McKinsey & Company

Orchestrating Europe's deep-tech funding

A blueprint to bridge the financing gap

November 2025

Preface

Europe's deep-tech sector is at an inflection point. Deep-tech start-ups commercializing science-based technological breakthroughs face significant financing challenges. Effectively orchestrating investors proves pivotal for a start-up's ultimate success. By investing in deep-tech business building, Europe's start-up ecosystem could create $1 trillion in enterprise value and up to one million jobs by 2030—paving the way for renewed prosperity.[1]

While the region has made significant strides in breakthrough innovation, a systemic financing gap for deep-tech start-ups threatens to undermine Europe's competitive position in tomorrow's most critical technologies. There are two "valleys of death" that highlight the critical funding gap, particularly constraining companies requiring substantial capital for industrial deployment. The first "valley of death" spans the journey from scientific discovery to proof of concept. The second "valley of death" extends from pilot validation to commercial deployment.

As established, deep-tech companies outperform traditional software start-ups, delivering a 16 percent internal rate of return (IRR) versus 10 percent. Nevertheless, European deep tech struggles to access the "patient" capital (with long investment horizons) required for industrial-scale deployment.[2]

"Deep tech isn't just about evolution; it's about fundamental breakthroughs. That's why it's so hard to finance, but also why it's so impactful."

Deep tech represents the next frontier of value creation and regional sovereign strength, centered on intellectual property (IP).[3] Sectors within deep tech are poised to generate trillions in global economic impact by 2030,[4] while also driving sovereignty in several critical industries that could deliver security and economic growth in the coming decades. Europe is already gaining momentum in creating deep-tech businesses. Our analysis shows that in 2024, 8 percent of the world's deep-tech unicorns (companies valued at more than $1 billion) were born in Europe, up from 4 percent in 2021.[5] For European companies, investors, and institutions, the question is not whether deep tech will reshape entire industries, but whether Europe will capture its proportionate share of this transformation.[6]

McKinsey's analysis reveals that success requires moving beyond traditional venture capital (VC) models to orchestrate multiple capital sources and investor types. Based on examinations of successful European deep-tech companies and extensive stakeholder interviews, we have identified three priorities for ecosystem action to bridge the financing gap while leveraging Europe's distinctive competitive advantages.

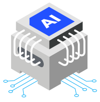
1 McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.
2 McKinsey, "European deep tech: What investors and corporations need to know," December 17, 2024.
3 McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.
4 European Investment Bank, *Französische Gigafabrik für Elektrofahrzeugbatterien, [French gigafactory for electric vehicle batteries],* EIB Publications, n.d.
5 McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.
6 McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.

Deep tech delivers superior returns, but Europe faces a structural financing gap

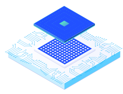
Deep tech encompasses science-based technologies that address societal issues like climate, health, and security challenges across eight investment areas: novel AI, the future of computing, novel energy, space tech, advanced materials, biotech, robotics, and defense tech (Exhibit 1).[7]

"In early stages, the focus is more on technology and proof of concept, while later stages emphasize market risk, exit timelines, and clearer return expectations."

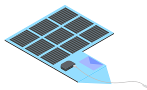
Exhibit 1: Eight deep-tech investment sectors are driving European innovation



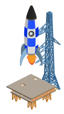
Novel AI
Autonomous systems, explainable AI, privacy-enhancing technologies, semantic AI



Future of computing
Superconductors, quantum technologies, ambient computing, brain-computer interfaces, AR/VR

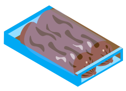


Novel energy
Green hydrogen, nuclear fusion, geothermal energy, next-gen solar, waste heat recovery



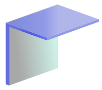
Space tech
Launch services, earth observation, in-space manufacturing, nanosatellites, space mining

Robotics
Humanoid robots, nanorobotics



Biotech, Foodtech, and Agtech
Synthetic biology, lab-grown food, AI-enabled drug discovery, fertilizers

Defense tech
Cybersecurity, drones



Advanced materials and nanotechnology
Green concrete, graphene, nanomaterials

These start-ups differ fundamentally from traditional tech in ways that standard financing approaches fail to address:

— **Deep tech is capital-intensive by nature.** Some deep-tech start-ups can scale substantially with computing infrastructure investments, particularly in novel AI. Most require physical assets: specialized equipment, pilot production lines, and first-of-a-kind industrial facilities. While hardware intensity is a key indicator of capital requirements, it is not the only one. Deep-tech start-ups consume 48 percent more funding than traditional tech counterparts by the time they reach €5 million in revenue.[8] Based on recent European case studies, first-of-a-kind production facilities often require investments of between €50 million and €200 million. Such volumes exceed the capacity of most European VC funds.[9]

[7] McKinsey, "European deep tech: What investors and corporations need to know," December 17, 2024.
[8] Lakestar, Walden Catalyst, & Dealroom.co., *The 2025 European deep tech report,* March 2025.
[9] Georg Metzger, *Biotech- und Deeptech-Start-ups gewinnen bei VC-Investoren an Bedeutung, [Biotech and deep-tech start-ups are gaining importance with venture capital investors]*, KfW Research, February 24, 2022.

— **Development cycles extend well beyond software timelines.** Deep-tech start-ups take 35 percent longer than regular start-ups to grow their revenues from €1 million to €5 million, and 39 percent longer to scale from €5 million to €10 million.[10] These extended timelines reflect the complex interplay of technological development, regulatory approval processes, and market education requirements that characterize breakthrough innovations.

— **Technical and market risks create a rare pattern.** Unlike traditional tech companies which face market risk after proving their technology, deep-tech start-ups have higher failure rates in the early stages but lower failure rates in the later stages. Once deep-tech companies overcome their technical challenges, large addressable markets decrease competitive intensity, while patent portfolios create independent value protected by competitive barriers[11]

— **Deep-tech investments have demonstrated superior returns when structured correctly.** As noted in previous research, deep-tech investments consistently outperform traditional technology investments, delivering a superior net annual average IRR of 16 percent compared with 10 percent for conventional tech start-ups.[12] Prior analyses have debunked persistent myths about deep tech, including the beliefs that these start-ups have systematically higher failure rates, slower funding cycles, lower unicorn potential, and inferior capital efficiency.[13] The reality is more nuanced: deep-tech start-ups show similar overall failure rates to traditional tech, achieve comparable unicorn ratios (0.62 percent versus 0.54 percent), and demonstrate superior capital efficiency through the strategic use of nondilutive funding sources. In addition, European deep-tech start-ups are reaching valuations of $1 billion 28 months faster than their regular-tech counterparts (5 years and 7 months versus 7 years and 11 months) and achieve a 12 percent higher valuation growth on invested capital (a factor of 6.4 versus 5.7).[14]

Europe faces a persistent innovation paradox. The region excels in research and early-stage innovation, holding seven of the top ten positions in the World Intellectual Property Organization's Global Innovation Index.[15,16] European universities and research institutions generate breakthrough discoveries across quantum computing, advanced materials, biotechnology, and clean energy technologies. However, this research excellence has not translated into proportional commercial success.

Another factor is the growing interest and attraction of European deep-tech investments, which is partially driven by foreign investors. However, Europe's financing gap remains persistent and systemic across key development stages. European deep-tech companies accounted for 44 percent of Europe's total tech investment in 2023, an increase of 18 percentage points since 2019.[17] They secured a total of €15 billion in funding in 2024, demonstrating resilience compared to the broader tech sector's 60 percent decline.

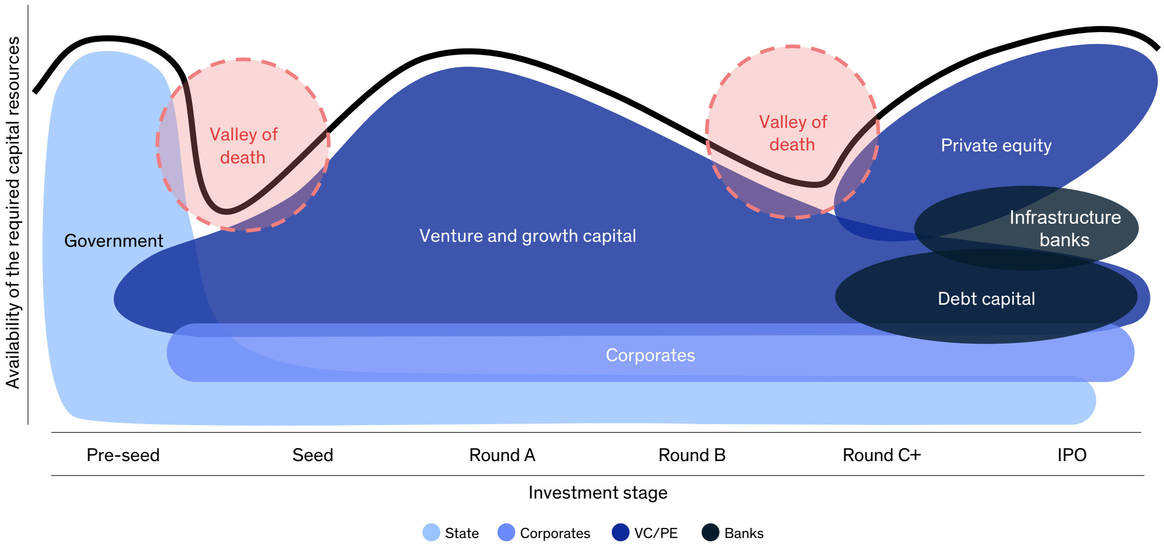
---

10 Lakestar, Walden Catalyst, & Dealroom.co., *The 2025 European deep tech report,* March 2025.
11 McKinsey, "European deep tech: What investors and corporations need to know," December 17, 2024.
12 McKinsey, "European deep tech: What investors and corporations need to know," December 17, 2024.
13 McKinsey, "European deep tech: What investors and corporations need to know," December 17, 2024.
14 McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.
15 European Investment Bank and European Patent Office, *Deep tech innovation in smart connected technologies: A comparative analysis of SMEs in Europe and the United States*, EIB Publications, April 28, 2022.
16 World Intellectual Property Organization, Global Innovation Index 2024, 2024.
17 McKinsey, "*European deep tech: What investors and corporations need to know*," December 17, 2024.

However, more than 50 percent of growth-stage capital continues to flow from non-European investors.[18] This dependence on foreign capital creates systemic vulnerabilities and limits a European company's ability to scale breakthrough technologies domestically.

Exhibit 2: The two valleys of death faced by deep-tech start-ups

Deep-tech start-up ecosystems face two valleys of death



"There are two valleys of death: the first between the spin-off phase and first customers; the second, when significant capital is required for scaling, such as before an IPO."

Ultimately, the deep-tech financing gap is a coordination problem (Exhibit 2). As start-ups progress from pre-seed to initial public offering (IPO), the investor landscape shifts. Angel investors and government funding dominate the pre-seed stage. Generalist and specialist VCs lead early rounds (from Series A onward) and continue to participate through the growth stages. This creates a funding gap between pre-seed and Series A, because public grants are often too limited (and sometimes too slow or restrictive) to fully finance the seed stage. VCs also require additional proof points of technical feasibility for their investment decisions, which are not yet available. Strategic VCs and corporates engage around Series A and B. Another critical financing gap emerges from Round B to C+, where deep-tech start-ups typically require between €50 million and €200 million but have outgrown Europe's VC capacity without achieving the commercial proof needed by infrastructure investors and traditional banks.[19]

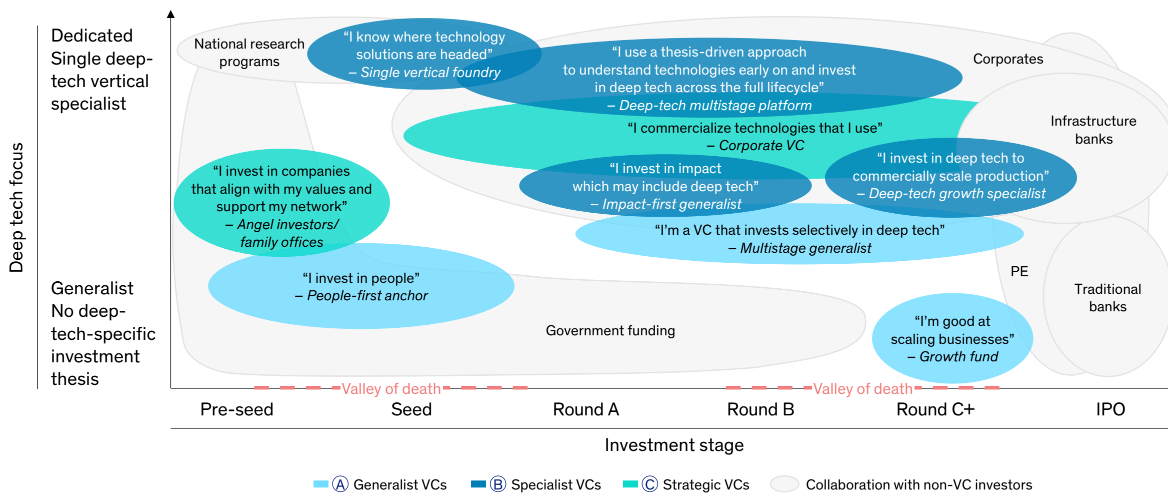
"Successful deep-tech funding depends on collaborative financing models that combine public, private, and corporate capital."

[18] Lakestar, Walden Catalyst, & Dealroom.co., *The 2025 European deep tech report*, March 2025.
[19] Georg Metzger, *Biotech- und Deeptech-Start-ups gewinnen bei VC-Investoren an Bedeutung, [Biotech and deep-tech start-ups are gaining importance with venture capital investors]*, KfW Research, February 24, 2022.

Success requires understanding which capital providers operate at which stages (Exhibit 3). More critically, it requires understanding how to sequence their entry and align their participation within individual deals despite fundamentally incompatible timelines and return expectations.

Exhibit 3: The gaps in deep-tech funding by VCs are complemented by non-VC investors, requiring investment consortia

Gaps in deep-tech funding by VCs are complemented by non-VC investors, requiring investment consortia



The following framework clarifies how six distinct investor types, each with unique return expectations, risk tolerances, and decision-making rhythms, can be aligned to finance deep tech at scale.

Orchestrating six investor types with distinct return expectations and roles

Deep-tech financing fails when fundamentally different investors with incompatible expectations attempt to collaborate without clearly defining their roles. Seeking 25 percent returns, a VC fund operates on different timelines and risk tolerances than an infrastructure bank, which accepts 10 percent returns from contracted cash flows. Corporate strategics prioritize supply chain access over financial returns. Government programs target strategic autonomy and job creation. Negotiations alone cannot reconcile these differences. Structural orchestration is needed. Matching the right capital providers with the right start-up stages, backed by a clear understanding of what each player contributes and requires, can mean success for deep-tech start-ups.

"We prefer to invest in syndicates, as success results when capital providers complement each other in terms of capital volume and expertise. Also crucial is ensuring that investors from target markets and regions are involved."

VC and growth capital provide risk-tolerant early capital and commercial discipline. As detailed above (Exhibit 3), three VC archetypes—specialist, generalist, and strategic/corporate VCs—can be sequenced across development stages based on their distinct capabilities and constraints. Performance patterns vary by archetype and stage: specialist funds typically outperform generalists in early-stage investing, where technical expertise and sector networks create an advantage; generalist funds show higher performance in late-stage investing, where company-building capabilities matter more than technical expertise. Collectively, VC funds seek a 20 to 30 percent IRR through equity appreciation, typically exiting within seven to ten years. They provide board-level involvement, strategic guidance, and network access. Their limitation is structural: fund sizes are typically insufficient for infrastructure-scale deployment, and investment timelines are misaligned with experimental technologies, which require 10- to 15-year horizons. VC works best for software- and early-stage product disruption, where rapid iteration and market validation drive value creation.

Private equity bridges late-stage growth with operational expertise. Private-equity funds seek annual returns of 15 to 20 percent from companies with proven revenue models nearing profitability. They specialize in helping companies scale operations and prepare for acquisition or stock market listing. However, they avoid unproven technology, typically requiring near-commercial readiness (a technology readiness level or TRL of 8 or 9) and demonstrated customer traction.

Infrastructure banks enable the deployment of megascale projects with patient capital. These investors accept returns of 8 to 12 percent, secured by hard physical assets and contracted revenue streams over 10- to 20-year horizons. They provide €50 million to €500 million and more for industrial-scale projects, but require fundamentally different proof points from VC. Hard assets that banks can independently value—production facilities, equipment, and real estate—serve as the core criterion. IP cannot be used as collateral. Binding purchase agreements with financially stable customers provides additional revenue assurance, but physical-asset backing remains essential. Proven profitability and a demonstrable cash flow are required, making this financing option highly case-specific and unavailable for many deep-tech start-ups until late stages.

Debt capital reduces dilution but demands bankability. For deep-tech start-ups with the right characteristics, debt financing reduces founder dilution while preserving upside potential. Specialized venture debt providers enter as early as Series A for companies with strong fundamentals: technical maturity (around TRL 5), institutional equity backing, and robust pipeline visibility. These lenders structure flexible instruments—equipment leasing, inventory-based credit, milestone-linked tranches—that evolve with the company's maturity. Physical assets provide the foundation for bankability: production equipment, specialized machinery, and facilities offer tangible collateral that lenders can value. Unlike traditional tech, IP rarely serves as primary collateral. Traditional commercial banks remain conservative, typically engaging only at Series C+ when companies approach profitability. Venture debt is more expensive than traditional loans and can constrain flexibility for companies with unsteady cash flows. Accessibility varies dramatically by business model. Manufacturing-heavy start-ups with equipment and contracted revenues have multiple options, while R&D-focused start-ups may find debt inaccessible at any stage. Commercial banks cannot absorb early-stage technology risk without public guarantees or first-loss programs. Leading banks are increasingly functioning as ecosystem orchestrators, designing balanced capital stacks with VCs and corporates.

Corporate strategies provide market validation beyond capital. Strategic investors seek technological access, supply chain integration, or competitive positioning rather than pure financial returns. Their value extends beyond capital: offtake agreements provide bankable revenue streams, joint development accelerates commercialization, and procurement integration creates reference customers. Successful corporate partnerships require careful structuring. Decision timelines range from 6 to 12 months, compared to VC's 6-to-8-week timeline, which requires earlier engagement. Corporate decision-makers typically rotate every three to four years, making board-level institutional commitment essential. Ventures should negotiate structures that preserve financing flexibility. VCs often avoid syndicates where corporates hold leading positions or veto rights. The most effective arrangements balance corporate strategic value with governance that maintains financing optionality and diversified relationships, rather than single-partner dependence. Corporate investors add the most value through product disruption and megascaling, where industrial partnerships prove essential for market access.

Government and EU institutions absorb risks that private capital cannot. Public programs target strategic autonomy, decarbonization, and job creation rather than financial returns. They play a critical role in absorbing risk through multiple mechanisms, with first-loss equity covering 20 to 40 percent of the downside potential, which catalyzes private participation. Grants fund fundamental research in early stages that no commercial investor would support. Government-as-a-customer contracts (procurement agreements that generate actual revenues) often provide more valuable validation than non-dilutive grants. Guarantees enable bank lending against technological milestones. However, grants carry risks when poorly designed: they can distract start-ups from their commercial focus, impose research requirements that are misaligned with market needs, and suffer from inefficient allocation when channeled directly rather than through professional investors. Programs like ESA Boost!, the EU Innovation Fund, and Germany's DeepTech Future Fonds demonstrate that disciplined public capital unlocks multiple private investments. The design principle holds across successful programs: public capital must function as a multiplier, not a substitute.

"The state should act as an anchor customer, not just a grant provider. Real contracts are more valuable than subsidies."

Successful deep-tech start-ups deliberately sequence these players. They don't pursue all capital sources simultaneously; they match investor types to development stages, backed by a clear understanding of what signals unlock each financing layer.

Within the VC layer, three distinct investor types operate with different capabilities and constraints:

— **Specialist deep-tech VCs** are funds that invest more than 50 percent of their capital in deep-tech start-ups. They have sector-specific expertise, technical networks, and tolerance for longer development cycles. However, their fund sizes typically limit individual investments to between €5 million and €15 million, making them most valuable in early rounds (seed through Series A) where technical validation matters more than check size.

— **Generalist VCs** allocate less than 25 percent to deep tech but provide larger-scale funding (€20 million to €50 million and more) with broader commercial networks. However, they often lack the patience for extended technical development. These investors enter most effectively at Series B+ once the technological risk has subsided.

— **Strategic/corporate VCs** offer unique value through market validation, supply chain integration, and potential offtake agreements, but their decision cycles extend 6 to 12 months versus the 6 to 8 weeks typical of financial VCs.

Rather than treating VCs as monolithic, deep-tech start-ups can deliberately sequence these VC types: specialists for early technical derisking, generalists for attracting sufficient growth capital, and strategic/corporate VCs for market anchoring.

Even with optimal VC sequencing, most deep-tech companies require additional capital sources to bridge the gap from technical proof to industrial deployment. This misalignment between VC capacity and deep-tech capital requirements explains why start-ups need orchestrated financing beyond the VC ecosystem.

Four archetypes of deep-tech scaling

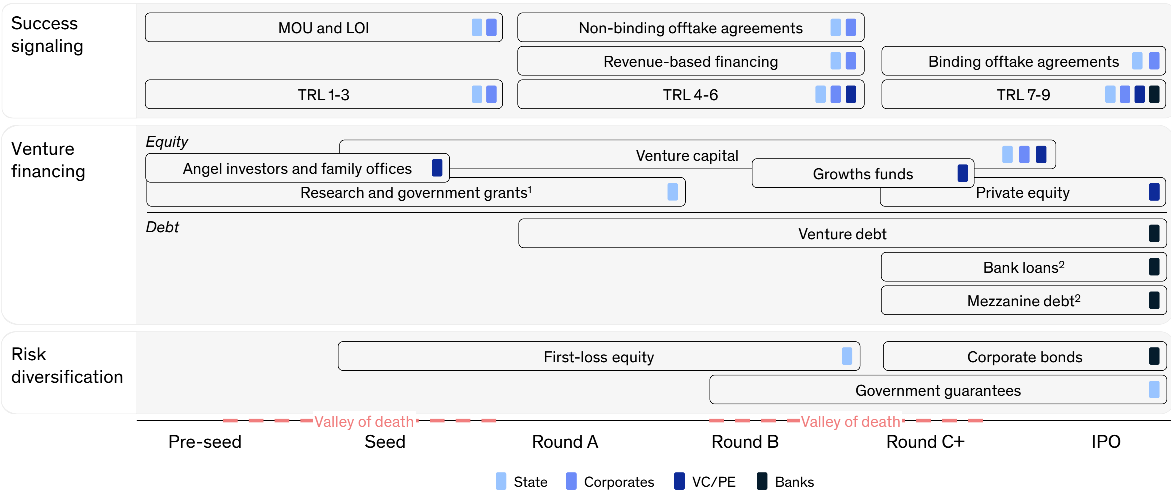
Four archetypes can offer guidance on how to translate the deep-tech financing puzzle into practice. Each archetype is defined by its capital intensity, risk horizon, and investor sequencing. Together, they reveal how the most successful start-ups orchestrate diverse capital sources, beginning with equity-driven validation and evolving toward debt-supported industrial scale. Two principles underpin all archetypes: signaling success and diversifying risk. Customer commitments, regulatory milestones, and strategic alliances provide credibility that unlocks the next financing layer. Blended capital structures allocate technological and market risk to investors with different appetites, enabling start-ups to traverse the two “valleys of death”: from scientific discovery to proof of concept, and from pilot validation to commercial deployment.

Exhibit 4 maps out the hybrid financing architecture that underpins all four archetypes. Successful start-ups orchestrate two elements flanking and reinforcing VC financing, from angel investments to infrastructure-scale debt.

— **Success signaling:** Specific proof points—technical milestones (TRL progression), pilot deployments, and binding offtake agreements—that validate technical readiness and market traction. Note: While common, nonbinding memorandums of understanding and letters of intent (MOUs/LOIs) carry substantially less weight with investors compared with contracted revenues or take-or-pay commitments.

— **Risk diversifications:** Blended mechanisms—first-loss equity, government guarantees, and corporate co-investment—that distribute technological and market risk across investors with different appetites. This enables participation from private investors, banks, corporates, and public institutions within the same capital stack.

Deep-tech financing landscape across maturity stages: Success signaling, venture financing, and risk-diversification mechanisms



1. Non-dilutive; placed with equity as they prepare for venture investment
2. Classified as debt but hybrid in nature—subordinated, often with equity-like features (e.g., warrants, convertibility)

Exhibit 4: Orchestrated financing architectures in deep tech across investment stages

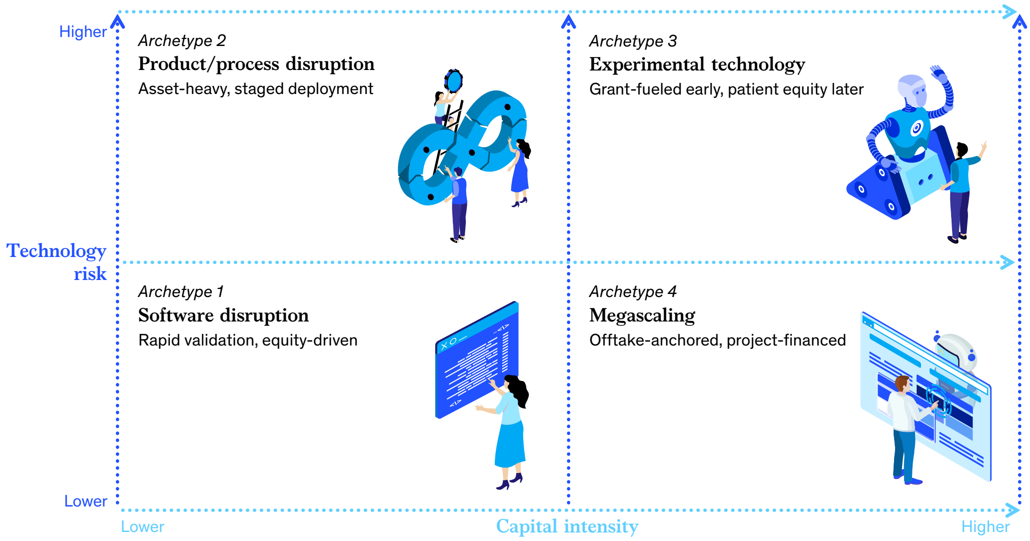
"In software, you can succeed with 100 percent VC equity. In deep tech, that's impossible. Hybrid models combining equity, debt, grants, and revenue-based financing are mandatory."

Together, these elements enable start-ups to navigate the "valley of death" from pilot validation to commercial deployment. The specific mix and sequencing vary by start-up archetype, as described below.

Archetype-specific playbooks

Not all six investor types participate in every deep-tech start-up at each stage. The following four archetypes map which players from the orchestration framework—VC (specialist, generalist, or strategist), private equity, infrastructure banks, debt providers, corporates, and government institutions—engage at which stages based on start-up characteristics.

Exhibit 5: Four deep-tech archetypes by capital intensity and technology risk



Archetype 1: Software disruption—rapid validation, equity-driven

The first archetype sits at the lightest end of the capital spectrum: start-ups that create value based on algorithms, data, and software rather than on physical assets.

Profile: Low capital expenditure, rapid-iteration companies in AI, workflow automation, and data analytics. Their challenge is not industrialization but speed: scaling distribution before competitors replicate the model.

Success signaling

— MOUs, pilot customers, and early revenues within 12 to 18 months

— Recurring revenues to validate market demand

— Strong unit economics (customer acquisition cost payback of less than 12 months) before Series A

Financing strategy

— Dominated by venture and growth equity, the connective tissue of early risk capital

— Minimal grants; debt rarely relevant given negligible collateral

— Value creation based on rapid valuation step-ups, not leverage

— Timeline of around 18 to 24 months from product launch to Series B scalability

European success stories

— **n8n, Cognigy, and DeepL:** Built enterprise-focused AI companies by aligning capital infusions with product maturity and third-party validation[20,21,22]

- Used successive VC and growth equity rounds to expand sales and product development
- Pointed out strong product-market fit by blending multiple proof points, such as customer logos, usage depth, and willingness to pay
- Prioritized security and data governance to ease procurement in regulated sectors and reduce vendor risk concerns

— **Mistral AI:** Built a Europe-first foundation-model company that scaled fast on the back of equity rounds and strategic distribution[23,24]

- Sequenced large equity rounds, bringing in reputable VCs and European corporates to secure compute
- Kept a rapid release cadence, including chat and an API, backed by hyperscale distribution and blue-chip co-builds for signaling technical competitiveness and enterprise pull
- Prioritized EU-sovereign deployment paths, transparent licensing, and model documentation aligned with the EU AI Act, and anchored regional strategic partnerships for geopolitical business-model resilience

Lesson: These companies quickly validated the product–market fit with pilot customers, then scaled rapidly on equity financing alone. Typical of software models, their capital efficiency enabled them to reach a significant scale without the infrastructure financing needed by other archetypes.

“Grants are helpful in the early stages but can distract start-ups from commercialization. The focus should always be on building a viable business.”

Archetype 2: Product and process disruption—asset-heavy, staged deployment

As technical complexity rises, so does capital intensity. Product and process disruption start-ups must finance physical production assets while proving market demand.

Profile: Significant upfront capital for production facilities, longer development cycles, and a hardware-centric value proposition. Developing hardware-based technologies or industrial processes that revolutionize existing alternatives with superior cost structures, sustainability

[20] n8n blog, “n8n raises $180m to get AI closer to value with orchestration,” blog entry by Jan Oberhauser, October 9, 2024.
[21] Cognigy, “Cognigy Raises $100m as Major Enterprise Brands Depend on its AI Agent Workforce” Cognigy press release, June 11, 2024.
[22] Ingrid Lunden, “DeepL, the AI language translation startup, nabs $300M on a $2B valuation to focus on B2B growth”, TechCrunch, May 22, 2024.
[23] Microsoft Azure. “Introducing Mistral-Large on Azure in partnership with Mistral AI,” blog entry by Eric Boyd, February 26, 2024.
[24] Joana Soares, “Mistral, OpenAI say will respect EU’s AI Code of Practice,” EU Perspectives, July 16, 2025.

profiles, or performance characteristics. Examples include advanced recycling processes, novel manufacturing methods, and new materials.

Success signaling

- Working prototypes within 24 to 36 months
- Initial commercial production within 36 to 48 months
- Revenue certainty based on offtake agreements or long-term contracts

Financing strategy

- Blended approach: early VC equity plus equipment leasing plus project finance
- Government grants for first-of-a-kind risk reduction (first-loss financing)
- Strategic corporate partnerships for market validation
- Infrastructure banks for large-scale deployment
- Timeline: Three to five years from prototype to commercial scale

European success stories

- **cylib** (Germany): Built a clean-tech battery recycling company by pairing industrial investors with regional and European grants[25,26]
  - Combined strategic OEM investors with deep-tech climate VCs to industrialize at scale
  - Signaled demand/progress: secured contracts and partnerships with leading automotive players
  - Secured multimillion-Euro public grants to reduce the capital expenditure burden for its first major facility, backed by government first-loss grants to derisk its innovative battery-recycling process
- **Isar Aerospace** (Germany): Structured a multi-layered financing stack blending private, institutional, and sovereign capital to advance Europe's launch capability[27,28]
  - NATO Innovation Fund and specialized VCs funded expansion and defense alignment
  - Successful test flights and early-launch contracts proved technical readiness
  - Won EU innovation prizes and European Space Agency contracts for safeguarding European launch sovereignty and reducing exposure to commercial launch market volatility

Lesson: Product and process disruption succeeds when public grants derisk technology (whether novel products or manufacturing processes), corporate capital confirms demand, and venture equity drives commercial focus. This deliberate sequencing turns hardware scale-up into investable growth. Government support does not displace market mechanisms; it enables them by absorbing first-loss risk that no private investor would accept alone.

---

25 Cylib, "cylib closes €55M Series A for industrial scaling," cylib press release, May 15, 2024.
26 Cylib, "cylib confirms EUR 26.1 million grant for battery recycling facility," cylib press release, September 24, 2025.
27 Isar Aerospace, "Leveraging commercial technologies for sovereignty: Isar Aerospace extends Series C to over EUR 220m with strong commitment from NATO Innovation Fund," Isar Aerospace press release, June 20, 2024.
28 Isar Aerospace, "Space commercialization gains momentum: Isar Aerospace signs additional EUR 15m ESA contract," Isar Aerospace press release, November 19, 2024.

Archetype 3: Experimental technology—grant-fueled early, patient equity later

A third archetype operates farthest from the market: start-ups translating frontier science into potential industries.

Profile: Breakthrough science with 10- to 15+-year development timelines, high technical uncertainty, often dual-use (commercial and strategic) applications. Developing highly novel, potentially industry-disrupting technologies, with a long journey to commercialization.

Success signaling

— Strong TRL 1 to 6 evidence from grants and peer-reviewed publications

— Government-as-a-customer contracts provide validation (especially for defense, space, and critical infrastructure)

— Strategic importance for sovereignty or security

Financing strategy

— Heavy grants (40 to 60 percent of early capital) for fundamental research, most effective when aligned with a commercial plan rather than purely academic milestones

— VCs and family offices with 10- to 15-year timelines from research to commercialization

— Corporate strategies for late-stage validation and market access

— First-loss public equity (30 to 40 percent downside protection) is essential for private capital participation

— Convertible mezzanine if approaching commercialization

European success stories

— **Marvel Fusion** (Germany): Leveraged public–private partnerships as well as EU and national R&D programs to advance laser fusion and make fusion energy investable with a long horizon[29]

- Combined substantial VC with EIC (European Innovation Council) Fund equity and reputable industrial partners
- Built laser research facilities through US and EU collaborations for financing applied R&D
- Diversified technical and financial risk through public co-funding and cross-border research alliances

— **IQM Quantum Computers** (Finland): Executed a balanced capital mix of grants, VC, and venture debt to accelerate hardware maturity and sovereign adoption. This balanced capital mix includes significant contributions from various sources:[30]

[29] Marvel Fusion, "Milestone for Fusion research: Inauguration of Marvel Fusion's new experimental chamber 'LION 2' at CALA in Garching/Munich," Marvel Fusion press release, July 17, 2025.

[30] European Investment Bank, "IQM Quantum Computing (EGF VD) – venture loan of €35 million by European Investment Bank under the Pan-European Guarantee Fund," EIB, August 19, 2021.

- IQM received substantial grant funding, including €3.3 million from Business Finland under the EIC Accelerator program. This nondilutive funding was crucial for early-stage development and innovation
- The company successfully raised multiple rounds of VC, including a €275 million Series B round led by Ten Eleven Ventures. This equity funding was instrumental in scaling operations
- IQM also leveraged venture debt, securing €35 million from the European Investment Bank. This debt financing provided additional capital to accelerate the development and commercialization of their quantum processors

Lesson: For experimental technologies, public–private risk sharing is the bridge, not the destination. Sustained grants and first-loss programs keep innovation alive until patient capital and corporates can take over.

Archetype 4: Megascaling—offtake-anchored, project-financed

At the far end of the spectrum lie start-ups that have proven their technology and now require industrial-scale deployment—their challenge shifts from invention to execution.

Profile: Constructing capital-expenditure-intensive, large-scale facilities such as green steel plants, batteries, and synthetic fuels. Massive capital requirements (€50 million to €500 million and more), asset-backed revenue streams, infrastructure-style returns, and strategic importance for industrial sovereignty or decarbonization. This archetype captures deep-tech start-ups that achieve true industrial scale, typically in large-scale manufacturing, energy infrastructure, or industrial process technologies. In practice, this represents a smaller subset of the deep-tech ecosystem. Many companies exit to strategic acquirers or continue with equity financing through late-growth stages rather than transitioning to infrastructure-style project financing.[31]

Success signaling

— True binding offtakes with take-or-pay clauses from creditworthy customers (investment-grade corporates or governments) covering 40 to 60 percent of capacity. These differ from the nonbinding MOUs/LOIs that most companies collect

— Proof of TRL 8 to 9 at commercial scale with demonstrated unit economics

— Hard physical assets that banks can value independently (production facilities, equipment, and real estate)

— Seven- to ten-year agreements with inflation protection and minimum purchase guarantees

— Derisked technical risk: investors emphasize that market validation alone is insufficient; technology must be proven on an industrial scale

“Offtake agreements are a powerful tool for derisking, but they need to be tied to the right financing instruments to unlock cash flow.”

[31] Ross McKenzie, “Carbon removals are critical to reaching net zero. Here’s how to accelerate them sustainably,” World Economic Forum, November 28, 2023.

Financing strategy

- Infrastructure-style stacks: 60 to 70 percent debt capital, 30 to 40 percent equity capital
- Debt is backed by contracted revenues; equity is supplied by corporates and growth investors
- Public–private risk-sharing mechanisms via guarantees or first-loss capital (10 to 20 percent) to attract banks
- Adaptive debt instruments like revolving credit and equipment leasing reduce the cost of capital once operations begin
- Timeline: Four to six years from securing binding offtakes to financial closure

European success stories

- **Stegra (formerly H2 Green Steel)** (Sweden): Created one of Europe's most advanced green-infrastructure financing deals by aligning private equity, banks, and state guarantees[32]
  - Combined equity, senior and junior debt, and EU grants for a blended financing package exceeding €6 billion
  - Secured multiyear binding OEM offtakes validating commercial viability
  - Leveraged export credit and national guarantees to reduce lender and construction risk
- **Sunfire** (Germany): Turned tech leadership in Solid Oxide Electrolysis Cell and pressurized alkaline into major equity backing and bankable orders[33,34]
  - Secured Common European Interest (CEI) grants with proven industrial deployments and local manufacturing partnerships to reduce technical, regulatory, and execution risk

Lesson: Megascaling start-ups succeed when technological risk is replaced by executional risk and financing shifts from equity dependence to bankable, project-financed structures underpinned by offtakes and public guarantees.

---

32 H2 Green Steel, "H2 Green Steel raises more than €4 billion in debt financing for the world's first large-scale green steel," *PR Newswire,* January 22, 2024.
33 Sunfire, "IPCEI hydrogen: 169 million funding for Sunfire," August 30, 2023.
34 Sunfire, "Sunfire secures more than EUR 500 million to accelerate its growth and industrialization," March 5, 2024.

The path forward: Three priorities for ecosystem action

Europe possesses unique advantages for deep-tech leadership.[35] While the €2 trillion Green Deal creates predictable demand signals and industrial heritage provides unmatched capabilities for scaling physical technologies, realizing this potential requires systematic execution. Three priorities emerge as critical for closing Europe's financing gap.

Priority 1: Build orchestration capabilities by educating investors and promoting cross-sector collaboration

Successful deep-tech financing depends on investors recognizing their limitations and actively orchestrating complementary capital. VCs can connect portfolio companies to infrastructure investors when start-ups outgrow funding capacity. Banks can assess technological milestones rather than demand historical profitability. Corporate strategies can streamline decision-making cycles to fit start-up funding rhythms. Systematic coordination mechanisms are key.

For all investor types

— Establish cross-investor working groups organized around specific archetypes (software and product disruption, experimental technology, and megascaling) to align expectations and sequencing

— Create transparent deal-flow platforms that enable early co-investment identification and reduce information asymmetry between investors

For VC, private equity, and corporate investors

— Foster understanding of complementary investment vehicles across investor categories, helping VCs recognize when start-ups need infrastructure finance, enabling corporates to align with start-up timelines, and allowing banks to evaluate technological milestones

For traditional and infrastructure banks and institutional investors

— Build capacity and expert networks to evaluate technological milestones (TRL frameworks) and milestone-linked collateral rather than relying solely on historical profitability

— Develop standardized term sheets for foundational deal elements while preserving flexibility for sector-specific provisions, acknowledging ongoing debates about optimal standardization levels

For government and EU institutions

— Design programs that function as orchestration catalysts: convening investors, subsidizing early coordination costs, and creating demonstration projects that prove hybrid financing models

Priority 2: Equip CFOs and boards with hybrid financing expertise

Since most deep-tech CFOs and board members are facing infrastructure-scale financing for the first time, they may lack experience in structuring blended capital stacks or sequencing diverse investor types. Therefore, systematic capability building is essential.

---

[35] McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.

“Education is critical. Founders need to understand the financing landscape, and investors need to understand the technology. Without this, the ‘valleys of death’ will remain.”

For deep-tech start-ups

- Build internal expertise in sequencing investor types: understand when to engage specialists versus generalists, when corporate validation unlocks infrastructure capital, and how government programs can derisk specific stages
- Train executives on emerging instruments, particularly adaptive debt facilities that evolve with company maturity, linking tranches to verifiable milestones like pilot completion or binding offtakes

For investors and industry associations

- Create public–private financing tool kits that codify best practices for blending venture equity, corporate capital, adaptive debt, and grants across development stages
- Make financing knowledge accessible through online resources, peer networks, and case studies that demystify infrastructure finance requirements, corporate partnership structures, and government funding mechanisms for deep-tech start-ups
- Build technical translation capabilities supported by independent expert validation, enabling companies to articulate technological opportunities, limitations, and risk profiles in business terms that generalist investors and banks can assess without deep-tech expertise

Priority 3: Standardize risk assessments by translating TRLs to risk metrics

TRLs provide sector-specific, standardized language for technical maturity, but fail to translate into risk metrics that financial investors understand. A start-up at TRL 6 means little to a traditional or infrastructure bank without understanding: What is the probability of failure? If it fails, is the technology unworkable, merely delayed, or does it require more capital? Europe needs investment-grade technical risk frameworks:

“The financing tools exist, but the mindset of investors needs to evolve to match the longer timelines and higher risks of deep tech.”

For industry consortia and research institutions

- Develop probability distributions for technical outcomes at each stage by archetype and sector (e.g., “60 percent of start-ups at TRL 6 achieve commercial readiness within 24 months, requiring median additional capital of €X”)
- Build analogous precedent databases showing how similar technologies evolved, with success rates and capital consumption patterns (e.g., “satellite launch success rates after n test flights”)

For government, EU institutions, and industry associations

— Establish independent validation services that certify technical progress and create expert consensus, replacing reliance on conflicting individual opinions

  - Fund the creation of risk-adjusted return benchmarks by archetype, stage, and sector, enabling institutional investors to make portfolio-level allocation decisions

For traditional and infrastructure banks and institutional investors

— Adopt TRL-based risk-assessment frameworks in due diligence processes

— Integrate technical risk metrics into credit models and investment committee decision frameworks

— Build internal capabilities to interpret technical validation reports alongside financial metrics

— For truly novel technologies where historical data does not exist, systematically document expert reasoning—specific technical hurdles, mitigation strategies, and conditional probabilities—to provide transparency without statistical validation

First movers who master orchestration will establish lasting advantages. Closing Europe's deep-tech financing gap represents a multi-decade undertaking, not a near-term fix. The United States built VC returns over generations, creating the institutional investor appetite that fuels today's ecosystem. Europe must simultaneously pursue near-term improvements—better orchestration, adaptive instruments, and risk-sharing mechanisms—while building the long-term foundation of sustained returns that attract pension funds, endowments, and insurance capital. The structural disadvantage is real: institutional investors allocate capital based on decades of performance data that Europe is only beginning to generate.

Success requires realistic timelines, persistent execution, and recognition that building a deep-tech powerhouse is generational work. Those who act decisively today—investors, companies, and institutions—will establish the foundations that mature into Europe's competitive advantage by mid-century. Europe's ability to commercialize and scale its science will determine whether it remains a laboratory or becomes a powerhouse of the next industrial age. That transformation will unfold over decades, not years.

About the authors

Gérard Richter is a senior partner in McKinsey's Frankfurt office; **Markus Berger-de León** is a senior partner in McKinsey's Berlin office; **Thomas Schumacher** and **Max Flötotto** are senior partners, and **Tobias Henz** is a partner in McKinsey's Munich office.

Hannah Hoehnke, **Jannik Nolden**, and **Philipp Lemanczyk** are consultants based in the Berlin, Cologne, and Frankfurt offices, respectively.

The authors wish to thank their interview partners for their contributions to this article.

References

Cylib, "cylib closes €55M Series A for industrial scaling," cylib press release, May 15, 2024.

Cylib, "cylib confirms EUR 26.1 million grant for battery recycling facility," cylib press release, September 24, 2025.

European Investment Bank and European Patent Office, "Deep tech innovation in smart connected technologies: A comparative analysis of SMEs in Europe and the United States", EIB Publications, April 28, 2022.

European Investment Bank, Französische Gigafabrik für Elektrofahrzeugbatterien, [French gigafactory for electric vehicle batteries], EIB Publications, n.d.

European Investment Bank, "IQM Quantum Computing (EGF VD) – venture loan of €35 million by European Investment Bank under the Pan-European Guarantee Fund," EIB Publications, August 19, 2021.

European Startups.co., 2021: The year of deep tech, dealroom.co, January 8, 2021.

H2 Green Steel, "H2 Green Steel raises more than €4 billion in debt financing for the world's first large-scale green steel," PR Newswire, January 22, 2024.

Isar Aerospace, "Leveraging commercial technologies for sovereignty: Isar Aerospace extends Series C to over EUR 220m with strong commitment from NATO Innovation Fund," Isar Aerospace press release, June 20, 2024.

Isar Aerospace, "Space commercialization gains momentum: Isar Aerospace signs additional EUR 15m ESA contract," Isar Aerospace press release, November 19, 2024.

Georg Metzger, Biotech- und Deeptech-Start-ups gewinnen bei VC-Investoren an Bedeutung, [Biotech and deep-tech start-ups are gaining importance with venture capital investors], KfW Research, February 24, 2022.

Lakestar, Walden Catalyst, & Dealroom.co., The 2025 European deep tech report, March 2025.

Marvel Fusion, "Milestone for Fusion research: Inauguration of Marvel Fusion's new experimental chamber 'LION 2' at CALA in Garching / Munich," Marvel Fusion press release, July 17, 2025

McKinsey, "European deep tech: What investors and corporations need to know," December 17, 2024.

McKinsey, "Europe's deep-tech engine could spur $1 trillion in economic growth by 2030," October/November 2025.

Sunfire, "IPCEI hydrogen: 169 million funding for Sunfire," August 30, 2023.

Sunfire, "Sunfire secures more than EUR 500 million to accelerate its growth and industrialization," March 5, 2024.

Ross McKenzie, "Carbon removals are critical to reaching net zero. Here's how to accelerate them sustainably," World Economic Forum, November 28, 2023.

World Intellectual Property Organization, Global Innovation Index 2024, 2024.

November 2025

Designed by Visual Media Europe

www.mckinsey.com

@McKinsey
@McKinsey