

Leveraging SBIR for Quantum Commercialization and Supply Chain Growth

By Phillip Singerman and Hideki Tomoshige

Introduction

Quantum information science and technology (QIST) **has the potential** to become a foundational platform technology, with wide-ranging applications in national security, advanced manufacturing, communications, and scientific discovery. Despite this strategic importance, U.S. public and private investment in quantum research, development, and commercialization remains modest. This underinvestment has slowed the transition of quantum innovations from the laboratory to the marketplace and weakened the development of a resilient domestic quantum supply chain.

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In 2024, U.S. private investment in artificial intelligence reached **\$109.1 billion**—roughly 109 times greater than investment in **quantum technologies**. Similar gaps appear in public funding: From FY 2019-2024, federal R&D spending on quantum information science totaled **about \$5 billion**, compared with more than \$50 billion in five-year appropriations for the semiconductor ecosystem, plus tens of billions in tax credits. International competition further heightens concern, as China is estimated to have invested **roughly \$15.3 billion** in quantum technologies, compared with U.S. public investments of about \$3.8 billion.

In this context, the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are modest but highly effective tools for addressing some of the quantum funding gap. SBIR is a competitive public-private partnership that provides non-dilutive, early-stage funding to small businesses for research and development with commercialization potential. As a complement, STTR strengthens these efforts through partnerships with universities and nonprofit research institutions. Together, SBIR and STTR invested roughly **\$4.7 billion** in FY 2023 across their technology portfolios.

SBIR is particularly well suited to early-stage, high-risk technologies, supporting small firms developing critical quantum components, systems, and enabling infrastructure. While SBIR investments in quantum are small, they can play a strategic role in developing and retaining domestic suppliers for quantum systems. Notably, by stabilizing the emerging specialized supplier base, SBIR strengthens the broader quantum ecosystem and accelerates commercialization.

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Evidence from federal award data and regional ecosystems—most notably data from Colorado’s quantum cluster reviewed in this paper—shows that SBIR funding catalyzes company formation, supplier development, and early commercialization when aligned with agency missions and complemented by state and local programs.

Structure and Function of SBIR and STTR

Congress created the SBIR program in 1982 (**Public Law 97-219**), stating that, despite the role of small businesses as “the principal source of significant innovations in the Nation,” the vast majority of federally funded R&D is performed by large businesses, universities, and federal laboratories. Per this legislation, the SBIR program seeks to advance four objectives: (1) stimulate innovation; (2) increase the use of small businesses in addressing federal R&D needs; (3) foster the participation of socially and economically disadvantaged individuals in innovation and entrepreneurship; and (4) increase private sector commercialization of technologies derived from federally funded R&D. Federal agencies with extramural R&D budgets of \$100 million or more are required to allocate a portion of that funding (currently 3.2 percent) to conduct an agency-run SBIR program. Currently, 11 federal agencies operate SBIR programs: the Departments of Agriculture (USDA), Commerce (DOC), Defense (DOD), Education (ED), Energy (DOE), Health and Human Services (HHS), Homeland Security (DHS), and Transportation (DOT); the Environmental Protection Agency (EPA); the National Aeronautics and Space Administration (NASA); and the National Science Foundation (NSF).

A complementary program, the STTR program, was created in 1992 (**Public Law 102-564**) to facilitate the commercialization of university and federal R&D through support for cooperative R&D between small businesses and research institutions. Federal agencies with extramural R&D budgets of \$1 billion or more are required to allocate a portion of that funding (currently 0.45 percent) to conduct an agency-run STTR program. Six federal agencies currently operate STTR programs: the USDA, DOD, DOE, HHS, NASA, and NSF. Each federal agency is required to administer its own SBIR and STTR programs in accordance with the statutory provisions of **15 U.S.C. §638** and the policy directive issued by the U.S. Small Business Administration (SBA). The SBA is also required to provide coordination across federal agency SBIR and STTR programs, monitor implementation, and report annually to Congress. The SBIR and STTR programs **have** three phases: feasibility, prototyping, and commercialization.

Figure 1: Phases of SBIR and STTR Programs

Phase 1: Feasibility



- ▶ Aims to determine technical and scientific merit and the feasibility of ideas in relation to commercial potential
- ▶ Awards of up to \$314,363 are available
- ▶ Funded through the SBIR and STTR budgets of federal agencies
- ▶ Award duration is 6 months for SBIR and 12 months for STTR

Phase II: Prototyping



- ▶ Supports the development of prototypes or further technical progress
- ▶ Awards of up to \$2,095,748 are available
- ▶ Funded through the SBIR and STTR budgets of federal agencies
- ▶ Award duration is 24 months

Phase III: Commercialization



- ▶ Focuses on the commercialization of technologies developed during the prior phases
- ▶ Unlimited award amount
- ▶ Funded through sources other than SBIR and STTR
- ▶ Unlimited award duration

Source: Congressional Research Service.

According to the SBA's most recent **SBIR/STTR annual report**, in FY 2022, federal agencies obligated \$4.12 billion in SBIR awards and \$618.3 million in STTR awards to small businesses. A total of 3,859 Phase I awards were offered, of which 39 percent were first-time awards, and \$2.76 billion in Phase III funding came from non-SBIR federal sources, such as procurements. As Table 1 shows, however, very few awards have been granted to support quantum small businesses.

The federal SBIR program has been subject to numerous rigorous, independent, and comprehensive reviews by the National Academies of Sciences, Engineering, and Medicine, requested by Congress as part of the Small Business Reauthorization Act of 2000. These included all of the major funding agencies: the DOD, NIH, DOE, NASA, and NSF. These detailed reports found that the program was sound in concept and effective in practice, often achieving the objectives of the agencies, and offered specific findings and recommendations. Reports on the program from the **DOD**, **NSF**, and **DOE**, among other agencies, demonstrated that the SBIR program was particularly useful for emerging technologies at the early stages of R&D.

Since its creation in 1982, the SBIR program has been repeatedly reauthorized or extended by Congress. Both chambers of Congress have now voted to authorize the SBIR and STTR programs through September 30, 2031, via the **Small Business Innovation and Economic Security Act**.

SBIR's Role in the Commercialization of Quantum Technologies

Quantum technologies have the potential to provide significant military and strategic advantages in applications such as secure communications, precision navigation, and advanced sensing; however, the limited amount of SBIR funding for this technology may be limiting technological advancement and commercialization.

There has been progress. From 2015 to 2023, U.S. government agencies **offered** 575 Phase I awards and 287 Phase II awards under the SBIR program for QIST, totaling approximately \$400 million to eligible small and emerging firms (excluding Phase IIA and Phase IIB funding).

- As the largest participant in the SBIR program, the DOD has made almost \$195 million in awards to support quantum technologies. The DOD's investment peaked between 2019 and 2021 at over 50 projects each year, accounting for over 40 percent of total quantum-related Phase I and II funding among all agencies.
- The DOE supported more than 30 quantum-related projects each year from 2019 to 2022, with a peak of 41 awards in 2022.
- NASA, HHS, and the NSF also contributed quantum technology awards through SBIR. From its proportionally small SBIR program, the DOC, through the National Institute for Standards and Technology (NIST), contributed ten SBIR awards from 2015 to 2023, including eight Phase I awards and two Phase II awards.

While these investments reflect a positive trend, as Table 1 shows, the percentage of SBIR funds allocated to quantum technology is arguably low relative to its strategic importance. Despite the huge potential of quantum technologies, only 1.7 percent of DOD SBIR awards between 2015 and 2023 were allocated to quantum technology projects. Likewise, despite the potential for QIST to advance progress in these fields, the leading agencies with SBIR programs—the DOE, NASA, HHS, and the NSF—provided similarly small numbers of quantum-related projects.

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Table 1: Quantum-Related SBIR Awards by U.S. Federal Agencies, 2015–2024

Agency	Total SBIR Phase I and II Awards	Quantum SBIR Phase I and II Awards	Share of SBIR Awards Related to Quantum
Department of Defense	22,473	390	1.7%
Department of Energy	4,657	211	4.5%
National Aeronautics and Space Administration	4,052	104	2.6%
Department of Health and Human Services	10,493	81	0.8%
National Science Foundation	3,353	53	1.6%
Department of Commerce	533	10	1.9%
Department of Homeland Security	395	5	1.3%
Department of Agriculture	993	4	0.4%
Environmental Protection Agency	264	3	1.1%
Department of Transportation	265	1	0.4%

Source: CSIS Renewing American Innovation and the U.S. Small Business Administration.

Colorado’s Emergence as a Regional Center of Quantum Innovation

Quantum science is still at an early stage in its development and commercialization pathway and is closely connected to federal agencies and university research organizations. Accordingly, it is useful to examine a regional quantum innovation ecosystem and its relationship to SBIR companies.

The principal driver of Colorado’s ascendancy in quantum technology has been its research universities working in concert with federal agencies. Colorado and the Mountain West region overall have emerged as the national center of the QIST industry, home to more quantum organizations, companies, and jobs than anywhere else in the country

As explored in greater depth in a February 2026 CSIS report, *A National Asset: The Colorado Quantum Ecosystem*, NIST has been operating a major research facility in Colorado since 1954 and has done more than any other agency to promote the state’s efforts in quantum science. NIST formed the nation’s first government-university research center, the Joint Institute for Laboratory Astrophysics (now known only by the acronym JILA), at the University of Colorado Boulder. NIST Boulder and JILA have become world-leading centers of precision measurement, driving international measurement standards.

Recognizing the science and technology resources that have been developed in the community, federal agencies have provided new funding and developed new partnerships to maximize their potential through the NSF's National Quantum Lab, the DOE's Sandia National Laboratory, the Defense Advanced Research Projects Agency's Quantum Benchmarking Initiative, and the DOD's APFIT program. Significantly, in 2024 the DOC awarded Elevate Quantum, a multistate consortium, **\$40.5 million** from the Economic Development Administration's Tech Hub program, the only hub award focused on quantum technology.

The Role of SBIR in the Growth of the Regional Quantum Ecosystem

The long-term federal investment in QIST R&D in Colorado, complemented by robust and creative state support, has fueled the emergence of a cluster of early-stage companies that have been stimulated by SBIR funding. A review of 18 Colorado-based companies that received SBIR awards between 2015 and 2023 is illuminating.

- **Company Size:** The companies are primarily very small, generally with between 1 and 50 employees, though a few have expanded to several dozen staff.
- **Company Age:** Many of the companies are young. Fifteen of the eighteen received their first quantum-related SBIR award after 2016, and three in 2015.
- **Company Location:** The companies are concentrated in Colorado's Front Range: Boulder, Golden, Broomfield, Louisville, Lone Tree, and Denver. Most have origins linked to federal and university research efforts and reflect the program's strength in offering a pathway to commercialize university research.
- **SBIR Award Distribution:** With the exception of two companies that received five and seven SBIR awards, respectively, the average number of **Phase I and II combined awards** per company in Colorado was 2.5. Among the award winners, nine quantum-related companies in Colorado received both Phase I and Phase II awards. These include ColdQuanta (Infleqtion), High Precision Devices, Maybell Quantum, New Iridium, Quantum Imaging, Tech-X Corporation, Vapor Cell Technologies, Vescent Technologies, and Xairos Systems. These companies manufactured cryogenic infrastructure, high-precision lasers, atomic vapor cells, and other components that directly support the quantum hardware supply chain, enabling further commercialization and developments of quantum systems.

The SBIR program is shaping a distinctive, emerging quantum regional industry and helping to build the broader quantum value chain. There has been progress in accelerating quantum commercialization. For example, Maybell Quantum **successfully advanced** from Phase I to Phase II for scaled production of High-Density Cryogenic Flexible coAXial (FLAX) RF ribbon cables in 2023. Maybell attracted more than **\$25 million** in private capital in 2024 and commercialized multiple products.

Utilizing SBIR to Advance a Cutting-Edge Technology: The Example of the CHIPS Act

Current policies and programs offer lessons for scaling up an SBIR program to advance quantum research by leveraging or revising existing authorities.

As part of the **CHIPS and Science Act**, the DOC and NIST were appropriated over \$50 billion to support the semiconductor ecosystem. Given the size of the CHIPS budget, and depending on how the various components are categorized, NIST could potentially provide hundreds of millions of dollars for CHIPS-related SBIR awards, including an allocation for STTR awards. In April 2024, the CHIPS R&D Metrology Program **issued** a notice of funding opportunity (NOFO) offering up to \$54 million across 24 awards: approximately 14 as open topics (aligned to seven specific Metrology Grand Challenges) and 10 as closed topics. The NOFO included the full range of flexibilities allowed under SBIR programs, including the following:

- maximum allowable amounts for Phase I awards (\$283,500) and Phase II awards (\$1,910,000);
- fast-track approvals; and
- Phase II awards under closed topics for firms that completed a Phase I award on a related topic with any agency.

To encourage commercialization, NIST offered the following:

- Technical and Business Assistance (TABAs) funding of \$6,500 for Phase I and \$50,000 for Phase II;
- authorization to make awards under the Commercialization Readiness Pilot Program;
- submission of a Commercial Viability and Domestic Production plan with a Phase I final report; and
- limitation of awards to applicants who had previously earned more than 20 SBIR awards.

In September 2024, NIST **announced** an award of \$5 million to 17 companies, committing as much as \$37 million in funding. If NIST decides to issue a second NOFO, and, depending on the breakdown of fast-track and Phase II awards, it could provide an additional \$15 million. In short, the NIST CHIPS SBIR funding launch illustrates how focused attention on quantum might be advanced through a dedicated funding source.

The TABA Program, authorized by Congress in 2019, provides funding for commercialization and business assistance expenses not allowed under regular SBIR funding. Although program specifics vary by agencies, generally up to \$6,500 may be provided to Phase I SBIR winners in addition to the award amount, and up to \$50,000 may be allowed as part of a Phase II award. The assistance must be provided by a third-party entity, either chosen by the company or offered by an agency. Services include technology assessments, market analysis and strategy, business model development, commercial road mapping, investment readiness assessment, IP, and regulatory affairs support.

The Complementary Role of State and Local SBIR Support Programs

State and local governments have developed innovative policies to broaden the base of SBIR applicants and support the commercialization of SBIR-funded technologies. Continuing and expanding these programs to emphasize quantum technologies would effectively amplify the impact of federal funding and support the growth of the quantum industry.

The State Science and Technology Institute **published** a comprehensive State SBIR/STTR Resource Guide that describes state-level programs. Every U.S. state and Puerto Rico has a set of programs, which

can include (1) proposal development and mentorship; (2) financial assistance; (3) commercialization support; and (4) technical assistance and networking. Representative examples include the following:

- **The Federal and State Technology (FAST) Partnership Program:** One example of a set of comprehensive programs is the SBA **FAST program**, which provides competitive awards of up to \$200,000 to state-designated organizations to provide specialized training, mentoring, and technical assistance, generally in underserved communities. Organizations offer “Phase 0” awards to help first-time applicants prepare competitive proposals. In October 2024, the SBA **funded** organizations in 48 states and Puerto Rico to provide support in applying for SBIR funding.
- **The Maryland Technology Development Program’s Initiatives:** From 2019 to 2024, **the Maryland Technology Development Program** (TEDCO) was Maryland’s designated recipient of SBA FAST funding. TEDCO’s FAST program—the SBIR/STTR Proposal Lab—assists first-time applicants, particularly from underserved communities, with competing for NSF funding. Services include proposal writing, commercialization planning, and budgeting.
 - In 2024, TEDCO also received **\$1.33 million** from the state to provide matching grants to successful SBIR awardees. Modeled in large part on Montgomery County’s program (see below), TEDCO offers \$25,000 to Phase I winners and \$75,000 to Phase II winners.
 - TEDCO also offers commercialization assistance and proposal writing for DOD, DOE, and NIH SBIR applicants (complementing the NSF-focused FAST program) through \$500,000 of state funding. TEDCO has offered to be a TABA third-party provider, offering a broad range of commercialization assistance.

Montgomery County, Maryland, is home to some of the nation’s most prominent federal agencies and research organizations, including the FDA, NIH, NIST, and DOD research institutions, and it operates the only county-level SBIR/STTR matching grant program. In a recent revision of the program, the county

- created a “Phase 0” award providing up to \$5,000 in reimbursement for technical assistance costs associated with applying for a first SBIR/STTR award;
- limited eligibility to small and young companies with only single-digit prior SBIR awards; and
- authorized a “TABA-like” program by requiring that 50 percent of grants be used for reimbursement of expenses attributable to technical assistance, investment assistance, or commercialization assistance.

Recommendations to Leverage the SBIR Program for Quantum Technology Commercialization

The following are specific recommendations regarding federal oversight and coordination, agency policies, state and local programs, and the SBA.

FEDERAL OVERSIGHT AND COORDINATION AUTHORITIES

The **National Quantum Initiative Act** (Public Law 115-368, passed on December 21, 2018) calls for a coordinated approach to quantum research and development efforts across the U.S. government,

including the civilian, defense, and intelligence sectors. To further the objectives of the legislation, the following actions should be undertaken:

- The National Quantum Coordination Office, working through the National Science and Technology Council’s Committee on Science and Subcommittee on Quantum Information Science, should utilize the update of **the National Strategic Overview on Quantum Information Science** (last published in September 2018) to emphasize the importance of SBIR funding to small company-based quantum R&D.
- The National Quantum Initiative Advisory Committee should highlight clusters of SBIR-awarded quantum companies to help verify best practices.
- The Quantum Economic Development Consortium (QED-C), in coordination with the Economic Development Administration’s Tech Hubs and the NSF’s Regional Innovation Engines, could develop a special program of engagement with its membership to identify technical needs that could be addressed through the SBIR program or other agency funding and connect young or small SBIR winners with potential private and public customers. Federal agencies should provide targeted funding to QED-C to support this initiative.

FEDERAL AGENCIES

- U.S. federal agencies could proactively use SBIR to advance QIST research and development. Although policy and practice are decentralized to the agency and sub-agency levels across the SBIR program, agencies do have the ability—for example, through topic selection and portfolio overview—to prioritize quantum research.
- Federal agencies should utilize all available authorities—including allocating research funds to small companies from the agency’s main research budget and leveraging Other Transaction Authority’s flexibility, funding amounts, fast-track awards, and both open and closed topics—to cast a broad net to attract technically capable firms to quantum research.
- Agencies should make more funding available for first-time (usually young and small) SBIR applicants, which often demonstrate rapid growth potential. The state-level “Phase 0” programs and the federal “Phase 1A” award proposed in the INNOVATE Act are examples of possible approaches.
- Federal agencies should work to establish a uniform, rapid follow-on award mechanism for SBIR recipients that implement successful quantum projects. Some agencies, such as the DOD and NIH, have Phase III programs or follow-on awards. However, programs may need **“additional arches” to bridge the “valley of death.”**
- To encourage commercialization, agencies should strictly apply transition rate and commercialization rate benchmarks and require commercial viability and domestic production plans. Most importantly, agencies should publicize and encourage the use of TABA authority, closely monitor performance, and provide vetted third-party service providers if requested by SBIR awardees.

STATE AND LOCAL PROGRAMS

- State SBIR support programs are an underutilized national resource, and their activities could amplify federal efforts.
- Of particular value for commercialization would be the incorporation of TABA-like mechanisms into existing state matching grant programs and encouraging SBIR applicants to apply for TABA funding in their SBIR proposals.

THE SMALL BUSINESS ADMINISTRATION

The SBA, which has oversight of the SBIR program and provides funding through the FAST program, is the most appropriate responsible federal agency to work with nonfederal entities to encourage commercialization.

Conclusion

Only a small proportion of total SBIR funding has been allocated for SBIR grantees to carry out QIST R&D efforts, despite the enormous potential impact that new advances in QIST could have on U.S. national competitiveness. Additional SBIR resources beyond present levels are critical for sustaining U.S. leadership in the QIST field.

There is great potential for additional funding through the use of Other Transaction Authorities and other programs at the federal, state, and local levels to help address the funding opportunities represented by this novel technology. Ramping up efforts at all levels of government to prioritize increased funding, utilize existing programs, and strengthen policy coordination for QIST is urgent.

Additional SBIR resources beyond present levels are critical for sustaining U.S. leadership in the QIST field.

It is important to capture the benefits of one of the most important and effective U.S. public-private partnerships to foster U.S. leadership in the context of growing international competition. The United States should reinforce and keep building upon this proven recipe to advance quantum commercialization and strengthen the domestic supply chain. ■

The Center for Strategic and International Studies' Renewing American Innovation program is undertaking a review of the U.S. Quantum Opportunity, as requested by the National Institute of Standards and Technology and in cooperation with the Quantum Economic Development Consortium.

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