# *Why You Should Tap Innovation at Deep-Tech Startups*

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**Businesses across all sectors, not just research-intensive industries, can benefit from innovations at science-heavy startups.**

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In today's business environment, firms must navigate labor shortages, market shifts, geopolitical tensions that strain supply chains and manufacturing, and mandates to adopt sustainable practices. Meeting these demands will require innovation rooted in breakthrough science and engineering. Even companies in less R&D-intensive sectors will need to look to science-based innovators — so-called deep-tech startups — as they seek solutions to their key challenges.

Deep tech describes a category of solutions rooted in atoms rather than bits — such as new materials, synthetic biology, fusion energy, and quantum computing— and grounded in cutting-edge research. Deep-tech ventures are startups dedicated to taking ideas from the lab bench to scaled global impact. And although these companies have great promise, adopting their breakthrough developments requires patience, a tolerance for risk, and capital.

Deep tech can benefit businesses across a range of sectors, including industries such as financial services, infrastructure, and retail, where R&D spending has traditionally been low, roughly 4% or less of sales revenue. Quantum computing, for example, presents significant opportunities for the financial services sector, particularly in terms of data analysis and

security enhancement[1]. The emergence of new eco-friendly cement and steel holds promise for transforming the sustainable footprint within the historically carbon-intensive construction industry[2]. And the introduction of innovative materials in the fashion sector offers substantial potential to enhance customer experiences while reducing waste[3].

While research-driven, R&D-intensive companies like Novo Nordisk and IBM have engaged with deep tech for years, other sectors have held back. Our engagement with executives from low R&D intensity sectors suggests that deep-tech ventures come with risk profiles and growth trajectories that are very different from these leaders' usual venture activities. Corporations in finance, retail, government services, and health care have plenty of experience with startup ventures, but most involve digital innovations. Others, such as those in construction and infrastructure, have had, until recently, only limited engagement with external startups.

If these organizations wish to harness deep tech, they must explore new strategies and practices. Our work with companies in sectors as diverse as fashion, transportation, and banking has yielded insights that can help guide managers in low-R&D organizations into the uncharted territory of deep tech.

**Challenges of Deep-Tech Ventures**

Through our interactions with deep-tech ventures in the United States and across Europe, we've identified three inherent features of such startups that pose challenges for companies that want to leverage deep tech but have low R&D budgets and are unaccustomed to working

[1]Bova, F., Goldfarb, A., & Melko, R. (2023). The business case for quantum computing. *MIT Sloan Management Review*, *64*(3), 31-37.

[2]https://www.pwc.com/gx/en/issues/esg/the-energy-transition/sustainable-energy-infrastructure/blueprint-for-sourcing-green-building-materials.html

[3]https://www.mckinsey.com/industries/retail/our-insights/state-of-fashion#/

with emerging technologies. For each of those features, we share key practices that can help managers address the challenges and apply solutions.

**1. Complex technology and commercialization risks.**

Deep-tech ventures face significant risks that their inventions might not perform as anticipated, especially in terms of the reliability expected of a commercial product. Even if the technology does work as expected, the venture's leadership team must assess potential market demand, establish product-market fit, and accept the uncertainty of actual market results. In this context, it's hard to apply traditional build-measure-learn approaches, such as lean startup, which aim to minimize risk by gathering customer feedback on minimum viable products and then refining them.

Unlike consumer products or digital offerings, deep tech is often too complex and costly to quickly and easily create prototypes. Deep-tech ventures face formidable challenges, such as the costs and risks of production at scale — with effective supply chains and unit economics — as well as regulatory uncertainty and the need to work along technical pathways in close engagement with potential customers. To succeed, ventures and their corporate partners must have clear road maps for de-risking across different technology readiness levels. Low-R&D companies often lack the in-house expertise to execute such strategic planning involving road maps to technical readiness.

**Key practice:** To tackle this challenge, low-R&D companies must develop new types of in-house expertise by seeking personnel with experience in the complexities of partnering with scientific ventures and the ability to translate road maps into language that is comprehensible to the parent corporation. Working with academic partners to understand the key milestones and experiments can be especially helpful. Exploring the new deep-tech landscape and learning widely before committing to a particular relationship is a necessary first step. When

sneaker company New Balance wanted to expand into novel fibers and fabrics, it partnered with a nonprofit, Advanced Functional Fabrics of America, and worked with MIT faculty members and the Fashion Institute of Technology.

**2. High capital investment.**

Deep-tech ventures — research-intensive and asset-heavy — demand substantial investment for effective development and scaling. Early-stage financing rounds can exceed $20 million, and as the ventures progress, capital requirements can escalate, with later stages reaching as much as $1 billion. For companies used to spending less on R&D or participating in small corporate venture capital funding rounds, deep-tech ventures are particularly challenging. The imperative to balance profitability and adhere to conventional metrics complicates the use of the traditional balance sheet, and demands new financial strategies.

**Key practice:** To deal with the cost of deep tech, some less R&D-intensive companies are using their balance sheets in new ways, such as exploiting strategic partnerships and new financing approaches to share risks at an acceptable level. Some of them have emphasized nonfinancial support that they can bring to the table to reduce their contribution to a particular funding round. That support may take the form of shared technical expertise and mentorship from experienced engineers, opportunities to test new technologies in situ, or supply chain and manufacturing capabilities that enable scaled production.

Access to all-important supply chain expertise, for example, was at the heart of a nonfinancial partnership between the autonomous trucking startup Gatik and Walmart[4]. Similarly, Air Canada teamed up with Carbon Engineering, which is developing direct air capture technology. The airline made a commitment to identify opportunities for cooperation in fuel production and carbon dioxide removal and help commercialize Carbon Engineering's

[4]https://corporate.walmart.com/news/2019/07/25/walmart-begins-pilot-with-autonomous-vehicle-company-gatik

new technologies. British Airways invested in LanzaJet to further the companies' shared goal of shifting to sustainable air fuels, which entails aiding the construction of the first commercial-scale production facility for sustainable aviation fuel in the U.S. and committing to designing a large-scale biorefinery in the U.K. And Mosaic Materials has partnered with ExxonMobil to better showcase the business advantages of its carbon-capture technology; the deep-tech spinoff of the University of California, Berkeley, has developed an ultra-high-capacity sponge material with the ability to absorb gases such as carbon dioxide[5].

**3. Extended timelines.**

A deep-tech company's progression from lab to market often spans a longer timeline than other ventures' journeys do. Developing a complex technology from an idea in a lab to a viable commercial product is a lengthy process that cannot easily be shortened. It's not uncommon for deep-tech ventures to take 10 to 15 years to gain traction[6]. Carbon Engineering, founded in 2009, took six years to develop its first functioning prototype and an additional seven years to open its first large-scale commercial plant. These relatively long timelines for ROI create misalignment with the business models of companies not rooted in the scientific world. Companies must learn to adapt to and align with these extended cycles.

**Key practice:** To solve this problem, low R&D intensity companies must define milestones that demonstrate to senior leadership that their projects are on the right track. These engagements require significant senior leadership buy-in; and showing progress along a clear pathway to success improves the likelihood that a deep-tech venture will outlive the tenure of any specific leader. JPMorgan is a case in point: By hiring a very senior quantum computing expert who had been a distinguished scientist at IBM, the company signaled the longevity of its commitment. The new team is emphasizing important use cases and exploring how

[5]https://chemistry.berkeley.edu/news/exxonmobil-and-mosaic-materials-explore-new-carbon-capture-technology

[6]Ramge, T., & de la Vera, R. L. (2024). Radical Innovation Needs Old-School VC. MIT Sloan Management Review (Online), 1-3.

quantum computing will be applied for long-term value. It's demonstrating short-term progress by engaging across the business, sharing with the wider quantum computing community at leading conferences, and publishing in JPMorgan's Global Technology Applied Research publications[7]. A long-term approach that centers on clear, value-creating milestones is essential for companies that are accustomed to immediate and near-term deliverables.

Deep-tech ventures provide numerous opportunities for companies to gain a competitive edge, enhance productivity and efficiency, and meet sustainability goals. For all companies, but especially for sectors with traditionally low R&D spending and limited experience with science-driven innovations, a better understanding of these ventures' dynamics is essential for a successful deep-tech strategy.

[7]https://www.jpmorgan.com/technology/applied-research/research-publications