U.S. Department *of* Defense

INVESTMENT STRATEGY
FOR THE OFFICE OF STRATEGIC CAPITAL

Fiscal Year 2024

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Foreword

The United States is in a global competition for leadership in critical technologies. Today, private capital finances the significant majority of the critical technology and supply chains needed by the Department of Defense. Consequently, private capital is a vital resource for the Department and a key source of U.S. comparative advantage in technology competition. Therefore, working with capital providers is a national security imperative.

I established the Office of Strategic Capital in December 2022 to work with private capital providers to build enduring national security advantages. This office will attract private sector investment in critical technology areas and supply chains that support national security to ensure that technology developed in America benefits America. By partnering with our federal colleagues to work with capital providers, the Office of Strategic Capital will add tools to the Department of Defense's investment toolbox. The Office of Strategic Capital will also work in concert with our allies and partners to enable production and sustainment. OSC is a crucial element of ongoing Department of Defense efforts to support resilient, diverse supply chains.

Through OSC, the Department of Defense will engage with and enhance the United States' significant national advantages in capital markets, technology development, and commitment to market competition. In contrast to global competitors that coerce and control investors and companies, the United States has an unmatched ability to invite and empower those who seek to contribute to our shared security. This Investment Strategy for the Office of Strategic Capital describes new ways that the Department of Defense will work with capital providers and companies to strengthen critical supply chains for national security. Together, we can work towards ensuring that the United States maintains its technological advantages.

Lloyd J. Austin III
Secretary of Defense

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Executive Summary

The mission of the Office of Strategic Capital (OSC) is to attract and scale private capital to technologies critical to the national security of the United States. OSC's initial emphasis is on using loans and loan guarantees in partnership with other federal departments and agencies to crowd in capital for component-level technologies.

OSC is unique but complementary to existing DoD efforts through the combination of three primary areas of emphasis. While not an exhaustive list, these areas include:

1. ***Components*** (not capabilities)
2. ***Finance*** (not innovation)
3. ***Lending*** (not spending)

The Investment Strategy for the Office of Strategic Capital provides the framework to identify initial priority areas for OSC in FY24. An investment thesis for investors will be forthcoming.

The Investment Strategy for the Office of Strategic Capital focuses on strategic capital needs where public support is required to attract private investment, especially for critical component technologies not always addressed by direct procurement. Specifically, OSC focuses on component-level technologies with broad commercial application that are also relevant to the national security of the United States and its allies and partners. The financial approaches described here are cost effective and efficient because loans and loan guarantees require repayment from borrowers, minimizing the required amount of federally-appropriated funds. When complemented with private capital, these strategic capital investments will create a multiplier effect for total capital invested in national security interests. New partnerships and approaches will strengthen the diverse, resilient supply chains needed for building and maintaining enduring technological advantages.

This Investment Strategy outlines the framework that the DoD uses to identify where to use financial tools available to OSC and federal partners, explains the approach to prioritize areas for investment, and lists the initial priority industries where OSC will direct its attention in fiscal year 2024. The first program activity available to OSC, in partnership with the Small Business Administration, will extend loan guarantees to licensed funds for investments in critical component technologies.

Initial Priority Areas for the First OSC Program Activity: SBIC Critical Technologies Initiative

Priority areas (and their related *Critical Technology Areas*) for the first OSC program activity: the Small Business Investment Company Critical Technologies Initiative. These priority areas are intended to be broad enough for investors to take a portfolio approach but narrow enough to increase investment in key industries. OSC will announce priority areas for additional program activities as they become available.

- Nanomaterials and Metamaterials (*Advanced Materials*)
- Bioenergetics (*Biotechnology*)
- Synthetic biology (*Biotechnology*)
- Open RAN (*FutureG and 5G*)
- Sensor hardware (*Integrated Sensing and Cyber*)
- Assembly, Testing, and Packaging (*Microelectronics*)
- Materials (*Microelectronics*)
- Quantum computing (*Quantum Science*)
- Quantum security (*Quantum Science*)
- Quantum sensing (*Quantum Science*)
- Battery storage (*Renewable Energy Generation and Storage*)
- Space-enabled services and equipment (*Space Technology*)

This Investment Strategy describes how capital providers and companies can partner with DoD in new ways for both national security and economic security. The public release of the Investment Strategy for the Office of Strategic Capital enables transparency for DoD to openly and ethically engage with public and private sector stakeholders. DoD invites investors and companies to participate in the initial and proposed OSC program activities in the priority areas described in this document.

For more information about participating in OSC's first program activity, please explore details on the SBIC Critical Technologies Initiative on the OSC website.

Overview and Mission of the Office of Strategic Capital

Capital and the global competition for critical technologies. The United States is in a global competition to be the world's leader in emerging critical technologies. These technologies are vital to creating enduring national security advantages. Today, the private sector funds a significant majority of technological research and development, and, consequently, private capital is the driving resource that determines the United States' research and development agenda.

While the United States has definitive advantages in robust, well-regulated, and highly developed capital markets, certain technologies vital to national security continue to lack sufficient access to capital. Without access to sufficient capital in the near future, many of these technologies may fail to mature or, worse, fall into the hands of global adversaries and competitors. Attracting private capital in strategically critical markets—or "strategic capital"—is needed.

Strategic Capital is the focused application of public incentives and private funds to achieve national security priorities.

Establishment of the Office of Strategic Capital. In response, the Secretary of Defense established the Office of Strategic Capital on December 1, 2022 to attract and scale investment in national security priorities, particularly in critical component technologies and processes that are not always supported through direct procurement.

Proven and cost-effective financial tools. DoD will utilize financial tools available to OSC to attract and scale the private capital needed to commercialize and scale critical technologies for current and future defense needs. Financial tools, such as loans and loan guarantees, are commonly used throughout the U.S. government to crowd in private investment. As used by OSC in collaboration with federal partners, these financial tools will enable capital providers to invest in critical technologies that would otherwise be less attractive because the cost of capital is too high, the timelines for repayment or liquidity are too long, or the technical challenges are too risky for a nascent commercial market alone. Through partnerships with other federal departments and agencies, DoD can build on the most successful examples of administering efficient, cost-effective financial tools to advance our national security priorities. By aligning government and private sector incentives around technology areas vital to national security and economic security, DoD aims to use the power of the market and economic competition to attract the capital required for critical technology investment.

The strategic imperative. OSC will support the achievement of the 2022 National Defense Strategy objective to "strengthen our defense industrial base to ensure that we produce and sustain the full range of capabilities needed to give U.S., allied, and partner forces a competitive advantage." The National Defense Strategy recognizes the need to ensure the United States' enduring technological advantage over potential adversaries. DoD identified the need for a strategy to better attract and scale private capital with national security priorities because of the growing influence of private capital and the barriers to accessing capital for defense-related, critical technologies.

The establishment and mission of OSC also aligns with guidance from the 2022 National Security Strategy:

"We must complement the innovative power of the private sector with a modern industrial strategy that makes strategic public investments in America's workforce, and in strategic sectors and supply chains, especially critical and emerging technologies."

Strategic and ethical alignment. In alignment with the National Security Strategy and the National Defense Strategy, OSC works with the private sector to strengthen technological advantages in the United States. This type of engagement is conducted in adherence to ethical and regulatory standards. OSC operates according to DoD-wide ethical standards for successful, fair, and transparent execution of these programs. Additional standards for engagement will be

included in policy statements for individual program activities.

A unique but complementary mission. OSC is unique but complementary to existing DoD efforts through the combination of at least three areas of emphasis. While not an exhaustive list, these areas include:

1. **Components (not capabilities):** OSC emphasizes investments in component-level technologies and processes that are critical to the supply chains that enable DoD capabilities but are not always supported through direct procurement. Examples of component-level technologies include advanced materials, biotechnology, and advanced manufacturing.
2. **Finance (not innovation):** OSC emphasizes financing investments to increase available capital, rather than using acquisition-based tools like contracts or grants to increase direct government spending on innovation for capabilities. The office is complementary to DoD's existing approaches for increasing technological innovation. Current innovation organizations within DoD utilize grants and contracting for prototypes. In contrast, OSC focuses on capital programs for both investors and companies utilizing financial tools like loans and loan guarantees through partnerships with other federal departments or agencies. In turn, these capital programs attract and scale private capital for investments in critical technologies.
3. **Lending (not spending):** OSC emphasizes the use of credit-based financial tools, whereby capital is expected to be repaid at limited cost to the taxpayer. Investors and companies that receive loans and loan guarantees will be required to repay the loan to the taxpayer, minimizing both the appropriations required and the overall program costs. Returns from lending activities may offset some program expenses, based on the historical results of existing federal credit programs. OSC will utilize the best practices of more than 100 current federal credit programs.

Initial program activities. OSC will begin to accomplish its mission through initial program activities. The initial and possible program activities are explained in the section titled Guiding Critical Technology Framework for the Investment Strategy for the Office of Strategic Capital, and more details will be provided as these program activities become available. For program activities that require authorities or appropriations not currently available to DoD, OSC will rely on partnerships with federal departments or agencies that share mandates to advance critical technologies and have the relevant authorities and appropriations. OSC will also work with allies and partners to determine the best ways to strengthen a collective supply chains that contribute to national security to ensure that we produce and sustain the full range of capabilities needed to give the United States, allied, and partner forces a competitive advantage. OSC will also conduct value chain analyses and market studies to identify strategic capital needs with increasing precision over time.

OSC is unique but complementary to existing DoD efforts through the combination of at least three areas of emphasis:

1. **Components** (not capabilities)
2. **Finance** (not innovation)
3. **Lending** (not spending)

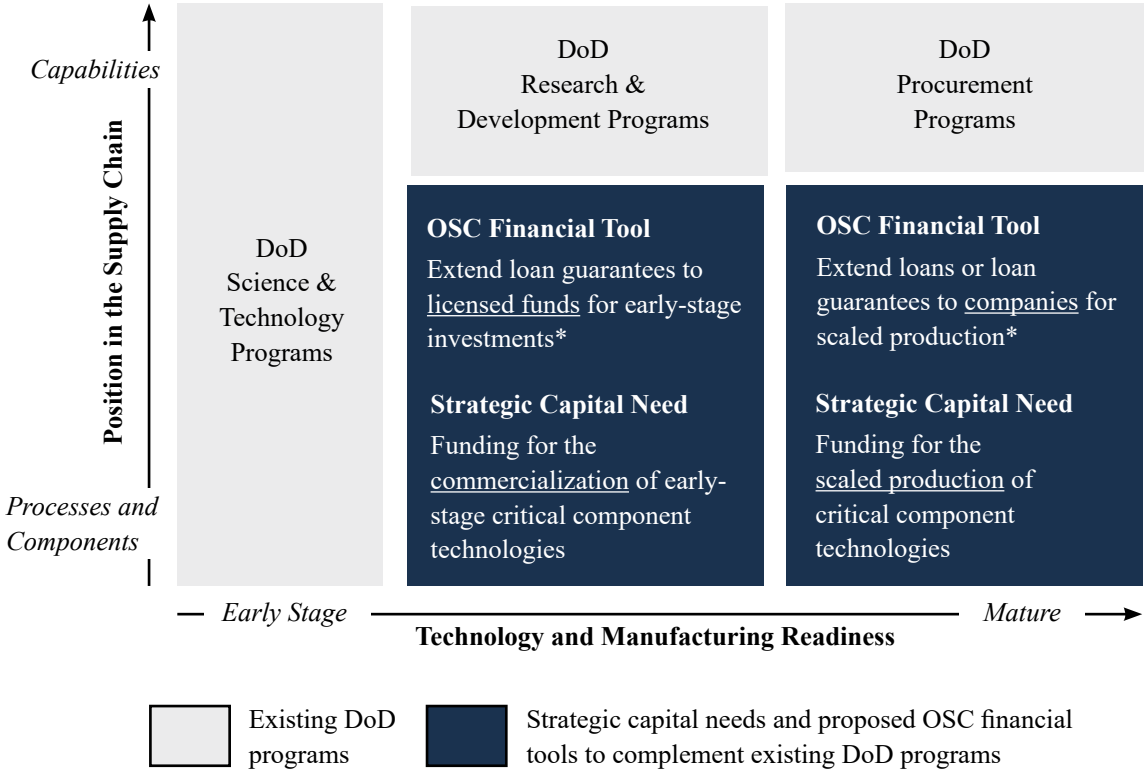
Safeguarding national interests. To safeguard national interests, OSC incorporates comprehensive reviews for adversarial capital investments and influence. These reviews assess potential investors and their affiliations to identify connections with entities, persons, or countries of concern that may pose risks to national security, economic security, or the integrity of the supply chains needed for defense. Such reviews will be conducted across investors and companies according to the needs of individual program activities. OSC will also use a coordinated risk-based approach with allies and partners to ensure that decisions about risk are informed by global context.

Guiding Critical Technology Framework for the Investment Strategy for the Office of Strategic Capital

DoD relies on a guiding critical technology framework to identify why, how, and where OSC will use strategic capital tools. Unlike global competitors that frequently *coerce* and *control* investors and companies, the United States has an unmatched ability to *invite* and *empower* those who seek to contribute to our shared security, reflecting the fundamentally American values of openness and market competition.

The guiding critical technology framework for the Investment Strategy for OSC is organized around two basic concepts: (1) a given technology's stage of maturity, from earlier-stage lab research and prototyping to late-stage production and scaling; and (2) that technology's position in the supply chain, from upstream raw materials and components to downstream capabilities. Those two organizing concepts are reflected in the x- and y-axes in Figure 1 below.

Figure 1. Guiding Critical Technology Framework for the Investment Strategy for the Office of Strategic Capital.



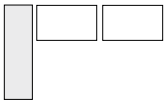
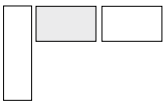
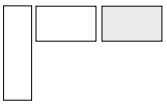
** Requires partnerships with other federal department or agencies that share mandates to advance critical technologies and have the relevant authorities and financial tools.*

This framework guides the Investment Strategy in the following ways:

- Maps existing DoD programs for science and technology, research and development, and procurement across technological maturity and positions in supply chains.
- Identifies strategic capital needs to complement existing programs.
- Indicates financial tools to address strategic capital needs.

Mapping existing programs within the guiding critical technology framework

The guiding critical technology framework clarifies the areas in the technological development process where existing DoD programs currently operate. Depicted as the shaded areas in Figure 1 above, those programs include:

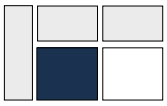
Framework Key	Description
	***Existing science and technology programs.*** DoD's Science and Technology Enterprise primarily funds early-stage technologies, often in the forms of basic research, applied research, and advanced technology development. These pre-commercial programs tend to include multiple parts of the supply chain, ranging from processes and components to capabilities. For example, a national laboratory might fund advanced materials and also fund the early-stage development of advanced aircraft, ships, land vehicles, or other future capabilities.
	***Existing research and development programs.*** DoD's Research and Development funding focuses on research, development, test, and evaluation of technologies, often to prepare them for the transition into capabilities. These programs tend to focus on technologies that require product development and commercialization. For example, a research and development program might fund prototyping for an autonomous system with the objective to field it as a defense capability.
	***Existing procurement programs.*** DoD also dedicates significant funding to mature stage technologies, often in the forms of system development and demonstration, management support, operational system development, and others. These programs tend to focus on capabilities at the end of the supply chain. For example, each year procurement programs focus on aircraft, ships, land vehicles, satellites, and many other end products to enhance DoD capabilities.

Identifying strategic capital needs and proposed OSC financial tools

The guiding critical technology framework also highlights where existing DoD programs do not operate and technological development relies upon private capital markets. Many of the critical technologies vital to national security attract little capital relative to other technology areas and are susceptible to efforts by strategic adversaries to capture or blunt their benefits. Investors and companies are often unable to fund and develop these technologies for a variety of reasons, such as the cost of capital is too high, the timelines for repayment are too long, or the technical challenges are too risky for a nascent commercial market alone. These gaps reveal areas where existing DoD programs can be complemented with additional financial tools and approaches. The Investment Strategy refers to these gaps as strategic capital needs.

DoD seeks to add to market activities by crowding in private capital to unlock growth for the technologies and capabilities of the future. By attracting private capital through OSC financial tools, DoD is inviting and empowering capital providers and companies in a common pursuit to develop, commercialize, and scale critical technologies. As depicted in Figure 1, the guiding critical technology framework identifies multiple strategic capital needs that need to be addressed to unlock the commercialization and scaling of critical technologies.

Strategic Capital Needs arise where public support is required to attract private capital to national security priorities.

Framework Key	Strategic Capital Need	Active and Proposed OSC Financial Tools
 *Active Program Activity*	***Funding for the commercialization of early-stage critical component technologies***. Early-stage critical technology companies often struggle to raise capital, but the challenges are especially pronounced when developing components and processes requires significant scientific advances. These companies often have long R&D and adoption timelines and high technical risk. Yet, component-level and process-focused companies need early-stage financing to create many of the enabling technologies that unlock advancements for final products. DoD relies on these critical component-level technologies and production processes but currently has limited ability to support their maturation and commercialization for national security applications.	***Extend loan guarantees to licensed funds for early-stage investments***. In partnership with the U.S. Small Business Administration (SBA), OSC will support the licensing of purpose-built critical technology funds and, under the SBA's SBIC program, provide loan guarantees to investors investing in priority DoD technology areas. The SBA established the SBIC program in 1958 to increase small business access to venture capital and private equity. SBICs are privately owned and operated companies that fund small businesses through debt and equity investments. An SBIC typically uses its own capital, along with federally-guaranteed loans, to increase the amount of capital provided to companies within the bounds of the SBA's relevant SBIC program policies. The SBA website provides program instructions for participation.
 *Proposed Program Activity*	***Funding for the scaled production of critical component technologies***. Later-stage critical technology companies often struggle to raise capital for infrastructure, equipment, and processes to scale production. These companies may have promising prototypes or products, but investors are often reluctant to provide the required capital until the companies can demonstrate meaningful sales – which requires the capital in the first place. In this case, critical technology companies commonly need debt rather than equity, most commonly secured through loans. The United States needs resilient, diverse supply chains for critical component technologies and production processes, yet DoD has limited ability to support scaled production for the critical component technologies it requires.	***Extend loans or loan guarantees to companies for scaled production***. With a U.S. government interagency partner, OSC may support the extension of loans or loan guarantees to companies that are scaling production of critical technologies in relevant industries as well as important, dual-use supply chains. Loans or loan guarantees may include a variety of financial programs, such as (but not limited to) working capital, project financing, or infrastructure financing.

Separate from the use of loans or loan guarantees, OSC may match private sector capital with DoD Research, Development, Test, and Evaluation (RDT&E) funding for larger investments in critical technology when definitively aligned to Military Service needs, authorities, and transition pathways, to include out-year procurement program funding. The increased level of capital, diligence, and accountability aims to accelerate and scale development, production, and fielding of transformative military capabilities.

Federal credit programs are cost effective and efficient

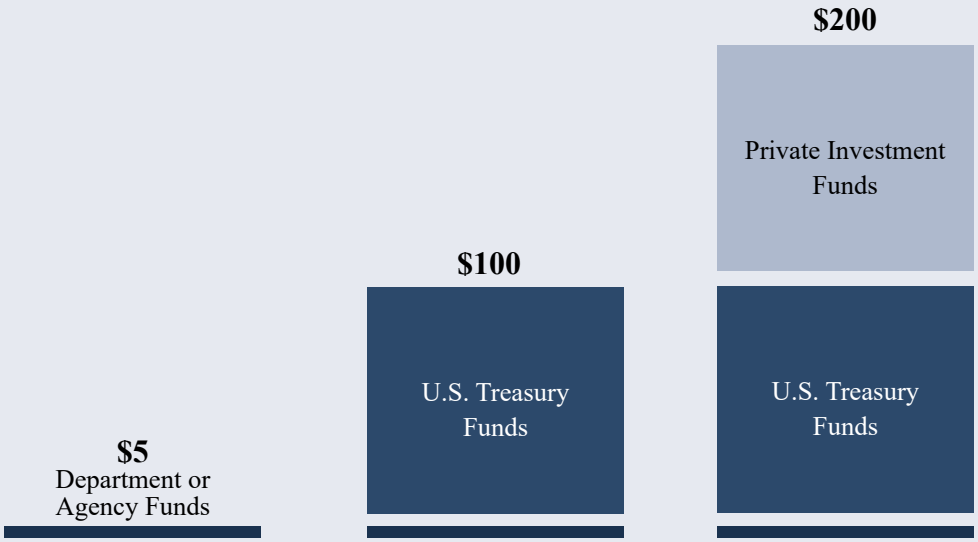
Enhancing competitiveness in an era of resource constraints

By using loans and loan guarantees in partnership with other federal departments and agencies, DoD can significantly magnify taxpayer dollars used for the development of component-level technology. With these financial tools, a small outlay can be amplified through the extension of government credit. Furthermore, as depicted in the simplified example below for a possible fund in the Small Business Administration's SBIC program, private investors are required to provide matching funds, resulting in $200 being invested from a $5 SBA commitment—a multiple of 40x. Loan repayment contributes to the long-term sustainability of these programs, enhancing U.S. competitiveness in an era of resource constraints.

Loans and loan guarantees are familiar, longstanding tools that are frequently used in other contexts due to their attractive characteristics. These commercial activities create real economic value and are independent of federal activity. Appendix B provides additional information on how those tools are deployed in other federal credit programs.

Credit Programs Enable Large Multiplier Effects for Investments in Priority Areas

This diagram depicts the multiplier effect of a credit program that requires matched private capital investment. For example, through the Small Business Administration's SBIC Program, private investors are required to provide a match in funds. In this illustrative example with a one-to-one public and private match requirement, a $5 initial outlay from the department or agency program results in $200 total capital available.



Appropriated funds to cover the risk of investments

Step 1. The relevant department or agency provides funds to cover the cost derived from the risk calculation for an investment program. Here, that risk calculation is illustrated as 5 percent.[1]

U.S. Treasury funds to cover remaining balance

Step 2. The United States Treasury provides the credit recipient the balance of funds, illustrated here as the remaining 95 percent not covered by the 5 percent risk calculation from the relevant department or agency program.

Private capital crowded in as part of investment terms

Step 3. For programs like the SBA SBIC program, private capital providers are required to bring additional investment funds, illustrated here as twice the amount of credit facilitated by the U.S. government.[2]

[1] The $5 of appropriated dollars budgets for losses, or *costs*, as defined by the Federal Credit Reform Act of 1990. The average risk calculation across federal commercial lending programs in fiscal year 2024 is estimated to be 2.3 percent. *See* Congressional Budget Office, Estimates of the Cost of Federal Credit Programs in 2024.

[2] For details about the terms of the SBA SBIC program, please see the Investment Policy Statement.

Investment Prioritization Approach

To most effectively use the financial tools introduced above, the Secretary of Defense directed OSC to identify and prioritize promising critical technology areas for investment. The following prioritization approach represents the method through which DoD focused OSC's active and proposed financial tools. As a direct result of this approach, the initial priority areas for investment are listed in the following section.

The foundation of the prioritization approach is the critical technologies identified in the 2023 National Defense Science and Technology Strategy. By attracting private investments into these critical technologies using the tools available to OSC, DoD seeks to accelerate the development and deployment of technology critical to current and future defense capabilities. Descriptions of these Critical Technology Areas are found in Appendix A. While those Critical Technology Areas are the starting point for OSC, investment may occur outside of those Critical Technology Areas so long as it involves supply chain and component-level technologies and processes that enable DoD capabilities but are not always supported through direct procurement.

OSC focuses on component-level technologies with broad commercial application that are also relevant to the national security of the United States and its allies and partners.

Specifically, the prioritization approach starts with an in-depth analysis of each of the 14 Critical Technology Areas. The analysis uses multiple lenses to assess relevant industries, including both the underlying technologies and commercial dynamics in a market, to ensure a comprehensive understanding of the industries in a Critical Technology Area. For example, the analysis of Quantum Science identified several nascent industries, including quantum computing, quantum security, and quantum sensing.

The approach then applies three sequential steps for prioritization in the relevant industries and is not rigidly defined by formulas. Appendix C describes the methodology for this three-step approach in greater detail.

The first step of this three-stage approach for component-level technologies (*e.g.*, advanced materials, biotechnology, microelectronics) prioritizes strategic capital needs based on the following criteria.

Stage 1: Initial prioritization

- ***Enabling technologies*** - Does the industry feature enabling technologies, which support multiple DoD priorities, requirements, and programs?
- ***Losing or maintaining market share*** - Is the United States failing to gain market share relative to global competition in this industry?
- ***Need for strategic capital*** - Is public support required to attract private capital to national security priorities?
- ***Security impact*** - Will an investment positively impact security by enhancing the development and/or scaling of critical component-level technologies and/or securing access to key supply chains for the United States and its allies and partners?

The second step of the component-level prioritization approach then focuses on identifying the financial tools best suited to address the strategic capital need. For earlier-stage technologies, DoD prioritizes OSC investment in industries with a promising innovation advantage, as measured by a strong base of intellectual property, that signals potential for growth. For later-stage technologies, the approach prioritizes OSC investments in industries with an overall manufacturing disadvantage relative to global competition but nevertheless have the potential to scale production within the United States.

Stage 2: Prioritization for specific financial tools to commercialize and scale critical component technologies

Commercializing Earlier-Stage Critical Component Technology

Prioritization Criteria:
Does the industry have a strong base of intellectual property for commercialization?

Scaling Production of Later-Stage Critical Component Technology

Prioritization Criteria:
Does the industry have a manufacturing disadvantage relative to competitors?

The third step of the three-stage approach asks whether OSC, or another program within DoD or another federal department or agency, is the most appropriate mechanism for investment. DoD works with other federal departments and agencies to identify areas of mutual interest and potential overlap in commercial investing activity and seek alignment or deconfliction where necessary. The Strategic Capital Advisory Council, co-chaired by the Under Secretary of Defense for Acquisition and Sustainment and the Under Secretary of Defense for Research and Engineering, promotes collaboration where OSC activities intersect with existing equities and authorities amongst their respective subordinate organizations. DoD also seeks areas for coordinated investments with interagency or DoD partners to enhance the overall effects of investments. Consequently, some technology areas prioritized through stages 1 and 2 may be given lower priority for OSC at this stage, as other departments or agencies will prioritize in their investment strategies. The objective is to efficiently and effectively use taxpayer funds across government organizations.

Stage 3: Accounting for complementary programs within DoD and other federal departments or agencies

- ***Verifying complementarity*** - Is investment by OSC complementary to other DoD or other federal agency efforts?
- ***Identifying coordination opportunities*** - If OSC investment is complementary, can further coordination enhance performance?

Through in-depth analysis, DoD identified key industries within the 14 Critical Technology Areas. In stage one of the prioritization process, DoD narrowed those industries to a subset based on the extent to which industries feature enabling technologies, the maturity of the industry, the need for strategic capital, and an industry's potential to contribute to security impact. In stage two, DoD analyzed strategic capital needs in relevant industries and determined which financial tools will best address those needs. In stage three, OSC assessed, in collaboration with other DoD organizations and interagency partners, that investment in the initial priority areas would be complementary to existing investment efforts. These areas are introduced in the following section.

Initial Priority Areas for the First OSC Program Activity: SBIC Critical Technologies Initiative

While all critical technologies for DoD are in the scope of the OSC investment activities, DoD prioritizes investments tailored to each program activity. DoD will adapt OSC investment priorities to address emerging opportunities. OSC will release investment priorities as each program activity becomes available.

Priority areas listed here are only for the SBIC Critical Technologies Initiative.
OSC will announce priority areas for additional program activities as they become available.

The first program activity for OSC is the Small Business Investment Company (SBIC) Critical Technologies Initiative announced publicly on September 29, 2023. The priority areas, as determined through the prioritization approach, are intended to be focused enough to increase investment in key industries and supply chains, but broad enough to enable investors to take a portfolio approach to critical technology investments. Based on the prioritization approach, DoD prioritizes the following technology areas (and related *Critical Technology Areas*) for this initial OSC program activity:

- **Nanomaterials and Metamaterials (*Advanced Materials*).** Materials with any dimension between 1 and 100 nm that can have different physical and chemical properties to their bulk-form counterparts.
- **Bioenergetics (*Biotechnology*).** Utilization of biological processes and principles related to energy conversion, storage, and transfer for high potency applications.
- **Synthetic Biology (*Biotechnology*).** Use of technology to design, modify, or create novel biological systems that do not exist in the natural world.
- **Open RAN (*FutureG and 5G*).** Open Radio Access Network (ORAN) is an ongoing shift in mobile network architectures that enables service providers the use of non-proprietary subcomponents from a variety of vendors.
- **Sensor Hardware (*Integrated Sensing and Cyber*).** Physical devices that capture and measure physical inputs such as light, temperature, humidity, motion, and more to be converted into data for interpretation by a human or machine.
- **Assembly, Testing, and Packaging (*Microelectronics*).** The process to assemble, package, and inspect fully manufactured microelectronic chips enabled by advanced tools, machines, and technology.
- **Materials (*Microelectronics*).** Critical components, raw materials, and rare earth elements utilized in microelectronic manufacturing.
- **Quantum Computing (*Quantum Science*).** Quantum computing harnesses the principles of quantum mechanics, utilizing qubits, which can be implemented using atoms, to enable exponential computational speed-up compared to classical computers.
- **Quantum Security (*Quantum Science*).** Quantum security refers to developing and implementing cryptographic methods and protocols that are resistant to attacks by quantum computers.
- **Quantum Sensing (*Quantum Science*).** Quantum sensing leverages the principles and properties of quantum mechanics to develop sensors capable of making exceptionally accurate and sensitive measurements.
- **Battery Storage (*Renewable Energy Generation and Storage*).** The process of storing chemical energy using chemical reactions to convert and store energy within batteries, such as lithium ion, lead acid, and other technologies.
- **Space Enabled Services and Equipment (*Space Technology*).** Services related to satellite and other spacecraft launch and operation, such as satellite communications, geospatial intelligence, global navigation satellite systems, in-space refueling and servicing, and rapid global delivery of cargo via space launch, as well as associated ground equipment such as terminals and receivers.

This list is not exclusive of the technologies that may be addressed in the SBIC Critical Technologies Initiative. However, priority will be given to applicants for the program that demonstrate alignment with the listed priority areas. The SBA's website provides the most current information about the SBIC Critical Technologies Initiative, including terms, instructions for applications, and the Investment Policy Statement.

Conclusion

The Investment Strategy for the Office of Strategic Capital identifies why, how, and where OSC program activities are unique but complementary to existing DoD and U.S. government programs. This document provides an overview of OSC, the guiding critical technology framework for the Investment Strategy, the investment prioritization approach, and initial priority areas for the first OSC program activity.

Those interested in working with OSC may include providers of bank debt, venture debt, venture capital, growth equity, and other investors. Priority areas, investment terms and conditions, and instruction for how to participate will be provided separately for each program activity as it becomes available. If you have comments for the Investment Strategy for the Office of Strategic Capital, please contact research@osc.mil.

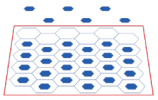
For more information about participating in OSC's first program activity, please explore details on the SBIC Critical Technologies Initiative on the OSC website by following the QR code below:

Appendix A: Critical Technology Areas

DoD's National Defense Science and Technology Strategy specifies 14 Critical Technology Areas vital to national security. By attracting private capital investments into these Critical Technology Areas, OSC seeks to accelerate the development and deployment of technology critical to current and future warfighting capabilities.

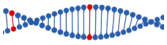
Advanced Computing and Software

Advanced computing and software technologies include supercomputing, cloud computing, data storage, computing architectures, and data processing. Software is ubiquitous throughout the Department, but the speed at which software develops outpaces the Department's ability to stay up to date. The Department must rapidly modernize its legacy software systems with resilient, affordable, and assured new software that has been designed, developed, and tested using processes that establish confidence in its performance. The Department must migrate to a Development-Security-Operations (DevSecOps) approach in its software development and evolve to a model of continuous development, continuous test, and continuous delivery. The Department must leverage modular open system architecture approaches to isolate hardware from software and enable rapid upgrades to secure processors.



Advanced Materials

Advanced materials explore innovative new materials and novel manufacturing techniques that can dramatically improve many of the Department's capabilities. Materials that have higher strength, lighter weight, higher efficiency, and can handle more extreme temperatures will have the potential to better protect our service members and enhance their ability to accomplish their missions.

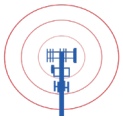


Biotechnology

Biotechnology is an emerging engineering discipline that uses living systems to produce a wide range of technologies and capabilities. From fighting global pandemics and avoiding surprises to reducing logistics and sustainment costs and increasing energy efficiency, biotechnology can help change the way the Department conducts missions, performs in contested logistics environments, and adapts to major global changes.

Directed Energy

Directed Energy Weapons utilize lasers, high power microwaves, and high energy particle beams to produce precision disruption, damage, or destruction of military targets at range. Directed energy systems will allow the Department to counter a wide variety of current and emerging threats with rapid responses and engagement at the speed of light. High-power lasers and high-power microwave technologies both offer new ways to counter diverse sets of threats.

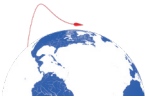


Future Generation Wireless Technology (FutureG)

FutureG is a suite of emerging wireless network technologies enabled by DoD and commercial industry cooperation to enable military operations and ensure a free and open internet. As Fifth Generation (5G) wireless technology is adopted and provides building blocks for capability, the DoD will also look to FutureG for leap-ahead technologies to lead in creating future standards. The Department will invest in FutureG technology development to lay the groundwork for continued United States leadership in information technology, which is vital for maintaining our economic and national security.

Human-Machine Interfaces

Human-Machine Interface refers to technologies related to human-machine teaming and augmented and virtual reality. Rapid advancements in this technology will have a multitude of benefits for our service members. Highly immersive realistic training environments provide real-time feedback to enhance warfighter performance. Intuitive, interactive human-machine interfaces enable rapid mission planning and mission command by providing a common operational picture to geographically distributed operations.



Hypersonics

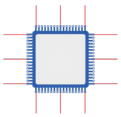
Hypersonic systems fly within the atmosphere for significant portions of their flight at or above 5 times the speed of sound, or approximately 3700 miles per hour. Hypersonics dramatically shorten the timeline to strike a target and increase unpredictability. While strategic competitors are pursuing and rapidly fielding advanced hypersonic missiles, the DoD will develop leap-ahead and cost-effective technologies for our air, land, and sea operational forces.

Integrated Network Systems-of-Systems

Integrated Network Systems-of-Systems technology encompasses the capability to communicate, provide real-time dissemination of information across the Department, and effective command and control in a contested electromagnetic environment. Integrated Network Systems-of-Systems capability must enable engagements by any sensor and shooter, with the ability to integrate disparate systems. An interoperable network that leverages emerging capabilities across the electromagnetic spectrum such as 5G, software defined networking and radios, and modern information exchange techniques will allow the Department to better integrate many diverse mission systems and provide fully networked command, control, and communication that is capable, resilient, and secure.

Integrated Sensing and Cyber

To provide advantage for the joint force in highly contested environments, the Department must develop wideband sensors to operate at the intersection of cyber space, electronic warfare, radar, and communications. Sensors must be able to counter advanced threats and can no longer be stove-piped and single function.



Microelectronics

Microelectronics are circuits and components that serve as the "brain" to human-made electronic functional systems. Virtually every military and commercial system relies on microelectronics. Diminishing microelectronics manufacturing in the United States and supply chain concerns have highlighted national economic and security risks. Working closely with industry, academia, and across the Government, the Department is addressing the need for secure microelectronics sources and will leverage state-of-the-art commercial development and production for defense microelectronic solutions.

Quantum Science

Quantum Science is the study of physical properties at small, even atomic, scales. Defense applications include atomic clocks, quantum sensors, quantum computing, and quantum networks. Quantum science promises to enable leap-ahead capabilities. Quantum computing can provide unprecedented computational speeds and help solve the Department's hardest analytical problems. Quantum sensors promise the ability to provide unprecedented accuracy in position, navigation, and timing. From more accurate information to faster decision making, to significantly stronger encryption capabilities, quantum science has the promise to deliver cutting-edge technology.

Renewable Energy Generation and Storage

Renewable energy generation and storage includes solar, wind, bio-based and geothermal technologies, advanced energy storage, electronic engines, and power grid integration. Renewable energy generation and storage promises to decrease warfighter vulnerability and deliver new operational capabilities for the Department. From more efficient batteries to diversifying energy sources and reduced fuel transportation risks, renewable energy generation and storage will add resilience and flexibility in a contested logistics environment.

Space Technology

Space technologies include space flight, space communication and other technologies needed to maintain space operations. With rising threats and increasing dependence on space-based systems, the Department's space strategy must shift away from exquisite satellites to a more robust and proliferated architecture. Novel space technologies are necessary to enable resilient cross-domain operations. The space strategy must incorporate technologies that enhance the Department's adaptive and reconfigurable capabilities in space situational awareness, space control, communication path diversity, on-orbit processing, and autonomy.

Trusted AI and Autonomy

Artificial Intelligence (Al) is the software engineering discipline of expanding capabilities of software applications to perform tasks that currently require human intelligence. Machine learning is an engineering subfield of AI that trains software models using example data, simulations, or real-world experiences rather than by direct programming or coding. Autonomy is the engineering discipline that expands robots' abilities to perform tasks while limiting the need for human interaction. AI holds tremendous promise to improve the ability and function of nearly all systems and operations. Trusted AI with trusted autonomous systems are imperative to dominate future conflicts. As AI, machine learning, and autonomous operations continue to mature, the DoD will focus on evidence-based AI-assurance and enabling operational effectiveness.

Appendix B: Federal Credit Programs

Federal credit programs, such as the first initial program activity for OSC in partnership with the Small Business Administration, are common and cost-effective tools for promoting investment consistent with the public interest. The federal government currently executes 131 federal credit programs, with estimated federal credit assistance of $1.6 trillion in fiscal year 2024.[1] Of that amount, specific assistance to businesses in the form of direct loans and loan guarantees is projected to total $231 billion in fiscal year 2024. These commercial activities create real economic value and are an efficient tool for magnifying taxpayer dollars.

The Congressional Budget Office estimates that the lifetime budgetary cost to extend $231 billion for FY 2024 federal commercial loan programs is $5.3 billion—a total of 2.3% of the credit extended.[1]

Example of federal credit programs that extend credit to commercial entities in fiscal year 2024

Department or agency	First federal credit program established	Number of programs	Estimated President's Budget FY2024 loan obligations	Example programs
Small Business Administration	1954	7	$105.21 billion	SBIC, 7(m) Direct Business Microloans, 7(a) General Business Loan Guarantees
Department of Energy	2005	6	$46.36 billion	Advanced Technology Vehicles Manufacturing, Title 17 Innovative Technology Loan Guarantee Program
Department of Commerce	1936	5	$16.58 billion	CHIPS Direct Loans, CHIPS Guaranteed Loans
Export-Import Bank	1934	5	$11.64 billion	Export Financing, Working Capital Fund
Development Finance Corporation	2019	8	$8.70 billion	Direct Loans Investment Funds, Loan Guarantees

Source: *Estimates of the Cost of Federal Credit Programs in 2024*

[1] *See* Congressional Budget Office, Estimates of the Cost of Federal Credit Programs in 2024. The appropriated dollars budget for losses, or costs, as defined by the Federal Credit Reform Act of 1990.

Appendix C: Methodology

This appendix describes the initial methodology to identify and prioritize areas for OSC program activities. For comments on the methodology or analysis, please reach out to research@osc.mil.

Levels of analysis

The Investment Strategy analysis focuses on market assessments of DoD's 14 Critical Technology Areas as outlined in the 2023 DoD National Defense Science and Technology Strategy. The analysis relies on a multi-level approach to assess relevant industries, including both the underlying technologies and commercial dynamics in a market, to ensure a comprehensive understanding of the industries in a Critical Technology Area. This choice is justified by several factors.

1. **Distinguishing between technology areas and industries.** While a technology area emphasizes the technology itself, an industry encompasses various stakeholders such as investors, companies, customers, and suppliers, among others. By examining the sub-area, the analysis provides better insights into the specific industry dynamics and identifies nuances that may not be apparent at a higher level of analysis.
2. **Maintaining balance between high-level and granular analysis.** A high-level analysis may overlook critical details and fail to capture the specific characteristics of different industries within a technology area. Conversely, an excessively granular analysis may make it challenging to identify broader trends and patterns. A multi-level approach enables an optimal balance that considers the industry's overall landscape while capturing the specific nuances within subareas.
3. **Accounting for differences in industry maturity.** Certain subareas may be relatively nascent, resulting in limited availability of standardized data. In such cases, proxy measures are utilized to supplement the analysis. Proxy measures provide a reasonable approximation of the desired data when direct measurements are not readily available. This approach allows for valuable insights, even in the absence of comprehensive standardized data.

Overall, the multi-level analytical approach aims to provide a holistic understanding of the market while considering different industry dynamics.

Overview of measures

The analysis focuses on measures of U.S. market competitiveness, investor interest and capital flows, and potential defense application.

Industry descriptors

Level of Enablement. The level of enablement indicates the degree to which advances in one technology area may unlock development and growth in other areas. As all of DoD's 14 Critical Technology Areas have defense applications, the analysis further assesses the degree to which technologies are highly enabling, meaning that advances in one technology area may unlock development and growth in several DoD priority areas. Focusing on highly-enabling technologies increases the likelihood of investments having an outsized impact on current and future Department programs.

- ***Metric description.*** The ability of a technology area to significantly enable other Critical Technology Areas to create new functionalities, reduce costs, or increase efficiency in various defense applications.
- ***Level of enablement rating.*** Industries are scored 0 to 13 on the number of other Critical Technology Areas that they enable. The greater the number, the greater indicator that a technology area enables other areas.
- ***Methodology limitations.*** To maintain simplicity, the analysis does not account for all possible applications of technologies within each of the assessed industries.

Industry Maturity. Industry maturity indicates the stage of an industry for the purpose of identifying which financial tools may be especially useful. For this measure, particular values are neither positive nor negative.

- ***Metric description.*** The industry maturity assesses the current stage of an industry, ranging from early to mature. Early-stage industries, focused on R&D

and creating a business model, will have different financing needs than mature industries.

- ***Scoring methodology*:**
  - » Industry timelines: Assessment of age distributions of companies within the industry population.
  - » Market size/growth data: Current global market size and growth to gauge the industry's relative position in an industry life cycle.
  - » Favored investment product maturity: Analysis of most common stages of investment.
- ***Methodology limitations*:**
  - » Industry maturity is fluid and varies based on industry and product; raw data may not always explain the full story.
  - » This risk is mitigated by layering perspectives from investor expert interviews into ratings.

Security Impact. Security impact occurs where investment enhances the development and scaling of critical technologies and/or secures access to key supply chains for the United States and its international allies and partners. For all investments, the Office of Strategic Capital prioritizes technological development and supply chain investments that have the potential to make significant impacts to the 14 Critical Technologies identified by the Department of Defense as crucial to national security.

United States comparative measures

Comparative measures assess how the United States is competing in technology markets, with a focus on advantages in manufacturing, market trends, and innovation. These measures show directionality to indicate the shifting market dynamics among the United States and global competitors.

Advantage in Manufacturing. The advantage in manufacturing indicates the degree to which the United States has a manufacturing advantage relative to global competition. This measure of competitiveness reflects the strength and security of supply chains as well as the ability to scale manufacturing domestically.

- ***Metric description*.** The current state of manufacturing capabilities in the United States in relation to competitors. For industries that lack physical products, this metric focuses on domestic creation of the software or service.
- ***Scoring methodology*.** The advantage in manufacturing assesses current state manufacturing capabilities in the United States relative to global competition. For industries that lack physical products, this metric focused on the creation of the software or service. Example metrics include:
  - » U.S. trade balance analysis: Utilize U.S. import and export data at the industry level to assess the U.S. trade balance. Strong exports in comparison to imports is often driven by countries with a robust manufacturing base and advantage.
  - » Market size: U.S. market size, as calculated by revenue or supply from publicly available market research firms, relative to global competition.
- ***Methodology limitations*:**
  - » For industries that are pre-commercial or software focused, proxies are necessary to fill in the metric and can provide an incomplete view of the industry.
  - » Data sources are often based on a basket of goods and services, not the entire sector.
  - » The metric does not adequately account for overall production, which is challenging to measure in a comparable way across all technology subareas.

Advantage in Market Trends. The advantage in market trends indicates the degree to which the United States has an advantage in the direction of growth in a particular market relative to global competition. This measure of competitiveness reflects the trends for a particular market to capture overall growth or decline in domestic market strength.

- ***Metric description*.** The direction that U.S. global market share is trending. The trend in market share indicates the pace at which competitive dynamics have moved markets.
- ***Scoring methodology*.** The advantage in market trend assesses the direction market share is trending between the United States and global competition. The trend in market share indicates the pace at which competitive dynamics have moved markets. Example metrics include:

- » Five-year export strength: Utilize U.S. export data to assess the changes in export market share overtime in comparison with global competition.
- » Five-year market share: Utilize U.S. market share data to assess changes in market power in comparison with global competition.
- » Key technological advancements: Key technological advancements show which industries are trending towards producing viable products.

- ***Methodology limitations*:**
  - » Export data is often based on a basket of goods and services rather than a comprehensive view of the entire industry.
  - » Historical trends may not capture future advancements and trends, particularly for markets focused on components and processes that require significant scientific advances.

Advantage in Innovation. The advantage in innovation indicates the degree to which the United States has an advantage in patent portfolios relative to global competition. This measure of competitiveness reflects the strength of documented intellectual property. Importantly, this measure is one aspect of innovation with the advantage of standardization across technology areas.

- ***Metric description*.** Index-based assessment of relative innovative strength of patent portfolios by assessing frequently cited, legally enforceable, technically diverse, and globally granted patent portfolios. Focuses on where the United States and global competitors compare in the synthetic index.
- ***Scoring methodology*.** Advantage in innovation proxies the relative innovative capabilities of the United States and global competitors with active patent data.
  - » Total Innovation: Utilizes all active patents across Critical Technology Areas to assess the total relative innovation leadership.
  - » Recent Innovation: Utilizes active patents filed in 2016 or later within the Critical Technology Areas to assess recent shifts in innovation leadership.
- ***Methodology limitations*:**
  - » Ownership estimation, patent translation, and differing international patenting standards are significant limiting factors.
  - » 6-18 month delay in publication of patent applications, differing processing speeds and patent types between geographies, and bleeding-edge innovation may yet to be patented.

Investor Interest and Capital Flows

Measures for investor interest and capital flows assess the attention and investment from investors for a given technology area. These measures indicate overall interest from investors and how much capital is currently invested in companies.

Total Capital Attracted. Total capital attracted indicates the overall interest from capital providers in a particular technology area. The purpose of this measure is to assess the historical attractiveness of the technology area for investment to understand which financial tools may be applicable where strategic capital investments may be needed most. Industries that attract higher capital are often defined by high investor interest and large investments. Lower capital attracted indicates greater opportunities for OSC financial tools to catalyze investments in meaningful ways.

- ***Metric description*:** Total capital attracted indicates overall funding interest from private and public capital providers. Higher total capital attracted often means an industry experiences more total funding due to a large number of players and more private capital interest.
- ***Scoring methodology*:** Total capital attracted is measured by the sum of all deal amounts within the industry since 2020.
- ***Methodology limitations*:** Investment data may be affected by historically high deal activity in 2021-2022. The private capital totals do not include corporate research and development spending or direct government spending.

Capital Intensity. Capital intensity indicates the average amount of capital raised per company in the industry. Low capital intensity is often a result of lower capital needs per funding round or less investor interest.

- ***Metric description*:** Capital intensity refers to the total funding per company in an industry. Higher capital intensity often means an industry is more mature, has higher capital requirements, and/or has

the attention of investors.

- ***Scoring methodology*:** Capital intensity will be calculated as the sum of the total funding amount since 2012, divided by the number of companies included. This metric provides perspective on how much deal flow is occurring for each company in an industry.
- ***Methodology limitations*:** Data captures capital across an approximately 10-year period; current capital intensity may differ from decade-wide average.

Deal Activity. Deal activity indicates the frequency that companies in a given industry raise capital from any source. Low deal activity is often a result of a low number of investors involved in the industry.

- ***Metric description*:** Rate of deals in an industry. Greater deal activity typically occurs in industries that are growing, innovating, or attracting investors.
- ***Scoring methodology*:** Average of deals per company, calculated as total number of deals since 2012 divided by number of companies.
- ***Methodology limitations*:**
  - » Data captures deals across an approximately 10-year period; current deal activity may differ from decade-wide average.
  - » Withdrawals against short-term financing facilities, such as revolving debt facilities, may be represented as a single deal even though they may enable multiple financing events.

Exit Dynamics

The exit dynamics assess the capital and time required to take a company from founding through late/early funding to an exit event (e.g., acquired by a mature company, a sale of substantially all the assets of the company, a leveraged buyout, an initial public offering, or other liquidation event).

Capital Needed to Exit. Capital needed to exit indicates how much capital or funding is needed for a company to achieve an exit event that signifies the viability of the company. The purpose of this measure is to assess the typical funding requirement for the industry. Low capital needed to exit is often a result of lower capital needs to develop a market-ready product.

- ***Metric description*:** Level of capital or funding needed on average to successfully exit. Industries with higher levels of capital needed are often characterized by greater funding requirements due to factors such R&D need or immature commercial markets.
- ***Scoring methodology*:** Median capital raised from company founding to exit across all relevant companies since 2012.
- ***Methodology limitations*:**
  - » Data captures deals across an approximately 10-year period; current capital needed may differ from decade-wide average.
  - » Exit dynamics may be nuanced depending on industry (e.g., an initial public offering, an acquisition by another company, a leveraged buyout, or another exit event).
  - » Some high-performing companies may never achieve exits as investors seek to maintain ownership indefinitely.

Time Needed to Exit. Time needed to exit indicates the speed at which companies in a given industry tend to achieve a successful exit event. The purpose of this measure is to assess the typical pace of an industry for development and commercialization. Faster time to exit is often a result of rapid product development and commercialization timelines.

- ***Metric description*:** Amount of time needed to successfully exit (e.g., an initial public offering, an acquisition by another company, a leveraged buyout, or another exit event). Industries that require more time to exit are often characterized by high regulatory hurdles, long product development timelines, and slow customer acquisition speed.
- ***Scoring methodology*:** Median number of years passed from founding to exit across all relevant companies since 2012.
- ***Methodology limitations*:**
  - » Data captures deals across an approximately 10-year period, and more recent activity may not be emphasized with a decade-wide average.
  - » Exit dynamics may be nuanced depending on industry.
  - » Some high-performing companies may never achieve exits as investors seek to maintain ownership indefinitely.