



Deep Tech Investing:

Expert Insights for Investors, Fund Managers
and Founders



Introduction

Deep tech (DT) investing in companies with potentially transformative technology solutions is gaining increasing attention by investors based on its ability to disrupt existing industries and drive breakthroughs needed to solve major societal problems. The market opportunity is significant — according to Boston Consulting Group, DT investments are expected to increase from over \$60 billion in 2020 to nearly \$140 billion by 2025. Unlike venture investing, DT tends to have long investment cycles that match long commercialization journeys, customer needs are not always understood at the beginning, and the backgrounds of founder teams are often science- and tech-heavy.

First Republic Bank and Infrastructure Ventures **hosted an expert panel** to explore the investment and portfolio management strategy of limited partners, venture firms and startups focusing in DT. The key insights from the panel discussion and results from a brief audience poll are outlined in this report.

Expert Panel

Manjari Chandran-Ramesh, Ph.D., Partner at Amadeus Capital Partners

Chris Kim, Co-Founder and Managing Partner at UNION Labs

Harry Destecroix, Managing Partner at Science Creates Ventures

Denise Ruffner, Chief Business Officer at Atom Computing

Ian Foley (panel moderator), Principal at Infrastructure Ventures

Deep Tech's Key Differentiators

Investing in Platform Technologies With Longer Investment Runways

"When you decide to get involved as an early-stage investor in deep tech (DT), you are typically investing in a platform technology," says Manjari Chandran-Ramesh, a Partner at Amadeus Capital Partners. This is unlike a more product-specific focus in other areas of venture investing, which starts with a customer problem. "It's rare," she observes, "for a DT to sit in one market sector as its game-changing nature makes it applicable across sectors." This is good news for investors because it means that a DT business is not easy to replicate, as it involves significant technical differentiation, which means these companies are well insulated from competition. However, this does translate into larger capital requirements and longer time for return on investment. She noted that Amadeus-backed Five AI, developers of a platform for autonomous vehicle development and safety assurance, was recently acquired by Bosch, but the first investment was made by Amadeus was in 2016.

In the case of emerging quantum computing, Denise Ruffner, Chief Business Officer at Atom Computing, points out that "these are long journey startups that are based on a founder's vision of bringing a specific technology to the market." She emphasizes that you need to build platform companies to enable the technology to evolve and mature. Ruffner is always careful in setting expectations and making clear that, with respect to quantum computing, "we are in the industry's infancy with 5, 10, 15 years to develop hardware and software." Chandran-Ramesh echoes Ruffner's view that DT is exciting: "We like doing the really, really, really hard stuff. That's what makes it fun."

Less Vulnerability to Competition but Higher Operational Challenges to Scale

An underappreciated difference with traditional venture, according to Chris Kim, Managing Partner at UNION Labs, is DT's very high operational requirements to scale your product when you're going to market. "With software, each incremental unit that you sell is basically free, but with most deep tech applications, there is some form of scaling factor that you run into going from zero to one, one to a thousand, thousand to 20 a million," he says. This involves huge operational challenges. DT is generally hard, thus "it has a wonderful built-in moat to competition compared to the low entry barrier to the typical SaaS product," Kim adds. He looks for teams that understand that there is a tradeoff in the level of scaling effort versus competition and are focused on trying to figure out how can you incrementally commercialize during that 5- to 15-year period.

"[DT] usually requires access to specialized, high-valued equipment and lab space, or the ability to outsource manufacturing partners to develop the technology."

Harry Destecroix
Science Creates Ventures

Specialized R&D Requirements

The nature and mechanics of R&D is what Harry Destecroix, a Managing Partner at Science Creates Ventures, identifies as a key differentiator with general early-stage investing. “[DT] usually requires access to specialized, high-valued equipment and lab space, or the ability to outsource manufacturing partners to develop the technology,” he says. “To build out your technology platform, it’s really important to have translational research facilities close to where the academic blue-sky research is being done. In most technology hubs you’ll see well-equipped incubator space and have access to hard facilities to do wet or dry science, whether it’s semiconductors or material science.” At the early stage, he emphasizes, it is critical to have access to resources to push the technology forward so that founders can understand where the edges of their technology are to better guide the product discovery and development stage.

DT Snapshot

Among the findings we discuss in the report:

- Key industries include artificial intelligence and machine learning, robotics, blockchain, advanced material science, photonics and electronics, biotech and quantum technologies.
- Recent trends include quantum companies exiting through SPACs (IonQ, Rigetti, D-Wave).
- 97% of DT ventures contribute to at least one of the UN’s Sustainable Development Goals.
- 96% of DT ventures use at least two technologies, and 66% use more than one advanced technology.
- DT generates defensive IP: 70% of DT ventures own patents in their technologies.
- About 83% of DT ventures are building a physical product.
- Some 1,500 universities and research labs are involved in DT, and DT ventures received some 1,500 grants from governments in 2018 alone.
- Unicorns: Of the more than 1,060 private companies with billion-dollar valuations counted by CBInsights in March 2022, nearly 8% (or roughly 85) were in AI.

Sources: First Republic Bank research, Boston Consulting Group: The Deep Tech Investment Paradox: A Call to Redesign the Investor Model (2021), CBInsights

Positioning Your Fund

Identify Your Differentiation and Understand the Drivers to Commercialization

“We thought our background as operators — our success in going through the process of raising capital, building a company and exiting, as well as having lots of relationships — would make corporations a natural fit for us,” says Kim. “We found it quiet challenging because being a good operator doesn’t necessarily mean you are a good capital allocator.” This revelation made Kim’s team think harder about defining its story and understanding what makes it different relative to other fund opportunities. “To do this, we realized that we needed to paint a very clear picture of the future and our technology’s path to commercialization,” he explains. As a first-time manager without a track record, the team had to talk more about its technology’s alignment with government policy and market trends and position the fund to appeal to investors willing and able to take on the greater risk to capture the potentially higher returns associated with the opportunity.

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Chris Kim
UNION Labs

Pitch Decks: Focus on Technical Differentiation and the Path to Commercialization

“Most pitch decks, whether it’s DT or not, focus on team, market size and differentiation,” Chandran-Ramesh says. “What makes DT different is the added focus on technical differentiation, particularly what the product and technology strategy is that will enable the company to be focused on customer pain points and keeping its technical differentiation for as long as possible.” Destecroix recommends not getting distracted when founders focus on a technology’s massive market opportunity, but instead “focus on the technology — how does it work? What is its lineage? What are the edges of the technology? Can they be protected from replication by rivals?” If it’s a great technology, the other aspects, such as the team, can be fixed. “We are very much technically focused during the early stage, and the more polished the deck is, the more skeptical I am,” he says.

According to Kim, what will get him to a second meeting with a founder is that “after they have helped me understand what is unique and different about their technology, they are able to demonstrate that they’ve really thought about how to bring the technology to market.” Articulating a path to commercialization within a reasonable time frame is the necessary hook to get his attention. In Kim’s experience, many academics are strong on the technical side but are naive about how to bring the technology to market. A further complication Chandran-Ramesh sees are teams led by a technically brilliant co-founder who really understands the product but is weaker on the commercial aspect

alongside a fellow founder who brings commercial skills and experience but has a very weak grasp of the technology itself. Thus, both individuals come to the table without a complete picture of how to grow the business. When you are a founder, she emphasizes, “understanding all the aspects of the business is important even if you are not responsible for delivering certain areas.”

The Role of Pivoting on Your Platform to Alternative Technology Opportunities

“A lot of my tech companies have pivoted — pivoting is not necessarily a bad thing,” says Chandran-Ramesh. “Often, they didn’t realize commercialization was going to take so long as another market opportunity comes knocking on their door.” In her opinion, pivoting is a function of DT’s applicability to so many different markets. “In other areas of venture, because you are starting from a customer problem and trying to create a solution, it becomes apparent more quickly if something is not working,” she notes. “In DT, your board and your advisors become especially important in helping to guide you on when to pivot and target another market.” Destecroix has direct experience pivoting: “We started focusing on a glucose sensor and ended up going to smart insulin.” Founders pivot when the product test doesn’t work — when there is no product market fit. In DT, he says, “you are building a platform where once you find its edges you must work out what’s the first product, the second, third, etc.”

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**Manjari
Chandran-Ramesh, Ph.D.**
Amadeus Capital Partners

Target the Right Investors and Evolve Your Pitch

“It’s important to know who you are — your strengths and weakness,” Destecroix says. He is also focused on making the transition to an investor from an operator and an entrepreneur within biotech sector. “As an operator and first-time manager, I didn’t even bother going to institutions to raise capital,” he says, as he didn’t fit their specifications. Instead, Kim was successful in turning to former investors that earned a good return from companies that he had been involved with. “Our pitch evolved dramatically as we met with increasingly sophisticated investors who asked fantastic questions that stimulated our thinking and helped us evolve our strategy,” he notes.

Collaborate With Experts

The Right Board Member Mix: Diverse, Collaborative and Technical

“I think the beauty of venture investing is that there is no one fixed investor mix,” says Chandran-Ramesh. In her view, founders good at attracting the right kind of investors can get all the necessary skill sets around the board table. “Diversity is important both in the venture teams as well as the board. If you look at Amadeus Capital Partners, we have diversity not only in terms of nationality and gender, but we also have a lot of diversity across our educational backgrounds as well as work experience,” Chandran-Ramesh says. To achieve a real team effort, it helps to have people with different strengths and backgrounds. “Some colleagues are willing to go deep into the technology and read through the research papers,” she says, “while others come with an accountancy background and are good at the modeling side of things.” In turn, a more diversified board and team helps in creating a broader and more effective network of experts.

How Important Is the Advisory Board?

Kim generally doesn't pay much attention to a GP's advisory board in the evaluation process unless it brings some unique understanding of the market that is critical to commercialization. He expects the team to have a solid understanding of the technology and the science as well as some track record of having figured out how to pull together people, whether it's advisors or experts from the academic community who can help solve problems. The biggest challenge Kim has seen at the pre-seed and seed stage is in selling and commercialization — is there a logical path? If not, that's where he may look to the advisory board for support.

Short- and Long-Term Sector Impact: Healthcare, Energy and Transportation

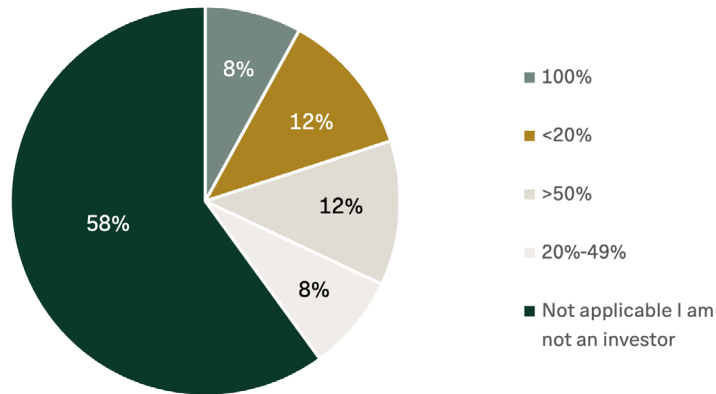
“In the short term, healthcare stands out as the sector likely to see the most impact,” says Destecroix. “You see it happening already in the cancer market with cell therapies.” In the longer term, Destecroix believes energy and transportation will ramp up. “There will be huge transformations in automation, particularly in robotics as well as electrified transport, which will address supply chain and logistic challenges,” says Kim. He thinks continued advances in computer and AI will find traction within specific vertical industries, such as trucking. Chandran-Ramesh believes that AI and the analysis of data will gain traction in the near term in sectors where it has been less widely used, such as food and beverage. In the long term, she sees general intelligence reaching commercial scale, with quantum technology not far behind. “Naturally, I am bullish on quant computing,” Ruffner says, “as I think it has the propensity to tackle various problems across a wide variety of industries.”

Appendix: Audience Polling Results

To complement the expert panel and direct questions it received from the audience, First Republic Bank elicited the audience's feedback about four DT-related topics. Below are the results.

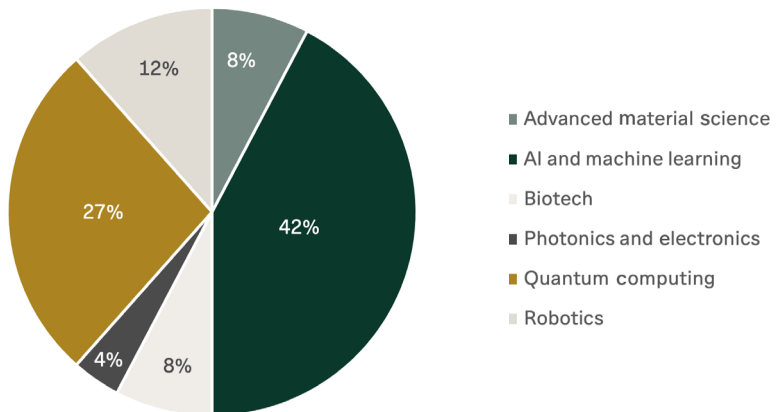
For 50% of the investors attending, DT makes up over 50% of their investment portfolio.

Figure 1:
How much of your investment portfolio is dedicated to deep tech?



Our audience expects AI and machine learning to be the DT with the biggest market impact in the next five years.

Figure 2:
What do you think are the deep technologies with the biggest market impact in the next five years?



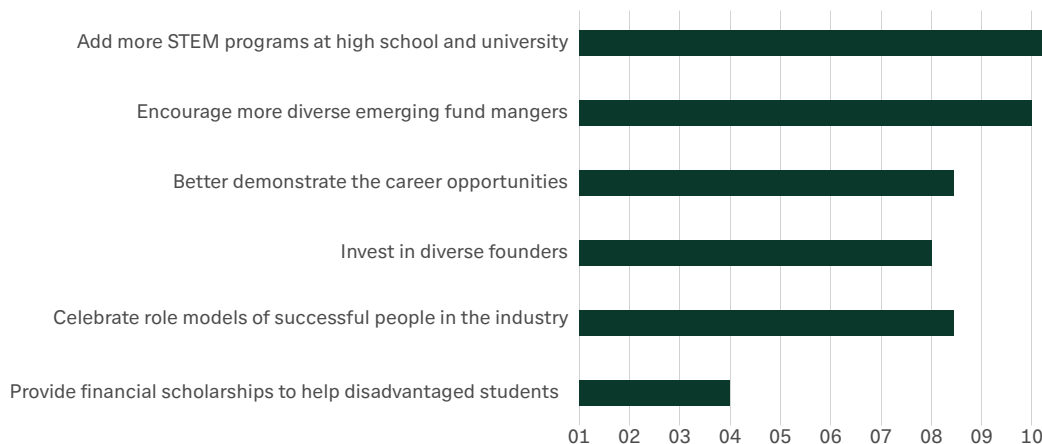
Capital, talent and productizing the technology were voted the top inhibitors to scaling a DT company.

Figure 3: Based on your answer above, which is the biggest inhibitor to getting a company focused on DT to scale? (Rank your answer.)

Ranking (based on the most frequent response per rank)	Top Concern
1.	Capital
2.	Talent
3.	Productizing the Technology
4.	Getting to Product Market Fit
5.	Revenue and Operational Scaling
6.	Time Horizon
7.	Government Regulation
8.	Finding Customers

Adding more STEM programs at high schools and universities and encouraging more diverse emerging fund managers are the two most popular suggestions for increasing diversity in the DT workforce.

Figure 4: How can we increase diversity in the workforce for the next generation of deep technology companies? (Select all that apply.)





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