isolate unique companies, which resulted in a data set of “Program Participants” that contained 1,140 companies.

In order to understand how these 1,140 companies performed in the defense sector subsequent to their program participation, we scraped and filtered more than seven years’ worth of publicly available defense contract award data from FBO.gov from January 1, 2011–January 15, 2018.⁵ Because FBO.gov publishes only unclassified prime contract awards, our data did not include classified contracts or information about companies’ performance as a subcontractor or teaming partner on DoD contracts. Nevertheless, the set contained more than 1.29 million defense contract awards, which we then filtered to isolate the defense contracts specifically awarded to the 1,140 companies in our Program Participant data set: a total of 13,449 defense contracts.

⁴ While the SBA system is rife with flaws in how it reports and names companies, our data tool controlled for these errors to an extent by removing duplications and recognizing slight differences in company names to avoid errors in contract attribution (Cordell, 2018).

⁵ These timeframes were selected to enable analyses of complete data sets. At the time this information was compiled, RIF awards were publicly available from program inception in 2011 through 2015. SBIR awards are all publicly available but the most recent, complete data is from 2013–2016.



Supplier Retention

The distribution of these 13,449 contracts across the 1,140 Program Participant companies in our data set produced striking results, as shown in Figure 2.

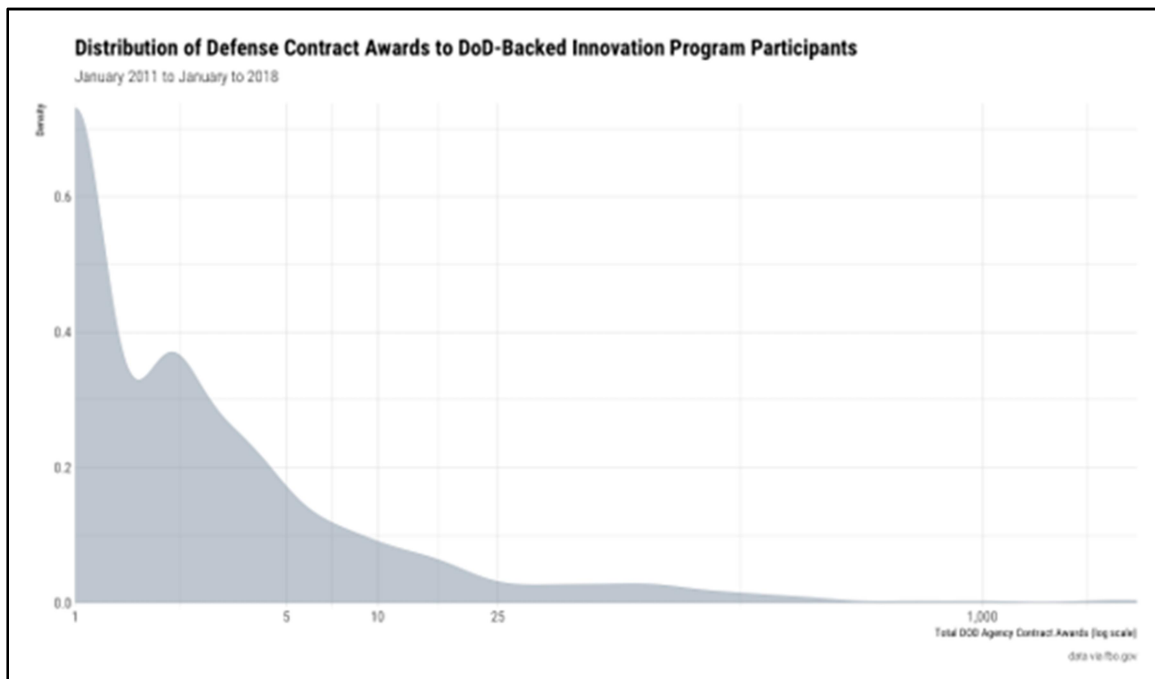


Figure 2. Distribution of DoD Contracts to Companies That Participated in a DoD-Sponsored SBIR/STTR Program or RIF Program (2013–2016 and 2011–2015, Respectively)

It is immediately apparent that a majority of participant companies won few if any follow-on defense contracts, as demonstrated by the concentration of companies on the left-tail of the distribution.

In fact, we determined that a startling 26% of the companies in our vast data set (~296 Program Participant companies) won zero defense contracts after completing their DoD-backed innovation programs.⁶ Another 22% of companies in our set (~250 Program Participant companies) won only one single defense contract following their RIF/SBIR/STTR award. In other words, nearly half of the program graduates (48%) received fewer than 2% of the total 13,449 defense contract awards.

The format of publicly available data limited our ability to control for specific timeframes, as contract award data was fixed from January 1, 2011 to January 15, 2018 (per the parameters of the “scraper” we used). We assessed the entire data set of participant companies over this period of time; thus a company that completed SBIR/STTR or RIF in 2011 was evaluated over seven years, while a company that graduated in 2016

⁶ ~296 companies exist as one contract in our data, but that contract is their award from SBIR/STTR or RIF.

was evaluated over two years. However, all companies in the data set had at least 13 months to win defense contracts, and given the size of our overall data sets and the overwhelming share of companies that failed to win DoD contracts following program participation, it is unlikely that the timeframe limitation significantly affected our results. Additionally, we recognize that small, innovative companies often lack the capacity and infrastructure to bid/perform as Prime contractors and instead subcontract or team with large Strategic Integrators (SIs) to expand their defense business. Unfortunately, we could not examine innovation hub participants' performance as subcontractors or teaming partners because no large, publicly available data sets exist containing that information. Presumably, a portion of program participants that won few or no defense contracts as a Prime did achieve some growth in their defense business indirectly. However, the significant and stark results of our data incontrovertibly reveal a trend and thus remain deeply troubling. Namely, that a significant share of participant companies went through the involved and drawn-out process of applying for an innovation hub, proved their relevance to a branch-specific requirement and received an award, and expended significant resources to develop the capabilities requested by their branch sponsor; and these efforts failed to bridge into any meaningful growth in their direct defense business. The implications are perhaps most concerning with respect to force readiness. The capabilities of these ~547 companies were honed by initial branch sponsors based on critical requirements for which private sector collaboration was deemed essential. For almost 300 of these companies, their capabilities were never procured directly by other defense customers, or from within the sponsor branch, or from other branches, and the other ~200 companies faced essentially the same fate.

The distribution of the 13,449 contracts across the 1,140 companies also made it clear that a small subset of companies won a disproportionate share of the remaining 98% of contracts in our data set. While RIF describes itself as a "vehicle for small businesses," the Participant Data data set includes names like 3M, BAE Systems, General Dynamics, Raytheon, and other experienced contractors. To better understand the effects of these outliers on our data, we isolated companies from our Participant Data data set that had won 50+ DoD contracts from January 1, 2011 to January 5, 2018. Forty companies in our data set fit those criteria.

These 40 companies, or approximately 3.5% of our total Program Participant data set, collectively received a staggering 80% of the defense contract awards in our overall defense contract award data set, as depicted in Figure 3.



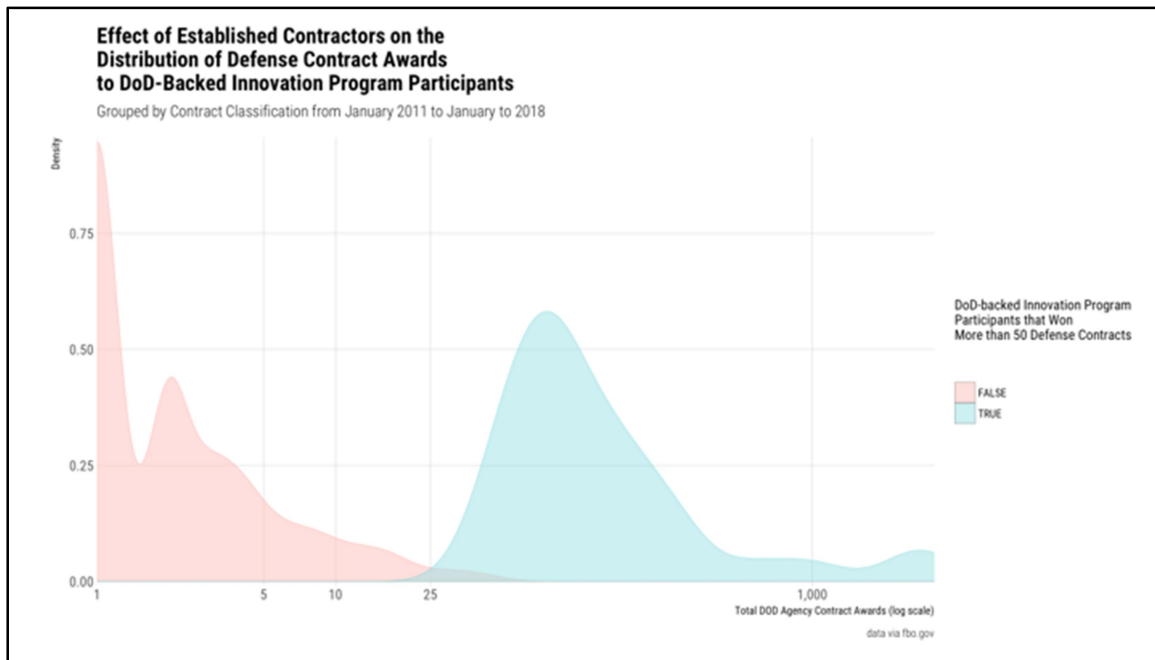


Figure 3. Distribution of DoD Contracts to DoD-Sponsored SBIR/STTR Participants and RIF Participants (2013–2016 and 2011–2015, Respectively) by Company Size

Removing these outlier companies from the data set, the percentage of the remaining 1,100 companies that won zero defense contracts after their SBIR/STTR or RIF participation also jumped by 10%, from 26% to 36%.

For the companies that stand to gain the most benefit from these programs, the reality—that the programs contributed to no meaningful growth in participants’ direct defense business—is even more acute. Furthermore, these programs are designed to provide the forces with greater access to emerging technologies, whereas our forces are otherwise limited to the technologies that the established DoD contractors present to them. Our data suggests that these innovation hub programs have in fact become yet another channel for legacy contractors to gain DoD market share.

Customer Diversity

While our initial analyses demonstrated that innovation hubs fail to convert a large portion of participants into viable DoD suppliers, we also sought to examine, for emerging technology companies that did manage to survive the transition from DoD-backed innovation program into the defense market, how broadly their capabilities were integrated across the forces. To do so, we examined whether participants won contracts with defense customers other than their initial sponsor branch. Limitations to the functionality of our data analytics tools meant that we could not examine customer diversity for our entire data set, so we created a subset of our Participant Data to include companies that won between two and 12 defense contracts subsequent to program completion: 360 companies, or 32% of our Participant data set. As 48% of participants won zero or one defense contract after program completion and 3.5% of participants accounted for a startling 80% of all defense contract awards, the data left a narrow subset of companies that fell somewhere in the “middle”—that is, non-entrenched contractors that had successfully bridged the gap from program participation into a healthy, modest defense contracting business. By focusing on

companies that won between two and 12 contracts, we were able to test customer diversity using a sizable data set from this narrow middle.

Our research found that, for a striking 76% of companies in this subset, all of their defense contract awards came from their initial sponsor branch.

In other words, 76% of these companies achieved no customer diversity, suggesting that even when the DoD manages to retain a supplier honed in an innovation hub, it largely fails to integrate the company's capabilities across the forces.

DIUx: Micro-Analysis

DIUx has garnered widespread attention as an especially promising approach to the DoD's innovation problem (Kaplan, 2016; Maucione, 2018; Williams, 2017). Its funding is slated to increase by more than 70% in Fiscal Year 2019, and Secretary Mattis recently lauded it, saying, "There is no doubt in my mind that DIUx will not only continue to exist, it will actually ... grow in its influence and its impact on the Department of Defense" (Lanier-Chappellet, 2017). Although DIUx data was too limited to include in our broad quantitative analyses and despite the more acute impact of limitations on a small sample size, we felt it nevertheless important to determine if DIUx retains and disseminates its participants' capabilities more effectively than its predecessors.

We created a "DIUx Participants" data set using the company names marketed on the DIUx website as of Q4 2017 (31 companies). We then filtered our DoD contract data set to isolate DoD contracts awarded to these 31 companies from January 1, 2015 (the year DIUx was founded) through January 15, 2018: a total of 440 defense contracts. We immediately recognized that entrenched government contractors have utilized DIUx as well, which profoundly affected the results. Specifically, Rockwell Collins was one of the 31 companies in our "DIUx Participants" data set. The company is a legacy DoD contractor; thus unsurprisingly it won 408 of the 440 total defense contract awards from our FBO award data set. The distribution of the remaining 32 contracts across the 30 other DIUx participants in our data set reflected the same troubling trends we identified in our SBIR/STTR/RIF analyses:

Four DIUx participants won between three and six DoD contract awards after program completion, and the remaining 26 companies—or 81% of DIUx participants in our set—won zero or one DoD contract.

Despite its laudatory attention, DIUx, like its predecessors, does not appear to position private sector innovators for long-term success in the defense sector. Rather, DIUx engages with participants solely to address singular, branch-specific projects and does not disseminate supported capabilities to other prospective DoD customers thereafter.



Surveys Methods

While we concluded that DoD-backed innovation programs are not effective distribution channels for small, innovative companies into the broader defense market through our quantitative analyses, to better understand potential causes of these program failures, we conducted surveys and interviews with individuals from three key stakeholder groups:

- Representatives from DoD-backed innovation programs
- Representatives from companies that participated in a DoD-backed innovation program
- Members of the DoD community

We developed unique survey and interview questions for each of these stakeholder groups and contacted a total of 159 prospective respondents. While our quantitative analyses were limited to SBIR/STTR and RIF data and a small set of DIUx data, our qualitative research encompassed the broader landscape of DoD-backed innovation programs. We received a total of 20 responses: seven representatives who work for a DoD-backed innovation program, three of whom elected to participate in an in-depth follow-on interview; five representatives from participant companies, one of whom elected to participate in an in-depth follow-on interview; and 10 individuals from the general DoD community, three of whom elected to participate in an in-depth follow-on interview.

Survey & Interview Feedback

The anecdotal evidence consistently pointed to the same programmatic failures we identified in our quantitative analyses and most significantly, helped us better understand the reasons for these problems. The key issues revealed by our survey and interview data include the following:

- *DoD-backed innovation programs do not educate participants on how to succeed in the broader defense sector.*

The majority of participants surveyed noted that their innovation program offered no instructions/education for how to identify or bid on government contracts after program completion. They also indicated that the program did not prepare them to support a broad base of DoD customers. Likewise, when program managers were asked how their program helps a participating company identify other relevant DoD requirements, it was clear that no formal, institutionalized process exists. For instance, one program manager explained, “We naturally become aware of [relevant opportunities] from our contractors, conferences, even our customers sometimes,” and another stated that they rely on “collaborative conversations” to find additional DoD opportunities for participants with promising capabilities. Similarly, when asked how they would improve the DoD innovation program, one respondent recommended, “Provide some sort of bridge to help small business survive the gap between the end of the ‘innovation contract’ and the follow on sustainment work.” Given that the innovation programs do not educate participants on how to find and bid on government contracts, it is therefore not surprising that, as indicated by our quantitative data, nearly half of program participants fail to win defense contracts after program participation.

- *DoD-backed innovation programs do not market participants’ capabilities to the broader armed services community.*



More than half of the program managers that provided feedback indicated that their programs have no formal process for circulating information about participants' capabilities to the broader armed services community. One of the most frequent comments from members of the DoD community was that they receive very few briefings on the projects their own branch funds and almost never receive information on the capabilities of companies funded by other branches. When members of the DoD do learn about the capabilities of companies that have participated in a DoD-backed innovation program, it is not because the programs are marketing them effectively. According to those surveyed, at best they might hear about a company through a random, one-off initiative like a "quarterly update" mailer that references an innovative technology, or "infrequent[ly] hosted industry days." Usually, they learn about the technology through a chance meeting with a colleague who is familiar with it. Our quantitative results are further explained by the fact that the innovation programs do little if any marketing of participants' capabilities to the broader DoD community. Simply put, a customer cannot buy something it does not know exists.

- *DoD-backed innovation programs do not track the performance of participant companies in the years following program completion.*

Our qualitative research confirmed the troubling fact that DoD-backed innovation programs do not follow a systematic, consistent process for tracking the performance of participant companies after program completion. Many DoD-backed innovation programs do not track program participants at all; others may track some companies inconsistently or on an ad hoc basis. Without tracking participants, DoD innovation programs cannot discern how these companies fare in the defense sector or at large. They do not see changes in a company's performance year to year; they do not receive updates on a company's capabilities developments; and if a company changes its name, changes its leadership, or moves its headquarters, that information is not recorded in a central database. Perhaps most concerning, they do not monitor the long-term effectiveness of significant investments of public funds into DoD-backed innovation programs. The absence of a formal process for tracking the long-term performance of participants is the equivalent of a venture capital firm not tracking the performance of its portfolio companies. It elucidates these programs' egregious supplier retention problems and signals that these programs are not concerned with the long-term success of the companies that they fund.

- *A company's failure to win DoD contracts after program participation does not necessarily correlate to a lack of demand for that company's capabilities.*

Our survey and interview feedback also demonstrated that, while in some cases innovation program participants may not achieve widespread adoption across the DoD due to the specificity of a sponsor project, a company's failure to win DoD contracts after program participation does not necessarily correlate to a lack of demand. For example, we interviewed the CEO of Monterey Technologies Incorporated (MTI), a company that develops mission planning software systems and has been an active defense contractor since 1984. MTI received one Navy-sponsored RIF award in 2012 and six Navy-



sponsored SBIR awards between 2013 and 2016, and between January 1, 2011 and January 15, 2018, MTI won three defense contracts, all from Navy customers. While MTI has only won Navy contracts, there have been 144 DoD contracts awarded for “mission planning services” over the past five years alone, signaling Department-wide demand for their solution. The CEO shared that recently an Army Airborne officer serendipitously learned about MTI through a Navy contact. The Army had been handling mission planning by hand, and MTI had the potential to address this ongoing problem. He called MTI’s CEO directly, and as a result of the ad hoc outreach they are now collaborating on a pilot project. This example demonstrates not only bona fide demand for MTI, but also the inadequacy of current communication channels across the services.

The interview also offered valuable insights relative to how small, innovative companies attempt to stay competitive in the defense sector. In addition to their own disparate business development efforts, MTI pays a business intelligence firm to compile a monthly report of relevant federal opportunities. MTI then undertakes an involved process to qualify relevant opportunities, many of which are designed for larger contractors. As such, after identifying a relevant opportunity, MTI must then develop a strategy to identify and engage with the appropriate teaming partners. Large integrators, from MTI’s experience, do not give preference to companies that have participated in DoD-backed innovation programs. While their program participation has provided them with valuable funding and strategic customer opportunities within the Navy, SBIR/STTR and RIF have not offered them unique leverage in the defense market.

The experience of another company in our Participant data set, “Enomalies,” tells a similar story. In 2016, Enomalies participated in Phase II of an SBIR project and, like many DoD-backed innovation program participants, has not won a single defense contract since. Enomalies specializes in advanced imaging and field-ready prototyping, and the Navy sponsored its SBIR project to further develop a Rapid Synthetic Environment Tool (Small Business Association, n.d.-b). The tool scans an area and quickly creates a 3D model that strategists and planners can walk through and interact with. Enomalies’s tools also have the ability to rapidly scan objects and print prototypes on 3D printers (Enomalies, n.d.). Despite the fact that Enomalies has not won any follow-on defense contracts, since 2016 alone, there have been 26 defense contract awards for 3D printing systems and four for 3D scanning services. According to their website, Enomalies supports a broad range of commercial customers and appears to remain a viable company. Presumably, then, it is neither a lack of demand nor an inability to perform that has kept Enomalies from winning a defense contract since its SBIR award. Instead, it suggests that DoD innovation programs fail to adequately connect their participants to prospective DoD customers.



Further Analysis & Recommendations

The fact that DoD-backed innovation programs fail to market their participants to prospective DoD customers has myriad consequences. It results in lost revenue for the innovative companies who, as our data illustrated, do not become robust DoD suppliers. Perhaps more concerning, however, are the consequences for the strength and readiness of our forces at large. If the armed services are not made aware of the capabilities supported in DoD-backed innovation programs, they cannot adopt them—instead, they either do not modernize, or they conduct redundant market research. Furthermore, these programs introduce private sector innovators into the defense ecosystem, provide them with past performance, and then fail to nurture them as long-term suppliers. These results are costly, and they also damage the reputation of the Department: innovative suppliers undertake the complex, expensive, and time-consuming process of participating in a DoD-backed innovation program only to find that it does not contribute to meaningful growth in their defense business. They are expected to undertake full life-cycle sales processes for each individual DoD customer, in contrast to how large commercial customers operate (where new vendors typically undergo a vetting period and if successful, their product or service is distributed across the organization's broader portfolio). If these problems are not addressed, innovative companies will increasingly forgo public sector opportunities altogether, and innovation programs will both fail to attract top innovators and fail to realize their full potential as force multipliers. However, with the proper reforms, DoD-backed innovation programs do have the potential to drive vast improvements in the readiness of our armed forces. As stewards of significant tax dollars, the defense sector should focus on maximizing their investments in innovation and R&D over the long term. To do so first and foremost requires that DoD-backed innovation programs maintain consistent, clean, and accessible records about their projects and program participants.

As such, we first and foremost recommend creating an “innovators database”—a central, searchable database containing information about all DoD-backed innovation program participants.

The innovators database would be populated by innovation hub program managers and the companies themselves, and would contain company basics, information about the company's capabilities, and details about the projects that the company has supported for both government and commercial customers. A company would be required to maintain updated records in the database or face penalties. Likewise, program managers would be held accountable for maintaining these records for the five to 10 years following a company's program completion. The innovators database would enable DoD-backed innovation programs to easily share information with stakeholders across the armed forces on the capabilities of their participant companies. These stakeholders could access the database directly and search its rich pool of proven solutions providers to identify prospective suppliers. It would reduce redundancy in market research and requirements development and improve the likelihood of broader, more rapid integration of proven capabilities. Furthermore, the money saved by eliminating redundancy could be reallocated across the Department. A version of the innovators database would be made available to Prime Contractors and SIs as well, to help facilitate teaming arrangements.

For an entity as rigid and adaptive as the DoD, simply making more information available to key stakeholders will not drive change. The Department must encourage key stakeholders to better leverage DoD-backed innovation programs.

Specifically, we recommend that the DoD implement an incentive program that requires defense contracting entities and large defense contractors to allocate a set



percentage of business to “Proven Innovators,” or companies that have graduated from a DoD-backed innovation program.

This incentive program would be similar to existing set-aside programs designed to increase opportunities in the federal market for various historically disadvantaged groups. Proven Innovators would earn their “set-aside” status upon completion of their DoD-backed innovation program. Like the existing cadre of set-aside programs, contractors and contracting officers would be required to achieve minimum engagement levels with Proven Innovators and would be motivated to do so through tax incentives and other benefits. This system would force broader adoption of leading technologies across branches, as the different branches (and the contractors that serve them) would be required to stay abreast of various sponsors’ projects by using the innovators database, and it would force collaboration and cross-communication in an otherwise siloed environment. This incentive program would also add tremendous value to participant companies, lending them a concrete advantage in the broader contracting environment. Participants would see an increase in their federal business overall and an increased willingness on the part of large integrators to support and engage with them.

To that end, in addition to these initiatives, DoD innovation hubs must also educate their participants on the fundamentals of the defense contracting sector—how to identify and bid on contracts, how to find and team with other firms, how to register for set-asides, etc.—in order to make them more competitive.

Innovation hubs could potentially partner with the SBA, which already offers similar training. The more benefits DoD-backed innovation programs can offer, the better positioned they are to attract and serve the most discerning, talented technology companies.

Conclusions and Future Work

While the aforementioned recommendations are crucial first steps toward improving the efficiency and functionality of DoD-backed innovation programs, further research is required to fully understand participants’ experience in the defense sector after program completion. First and foremost, additional research is required to further analyze the large data sets we compiled. A more sophisticated analytics tool would enable us to draw additional and more extensive conclusions, such as if and how non-DoD agencies leverage the technologies fostered by DoD-backed innovation programs and the impact of the rampant serial usage on the effectiveness of these programs as a whole. Additional data and analyses are also needed to evaluate participants’ performance as subcontractors and teaming partners on defense contracts. Relative to our recommendations, further research is also required to determine how best to structure the “Innovators Database” as well as the set-aside incentive program to enhance supplier retention and broad integration.

Once DoD-backed innovation programs are reformed and improved, additional research is needed to understand the most effective ways to market-to and attract the best and brightest innovators into these programs. Additional research is also needed to better understand opportunities for streamlining, merging, or eliminating redundant or ineffective entities throughout the vast, complex DoD innovation landscape, including the individual, specialized innovation programs within each branch and combat command. From the vantage points of both national security and efficiency, it is also critical that cutting-edge capabilities are integrated throughout the whole of the government. Therefore, further research is required to determine how to position participants in DoD-backed innovation programs for success as suppliers to both DoD and non-DoD customers.



It is essential for America's national security that the armed services have access to the best and brightest new technologies, and the continuous investment in DoD-backed innovation programs over the last 60+ years has resulted in a vast infrastructure of programs and access points for new, cutting-edge solutions. DoD-backed innovation programs provide both participants and the Department with valuable benefits. Participant companies benefit tremendously from the funding these programs provide, which allows them to grow their business, develop new research and prototyping, and commercialize. The programs also introduce participants to the various idiosyncrasies of the contracting space and to the unique challenges facing the armed forces. However, today's adversaries and threat environment demand unprecedented synchronicity and collaboration across the armed forces. It is, therefore, essential that all branches of the military adopt revolutions in technology as quickly and seamlessly as possible to ensure consistent standards in warfighting capabilities; to ensure fighters across the services can communicate and share information; and to ensure that the Department leverages its full potential and buying power to appeal to the small, private sector innovators it so desperately seeks to attract and retain. Unfortunately, DoD-backed innovation programs have failed to serve as viable entry-points for emerging capabilities into the broader defense sector and have failed to enhance the integration of these emerging capabilities across the forces. A superior military not only serves domestic national security interests, but also enables the United States to fulfill its role in safeguarding peace, prosperity, and freedom. As such, the DoD must stop at nothing to keep the forces agile, modern, and at the forefront of new technologies, and that includes adapting its existing resources—in this case, its vast network of innovation hubs—to be as effective as possible.

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