U.S. Army Applied SBIR Program
Innovation Framework

[Summary Version]

Leveraging Small Business Innovation Research Capital to Overcome Army Technology Challenges

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How to Read the *Innovation Framework*

The **U.S. Army Applied SBIR Program *Innovation Framework*** is a reference document that codifies the program's approach to bring small business talent and technologies into the Army enterprise (e.g., research, acquisition, and sustainment) to help overcome military technology challenges. As a practice-informed model, the *Innovation Framework* brings clarity to Applied SBIR operations and objectives and adds urgency to the broader debate over reform of the Army modernization business model. The purpose of the framework is to shape the SBIR Program's innovation leadership and inform its role as an important Army interface with the emerging technology sector, also referred to as the **innovation economy**.

In **Section I,** the *Innovation Framework* presents the theory and key elements underpinning the Applied SBIR approach to innovation leadership. It introduces the approach to key stakeholders, staff, and partners. It includes the program's mission, roles, functions and objectives, and provides the justification for the thinking that underpins the Program's interpretation of both its purpose and operating environment — the "Why" of Applied SBIR.

Succinctly, Applied SBIR is a Congressionally mandated pool of R&D capital provided from the Army's budget to fund small businesses to develop solutions to overcome Army technology challenges. As a Federal Department participating in the U.S. Small Business Administration administered "America's Seed Fund," the program's mission is to make high-risk R&D bets that smartly leverage small amounts of capital to buy-down risk for the Army's larger, more scalable acquisitions and research efforts.[1] Understanding the "Why" fuels decisiveness at all levels within the program to support the smartest capital allocations across the multi-year trajectory of the SBIR investment lifecycle.

Section II of the *Innovation Framework* defines the "What" of Applied SBIR. Through implementable illustrations called Innovation Profiles, the section demonstrates different aspects of Applied SBIR's approach. Providing more than an outline of activities, Innovation Profiles are an expression of the program's principles to maximize the impact of every dollar of SBIR R&D capital. Each profile is intended to be read on its own as a separate module and is not required to be read in a specific order.

The *U.S. Army Applied SBIR Process and Measures Manual* is a companion to this document containing the detailed processes supporting the Innovation Profiles and the measures by which the successes and failures of the model and its execution are evaluated.

Acknowledgement

In the spirit of the Joint Force, the Office of Army Prize Competitions and Army Applied SBIR Program gladly acknowledges the conceptual debt owed to the U.S. Air Force and its AFWERX Playbook.

[1] U.S. Small Business Administration website, What is Small Business Innovation Research (SBIR/STTR), https://www.sbir.gov/, accessed on 15 January 2022.

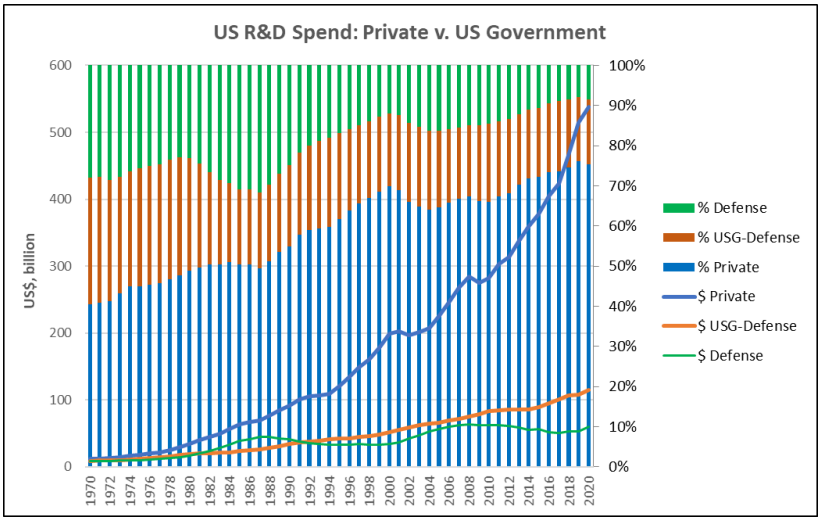
Executive Summary

The purpose of the *Innovation Framework* is to shape the Army SBIR Program's innovation leadership framework and showcase its role as an important Army interface with emerging technology firms. The framework helps staff and partners of the U.S. Army Applied SBIR Program to optimize designing and managing SBIR funded R&D efforts to best overcome Army technology challenges. This document is not about process, as the program has a companion document, *Army Applied SBIR Processes and Measures Manual*, detailing its process and metrics. Under the tenet that an organization's culture is the culmination of the behaviors of its people (*talent*) plus the organizational channels through which those behaviors flow (*process*), the combination of the ***Innovation Framework*** and *Applied SBIR Processes and Measures Manual* represents the codification of the Applied SBIR culture: the "secret sauce" of the program's success in dealing with the emerging technology industry — hereafter referred to as the **innovation economy**.

Innovation Economy as Competition Zone

The innovation economy is the portion of the overall economy — mostly private but also includes academia and government — in which technologies new and existing are emerging into novel applications to close the gap between current capabilities and a desired future state. This is the program's working definition of "innovation." Technology providers — those firms developing discrete technologies — are the most obvious innovation economy participants, but other essential participants are capital providers (e.g., venture capital), technology and business accelerators (e.g., Y Combinator, TechStars, etc.), and the consulting, legal, and accounting firms that support these participants.

Since the innovation economy is both the primary source of military technological advantage and global in nature, it is currently the primary field of great power competition where battles between many participants are fought daily to secure technologies essential to national security. The Army should be an active participant in the innovation economy, understanding that its standing and reputation within this economy is directly proportional to the *real* and *perceived* value it brings to the innovation economy. Historically, the Army boasted a strong brand and contributed value in the form of funding, research, and testing opportunities; however, since the 1990s, Army acquisition and R&D funding practices have not kept pace with the perpetually evolving and increasingly consumer-oriented, private sector-oriented innovation economy. The failure to adapt to a



changing environment has led to a growing gap between the Army's potential versus actual value contribution.

Shifting Center of Gravity of R&D

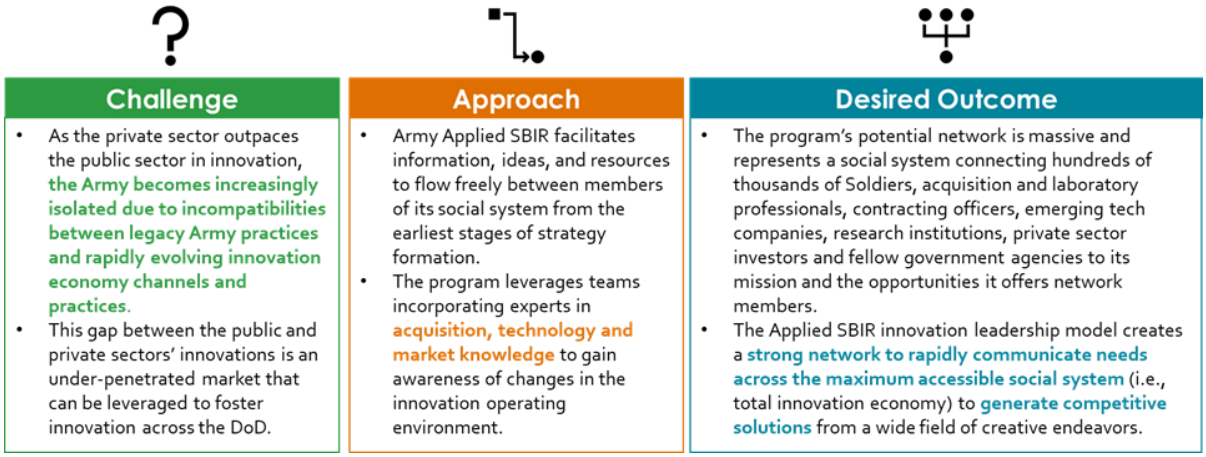
In 1988, U.S. government R&D spending dipped below that of similar domestic private sector investment and has been diving ever since as a percentage of total U.S. domestic R&D. This change represents a ground-shift away from the Army in who decides the direction of innovation as well as the considerations shaping end-use priorities. Successful Army funding models and practices employed to integrate emerging technologies in the mid-20th century are proving their obsolescence within the contemporary innovation economy. The Applied SBIR Program is part of the Army's answer to develop new approaches and processes that not only recognize the shift in influence over the innovation agenda, but also seize the opportunities presented to the Army by the enormous growth in private R&D spending.

Two Elements of Applied SBIR

As part of a larger reform effort to close the gap between what the Army can and does offer the innovation economy, the Applied SBIR Program recognizes two core elements of the nature of the program. The **first element** is the recognition that financial capital is the Program's primary resource to achieve its mission because that is the only asset it directly controls, as it does not itself conduct R&D nor acquires anything on behalf of the Army. The logical consequence is the program's **core competency is deciding how to best allocate its assigned capital**.

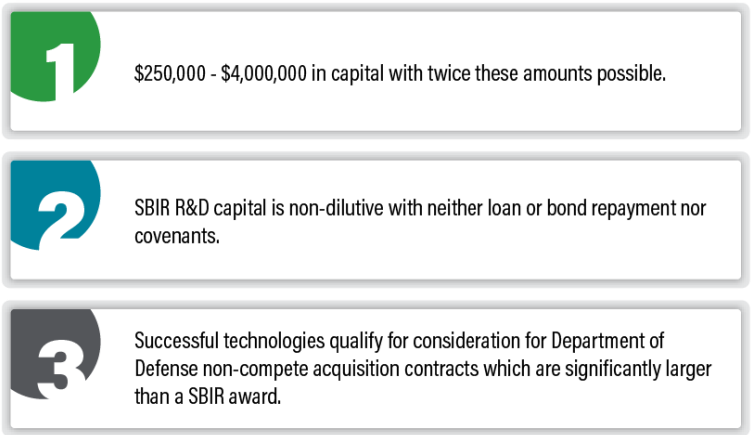
In a mission-focused sense, Applied SBIR's role is to provide financial intermediation between the Army and small, technology businesses; in essence, acting as a bank. The program functions to make many small bets to identify a few firms with the technical and business capacity to meet Army needs, and then participate in the planning to viably integrate these companies into an acquisition program. This description of function is the **second element** of the program and is the same function as a financial investment team. Recognizing this second and final element of the nature of the program should permit both the program and its stakeholders to understand where it fits within the larger Army enterprise as well as to appreciate what the program can and cannot do.

Applied SBIR Value Proposition

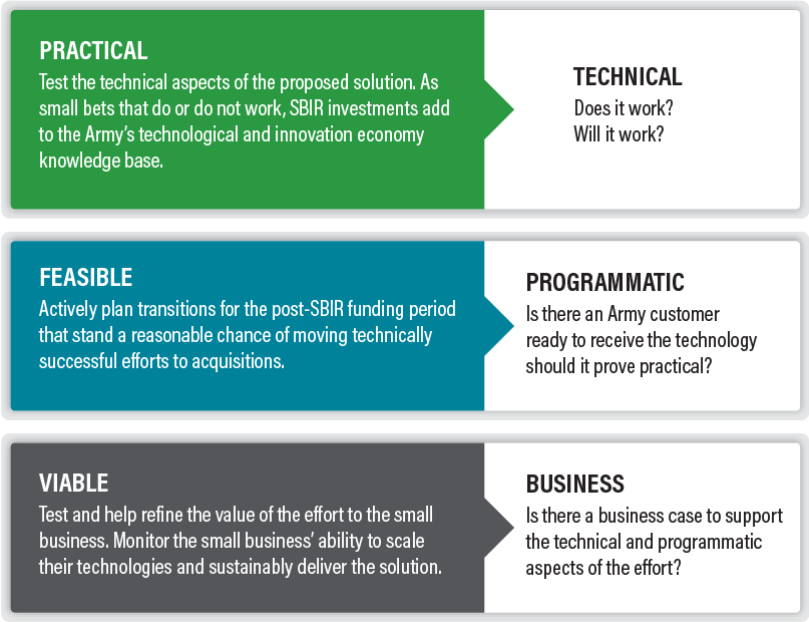


Applied SBIR's central value proposition to the Army is how it buys down risk to the Army's much larger acquisitions and non-SBIR R&D activities. This **risk buy-down** leverages small amounts of Army money to test technologies and prove the business case around their practicality and feasibility to address Army challenges. As small bets that succeed or fail in a technical sense, all SBIR investments add to the Army's R&D and broader innovation economy knowledge base. But feasibility of said technology's integration into Army acquisitions is just as important and encompasses testing and evaluating criteria from the small business' ability to scale production to uniquely Army considerations like willingness of acquisitions to integrate the tech into an existing platform or the availability of acquisition dollars from appropriated funds.

Investor Mindset Components:
With respect to Applied SBIR's direct value proposition to the innovation economy, the program leverages its financial strengths by making apparent the following three key advantages:



Modeling Risk:



The program employs three "fitness parameters" to shape which R&D efforts to fund and then monitors each effort's risk profile across the SBIR investment lifecycle. These parameters directly support the use of "risk and opportunity tests" to ensure the program models its portfolio to assess both risks and opportunities, both planned and emergent. A structured approach to assessing fitness, risks and opportunities supports cost effectiveness. Through continuous monitoring and dynamic planning, these tools help the program achieve results at the speed of relevancy to the innovation economy and manifest the program's core value proposition of buying down risk for Army acquisitions.

Two Customer Types: Applied SBIR intermediates between two sets of customers:

- **Internal customers:** Acquisition professionals, technologists, and supporting organizations (contracting, legal, etc.).
- **External customers:** Innovation economy firms who deliver or support the delivery of technological solutions to Army problems.

To effectively deploy its capital and safeguard its investments, the Applied SBIR Program must serve both types of customers appropriately and mindfully. To do this, the program strives to build and maintain an understanding of its market, its customers, and their relative market positioning. Given the unique considerations in working with the government, structuring R&D investments to be attractive to innovation economy participants is essential to overcoming resistance to doing business with the government — especially among capital providers.

Solution and Problem Discovery

How the Army communicates its technology challenges is important to the productivity of its engagement with the innovation economy. The Army's tendency is to solicit proposals for a solution per an identified Army requirement. However, with the increasing pace of private sector innovation and the emergence of peer, great power competitors, the Army's technological environment demands processes aware of the opportunities and threats of non-routine, disruptive innovations.

The growing cadre of technological challenges that do not fit a proscriptive approach opens the Army to the danger of a rush to solutions of incremental effectiveness by limiting the process to only "solution discovery," e.g., seeking new technologies that solve for known problems. Preventing technological surprise and leveraging disruptive innovations requires a model built to also recognize "problem discovery," or the process by which a solution discovered that doesn't work for the problem as originally sought is nonetheless a valuable solution to another problem. In communicating problem statements to the innovation economy that recognize the non-linearity of disruptive innovation, Applied SBIR funded R&D efforts go beyond incrementalism by opening ourselves to solutions looking for the right problem.

Intertwining Science and Engineering: Building on the openness to discovery of both solutions and problems is the Army SBIR Program's recognition of the value of intertwining the reasoning of the *scientific method* with that of the *engineering process*. Engineering is excellent at solving practical, discrete problems, and SBIR funded R&D efforts must always tie back to supporting technologies that solve discrete Army problems. However, engineering alone can fall into the narrowness trap of excessive focus on lower-risk processes and repeated testing that lacks connection with the original purpose of the R&D.

In contrast, the scientific method starts with a question, observations and experiments, and leads to a theory that is generalized to other similar phenomena. The benefit to this openness is the flexibility to discover solutions and new problems. However, the limitation of the scientific method is its theories may be easily disproven, and, most importantly for the Army, it is a method toward improved understanding of "why" things work and not necessarily intended to understand "how" things work necessary to achieve specific outcomes.

Drawing on developments in the understanding of technological change, Applied SBIR's innovation leadership employs a blend of both science and engineering to make the best decisions on how to allocate its R&D funds and manage the investments over their lifecycle to improve the chances of transition. Applied SBIR intertwines the openness of science with the focus of engineering to move quickly and nimbly to support the intake to the Army of information on the talent and technology within the innovation economy and assist our internal customers to develop discoveries into focused, practical solutions.

Transition Broker Team (TBT)

Modeled on a financial investment team and Section 809 Panel recommendations, Applied SBIR's Transition Broker Teams (TBTs) are the principal mechanism by which the program blends investing with Army priorities and then science with engineering to incubate effective problem and solution discovery.

TBTs are a cross-organizational team (e.g., acquisitions, technologists, business analysts) for information share among team members improve mutual understanding with the aim of enhancing SBIR fund allocation decisions. TBTs maximize the effectiveness and impact of Army SBIR funds to reduce technical and execution risk in Army acquisitions and R&D programs. The outcomes of the SBIR investment

portfolio must both enhance and expedite Army programs and enable commercialization opportunities for small businesses.

TBT Functions:

- **Action Shared Information:** Operating in the information space between its members, TBTs are knowledge managers who ensure that as developments occur in the technological, programmatic, and private sector business case, TBT members are aware of these changes and quickly take actions to mitigate risks and exploit opportunities.
- **Allocate Funds:** Institutionalized knowledge-sharing among internal customers improves risk-weighted decision-making in the allocation of SBIR capital to specific R&D efforts. Called Active Management, TBT processes employ the team's collective talent to achieve optimal decision-making over the SBIR lifecycle.
- **Transition SBIR Funded Technologies:** Synchronize the planning and actions of TBT members to lower the risk to transition of the SBIR funded technology to an acquisition program or further R&D.

Applied SBIR Investment Thesis

To succeed in its mission of applying its core competency of allocating capital to effectively support R&D activities, Applied SBIR needs a strategy to identify objectives, priorities, appropriate actions for capital allocations, and an approach to recognize which R&D opportunities fit with its mission. **Applied SBIR's investment thesis is to fund R&D to identify and then develop commercially available technologies into solutions for Army technology challenges.**

The following four policies constitute the program's execution of this thesis:

A. Establish itself as a government-styled investment firm by recognizing both the program's core competency of allocating scarce funding to specific R&D purposes as well as its fiduciary responsibilities to the Army to safeguard and mange those funds after allocation.
B. Employ a portfolio management model to actively manage risk and exploit opportunities.
C. Structure its activities within multi-disciplinary, cross-organizational entities (e.g., transition broker teams) to share information to improve mutual understanding of the risks and opportunities with the purpose of supporting the best capital allocation decisions.
D. Set as its objective the transition of technologies from the R&D to Army acquisition and then focus its planning and activities to achieve that transition in cooperation with internal and external customers.

Applied SBIR takes the following actions intended to overcome the obstacles it encounters:

A. Address a tech problem that can be solved by a U.S. small business with a rough total of $4M and in no more than four years.
B. The SBIR funded R&D technology solutions must have a commercial, consumer-oriented market application and revenue prospect.

C. While SBIR funding is RDTE and therefore the small business must perform some type of "research and development," there is no prerequisite minimum of either research or development in a SBIR funded R&D effort.
D. Firstline management of the SBIR funded R&D effort shall come from an Army expert with both the relevant technical competency and the time to manage the work of the small business.
E. An appropriate and willing transition partner shall be directly involved from the beginning of the R&D effort to furnish a transition plan to integrate the technology into a larger Army system using identified funds to make the transition feasible.
F. Through a TBT, all three parties to the effort (e.g., technologist, acquisitions, Applied SBIR) shall remain engaged across the entire SBIR lifecycle, and employ a team-based approach to lead through the inevitable changes and problems to transition.

Summation

The *Innovation Framework* creates a synchronization of effort for the Applied SBIR Program and its partners to improve mutual understanding of Army technology problems and the innovation context within which solutions may be found. Treating SBIR awards as investments managed by a stabilized team means there is a unified effort around consistent objectives over the entire SBIR investment lifecycle. Fine tuning the approach over time, with valuable contributions from partners' diverse, iconoclastic thinking, will foster an Army that is in sync with the innovation economy and is essential to furthering national security.

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