Can Europe Create Its Own Deep-Tech Giants?

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By Jean-François Bobier, Anne-Douce Coulin, Massimo Portincaso, and Arnaud Legris

Startups face four Europe-specific challenges in scaling up.

Not so long ago, the technology startup landscape in Europe was sparsely populated, especially when compared with other tech-rich regions of the world. But in recent years, European universities and research centers have become more proficient at spinning out young companies, and various national and Europe-level initiatives have ensured that there is plenty of innovation built into the spinoffs. Between 2015 and 2020, the number of European startups soared from about 1,850 to almost 6,600, according to Statista. Likewise, European deep-tech investment

has been growing at a rate of about 50% a year. Our analysis shows that in 2016, European deep-tech startups raised one-eighth as much venture capital equity as their North American counterparts; by 2020, the difference had dropped by half.

Today, Europe's deep-tech startups—which are taking breakthrough technologies like synthetic biology, quantum computing, and advanced materials from laboratory to market and using them to address large-scale fundamental problems—face a different and daunting challenge: scaling up as they begin to demonstrate technology and market success. Companies moving out of the startup phase encounter a Herculean set of tests, from finding funding and building management and marketing capabilities to putting in place a productive board of directors. Many of these challenges are intertwined. Attracting talent, for example, depends on having a strong management team, offering an appealing employee value proposition, and securing the funds to compensate employees competitively.

Many of these young companies are quick to speak of their "pride" in their European origins and their hopes of becoming flagship success stories with European investors. They would prefer to remain Europe-backed, and they and others like them are Europe's best chance of competing successfully with the US and China, which have been steadily moving ahead in the advanced-technology pack. Europe has powerful fundamental research and talent at its disposal. With the right levels of commitment and support, it can catch up.

Four Main Challenges

Recognizing the importance of a vibrant deep-tech startup ecosystem for Europe's economy and global competitiveness, the European Commission established the European Innovation Council (EIC) with the mandate to "target emerging technologies that have the potential to become strategically important" and help Europe achieve "technological sovereignty" in key technologies and technology-based economic segments, especially relative to the US and China. In 2021, the council commissioned a consortium of partners for the EIC ScalingUp project (which aims to create a model for European deep-tech companies to scale beyond

series B financing), including BCG, Deepwave Ventures, Bpifrance, and Tech Tour, to study the challenges of scaling and to design a blueprint for addressing them. (See "About Our Research.")

ABOUT OUR RESEARCH

Our research, which was commissioned by the EIC as part of the EIC ScalingUp project, involved interviews, quantitative surveys of investors and deep-tech companies, and supplemental qualitative interviews with investors and companies.

We conducted one-hour interviews with representatives of all 37 companies in the EIC Growth Club, a group of high-potential European deep-tech companies entering the scale-up phase, to understand their journey, backgrounds, specific challenges, and needs. We would like to thank the following companies for their valuable time and insights: aiMotive, AEInnova, CREAL, Carthera, Codasip, CroíValve, Cubbit, EFFECT Photonics, ENYO Pharma, Epishine, GreenWaves Technologies , IQM Quantum Computers , Indigo Diabetes, KEYOU, Katana, Lactips, Lancey Energy Storage, Lightspace Technologies, Lightyear, Didimo, NIL Technology, OneProjects, Outsight, PHYSEE, Pasqal, Photanol, Quibim, Resistell, S-Biomedic, SMART Photonics, SamanTree Medical, Satlantis, Sulapac, TreeFrog Therapeutics, and USound.

Based on input from the interviews and our knowledge of the European deep-tech investment ecosystem, we designed a survey and supplemental interview questionnaire for investors. The survey was conducted in March 2022 among Bpifrance and Deepwave Ventures investor networks. We conducted the supplemental interviews with investors in the network of Jean-Michel Deligny (chairman of EIC ScalingUp's selection committee), Bpifrance, Deepwave Ventures, and BCG. A total of 52 investors were surveyed and interviewed.

We ran a similar survey with another 54 deep-tech companies (including

companies outside of the EIC ScalingUp project) that are part of the Bpifrance's EuroQuity/Les Deeptech platform and partner network.

Based on interviews and surveys, we identified four Europe-specific challenges for deep-tech companies entering the scale-up phase:

- Securing financing and, in particular, a lead investor
- Building and leveraging a strong and productive board of directors with independent members
- Developing a compelling business strategy and investment narrative
- Navigating European institutional challenges

In addition, three broader challenges that many young firms face are especially acute for deep-tech companies: the frequent difficulties of collaborating with large corporations, attracting the necessary business and technical talent, and partnering with others in the ecosystem.

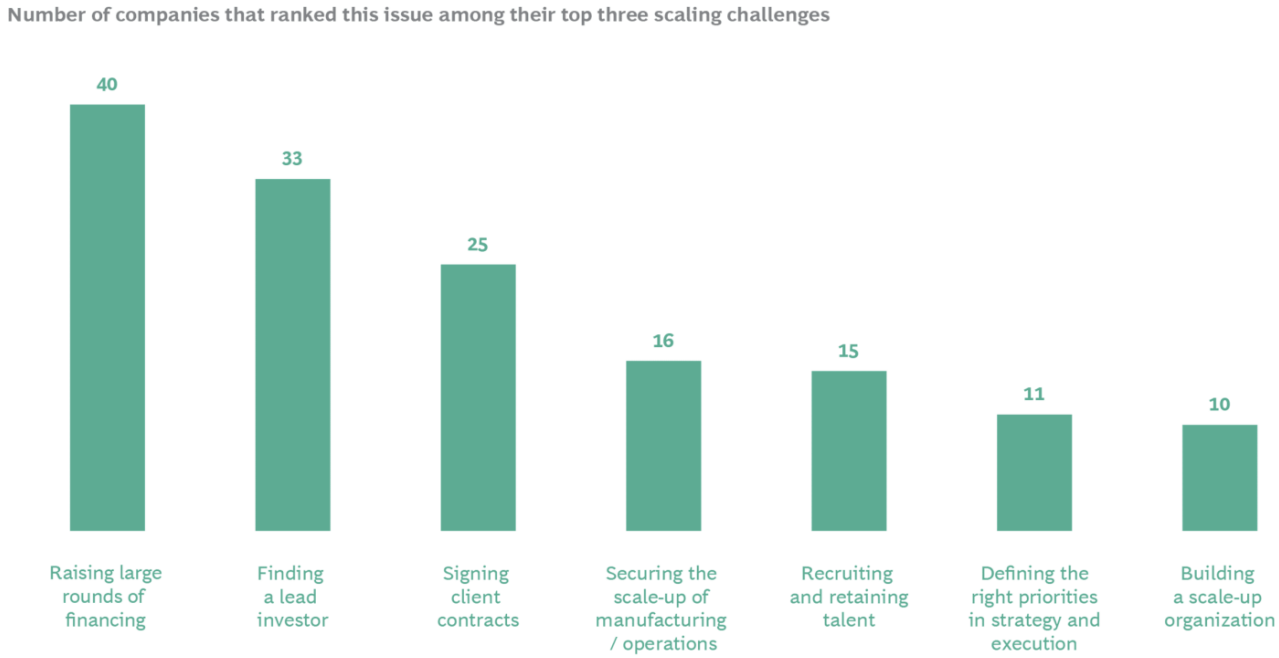
Our findings, which include firsthand assessments from European deep-tech companies and investors, have relevance for deep-tech companies, investors (including corporate venture capital), and government policymakers. We also present some preliminary recommendations for what each of these stakeholders can do to support Europe's emerging deep-tech capability and keep the EU competitive with the US and China in advanced technologies.

Funding and Lead Investors

Deep-tech companies and their investors agree: the number-one challenge is raising money. For management teams, securing the large funding rounds that enable scaling and industrialization is the biggest issue, and one that often depends on their ability to bring a lead investor onboard. (See Exhibit 1.) Investors themselves see the need for lead investors as the primary issue that deep-tech

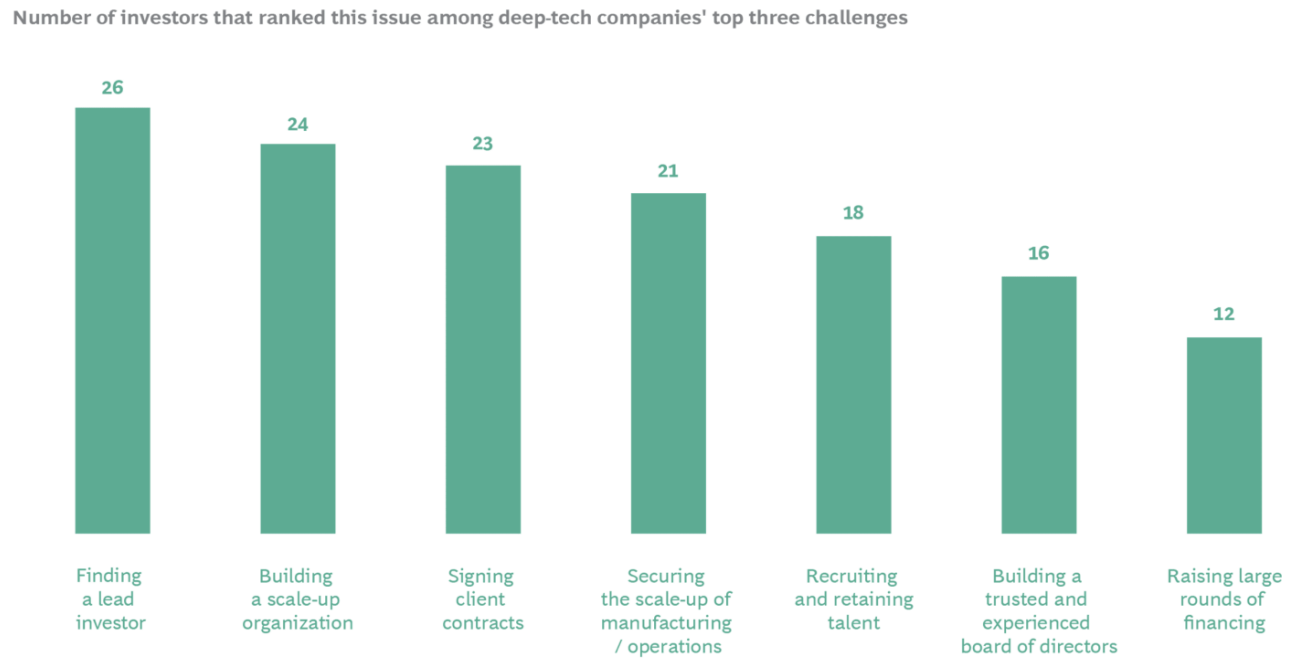
startups face. (See Exhibit 2.) In many ways, these are two sides of the same coin and point to larger structural issues in Europe's venture funding landscape.

Exhibit 1 – For Deep-Tech Companies, the Top Challenges Are Raising Large Financing Rounds and Finding a Lead Investor



Source: EuroQuity/Les Deeptech survey of European deep-tech companies (part of the EIC ScalingUp project), March 2022; BCG and Deepwave Ventures analysis.

Exhibit 2 – For Investors, the Primary Challenge Is Finding Lead Investors



Source: EIC ScalingUp survey of European deep-tech companies, March 2022; BCG and Deepwave Ventures analysis.

Number and Size of Venture Investors. There are still relatively few deep-tech investors in Europe. They include a handful of funds that regularly invest strategically in deep tech and a few more opportunistic funds that explore advanced technologies from time to time. The specialist funds that only invest in deep tech tend to be small.

The small number and size of funders constrain their ability to meet the needs of startups in later funding rounds, when companies are looking to raise substantial sums as they enter the industrialization phase and contemplate major expenditures. Since large lead investors frequently anchor these later rounds, this shortage is a significant hurdle. In the US, by contrast, several large and established venture capital funds regularly take the lead position, and in China both government agencies and private capital act as leads. A comment we heard often in our conversations with company management teams was, “Do you know a European fund making €10 million investments in deep tech in Europe? If so, please introduce us!”

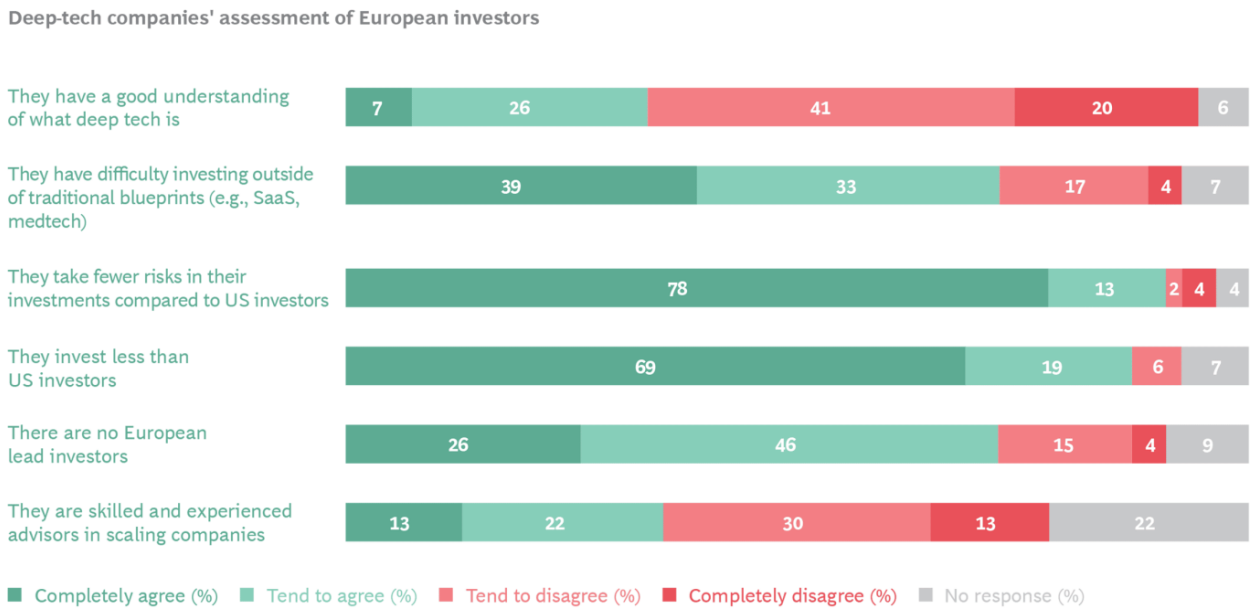
Smaller funding rounds often result in lower valuations, which can deter talent and, sometimes, other investors. One European investor recalled a case where investors from other regions walked away because they feared the company would have difficulty raising more money down the road.

Risk Aversion. Compounding the problems of size and number, European investors are often more risk averse than their counterparts in other regions. Europe doesn't (yet) have an established track record in other tech-related sectors, such as e-commerce or software, that might serve to reassure investors. Executives from multiple companies put it this way: "While European investors typically ask, 'How small can the investment be? How can we minimize the risk?' US investors ask, 'How big can the investment be? Would the impact double if we doubled the investment?'"

The results of our survey were clear on this point. Nine out of ten respondents at deep-tech companies completely agree or tend to agree that European investors take on less risk compared with US funds, and 87% said that European funds invest smaller amounts. The investors we surveyed concurred: 90% on risk aversion and 94% on investment size.

Knowledgeability. A big barrier to more investment is the lack of deep-tech knowledge and experience among European funds. Only a fraction of European generalist investors have a strong grounding in advanced technologies. Moreover, many limited partners (such as pension funds and family offices) are reluctant to take this type of risk. A substantial majority of executives at deep-tech companies and more than three-quarters of the investors we surveyed believe that European investors do not have a good understanding of what deep tech is. (See Exhibits 3 and 4.)

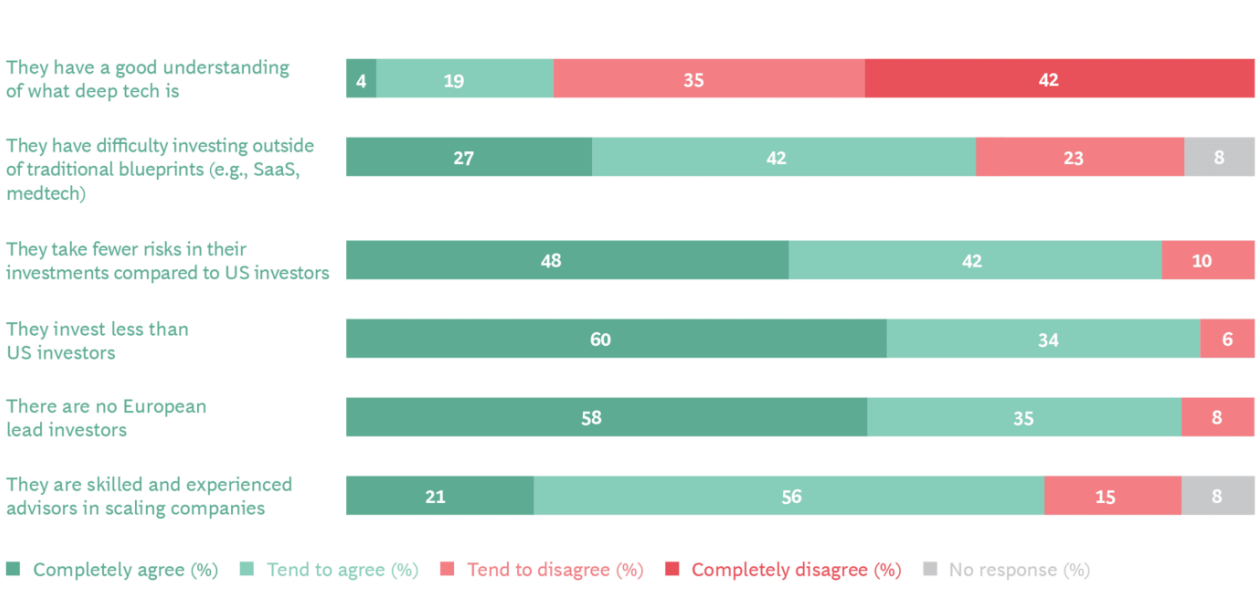
Exhibit 3 – Deep-Tech Companies Believe That European Investors Have a Limited Understanding of Deep Tech



Source: EuroQuity/Les Deeptech survey of European deep-tech companies (part of the EIC ScalingUp project), March 2022; BCG and Deepwave Ventures analysis.

Note: Because of rounding, not all percentages add up to 100.

Exhibit 4 – Investors' Risk Tolerance and Understanding of Deep Tech Are Limited



Source: EIC ScalingUp survey of European deep-tech companies, March 2022; BCG and Deepwave Ventures analysis.

Note: Because of rounding, not all percentages add up to 100.

These views are hardly surprising. Many of the emerging technologies under development are complicated and at the cutting edge in their fields. Investing in deep tech requires expert knowledge and skills (in-house or external) and scientists, engineers, researchers, and biologists who can assess the potential and limitations of advanced technologies ranging from synthetic biology to quantum computing.

Metrics and Timelines. Another impediment: the metrics and timelines used by traditional venture investors and corporate partners do not match the development patterns and timelines of many advanced-tech companies. About 70% of the companies and investors surveyed agreed that European investors have difficulty investing outside of traditional blueprints (such as SaaS or medtech) and applying other than the typical metrics, such as annual recurring revenues or customer acquisition costs.

Venture capital funds in Europe often require solid proof of revenue or market traction before they invest in large rounds. But because the development timelines of advanced technologies are longer and less predictable, few deep-tech companies have sustainable revenue sources by the time they are ready for larger funding. This creates a difficult chicken-and-egg situation, in which companies do not meet the traditional revenue-based criteria of growth capital funds, just when they are seeking the backing they need to scale their production to the quantities required to generate significant revenues. Even in the health care sector, where many European venture funds are highly experienced, companies at the frontier of medtech and life sciences have difficulty attracting funding.

Exit Opportunities and Market Dynamics. A final funding hurdle for investors is the lack of clear exit opportunities. Some investors fear being constrained by European sovereignty concerns through vetoes at the state or Europe level or by rules potentially requiring European ownership for deep-tech companies pursuing strategically important technologies. M&A in Europe does not serve as the active off-ramp it provides in the US. From a macroeconomic standpoint, in the current

environment, investment and exit valuations may be impaired by inflation or geopolitical tensions.

A Strong Board with Independent Members

Board members—especially experienced nonexecutive, or independent, directors—can bring valuable experience, expertise, and contacts to a young business, and they are often instrumental in its success. But realizing value from the board is not axiomatic, and many companies in our survey cited room for improvement. Several issues arise.

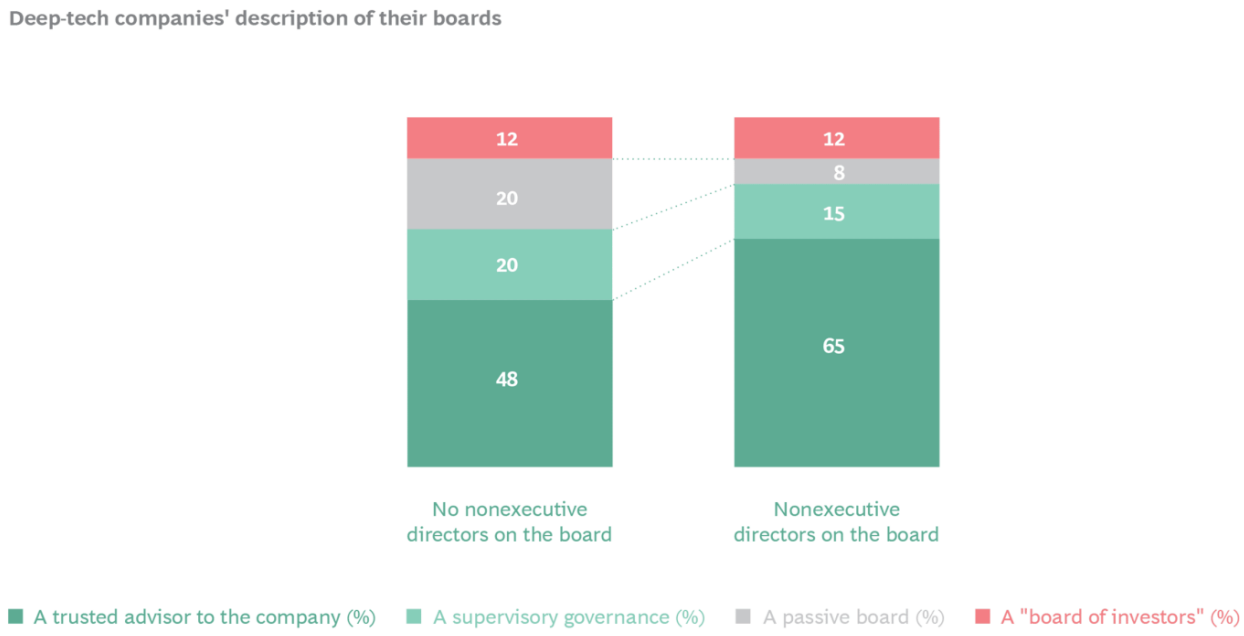
Managing Conflicts of Interest. Board members who are also investors (or corporate partners) can have a built-in conflict of interest and prioritize near-term financial goals over longer-term development. When wearing their investor hat, they might advocate for accelerated exit strategies, for example, or minimization of investment and risk. In our interviews, founders expressed such frustrations as, "We don't have a board of directors, we have a board of investors." Yet compartmentalization is possible. One European chief portfolio officer told us that at his fund, "when investors enter a board room, they work for the company and not for the fund anymore."

Experience. Another frustration is that board members do not always provide substantive assistance on difficult business or technical topics, or in guiding management on the basis of experience or industry or technology background. Help in hiring key people and gaining introductions to potential customers or investors often is not forthcoming. One company executive went so far as to say that his board members "are supportive, but they are clueless about what we are doing."

Independent Board Members. Part of the solution lies in thoughtful board composition. The addition of nonexecutive directors who do not also represent investment funds can bring relevant expertise, outside-in thinking, and creativity to a board. Almost two-thirds of the European deep-tech companies in our survey

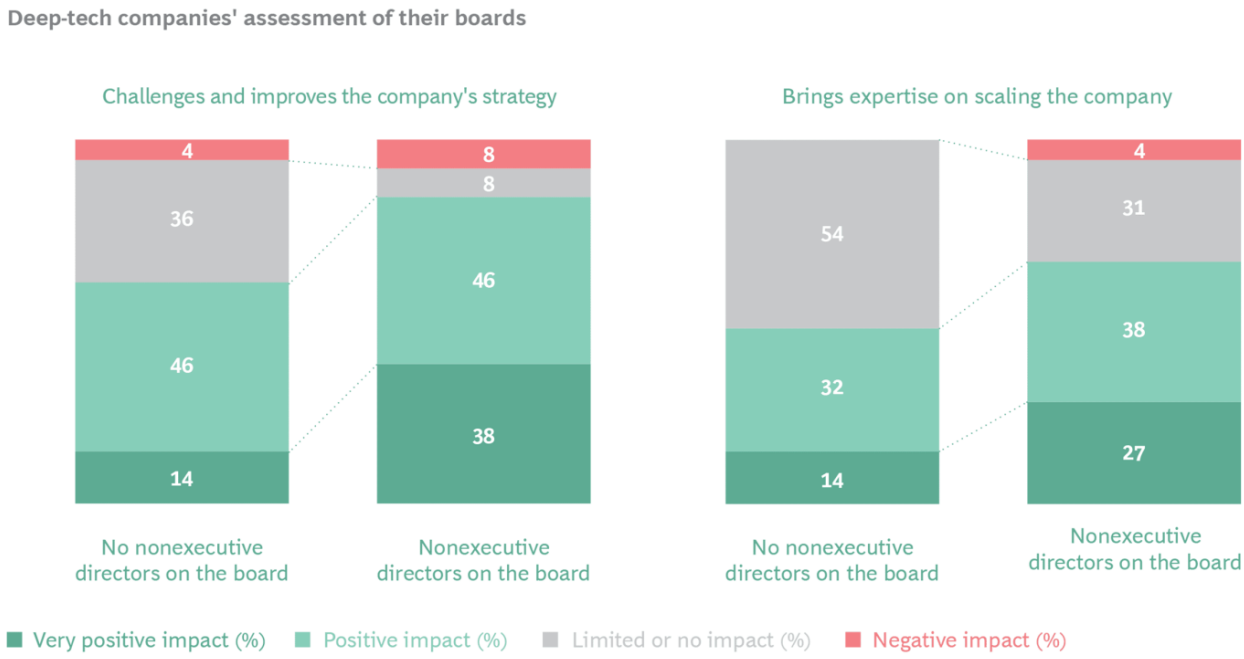
with nonexecutive directors described their boards as “a trusted advisor to the company.” This compares with less than half of companies that do not include such directors on their boards. (See Exhibit 5.) Furthermore, boards with strong nonexecutive directors are much more likely to bring expertise in company strategy and scaling. (See Exhibit 6.) One European deep-tech investor told us that “a good nonexecutive director can be transformative to the company.”

Exhibit 5 – Boards with Nonexecutive Directors Are Much More Likely to Be Seen as Trusted Advisors



Source: EuroQuity/Les Deeptech survey of European deep-tech companies (part of the EIC ScalingUp project), March 2022; BCG and Deepwave Ventures analysis.

Exhibit 6 – Nonexecutive Directors Have a Significant Impact on Company Strategy And Scaling



Source: EuroQuity/Les Deeptech survey of European deep-tech companies (part of the EIC ScalingUp project), March 2022; BCG and Deepwave Ventures analysis.

The good news? According to experienced investors, Europe has an underleveraged pool of C-suite-level talent with relevant industry experience available to fill these positions. While few are accustomed to the venture capital and startup environment, dedicated training programs are available, such as the Board Education program at the Technical University of Denmark.

Business Strategy and Investment Narrative

Defining strategic priorities can be difficult for deep-tech companies. Founders in nascent industries have few business blueprints to follow, and they often lack practical business experience. Which industry segments do companies prioritize? Which business model do they follow? How do they transition from R&D to scaling up actual products or applications?

Strategic Vision and Focus. Developing a clear strategy is a prerequisite to moving from the startup to the scale-up phase, and it is also key to securing

investment. Both financial investors and corporate partners want to be sure that the company sees a clear path forward and that capital and other forms of assistance, such as customer contacts, will be used efficiently and effectively.

Moreover, unless they translate their strategy into a compelling pitch for funders, young companies will have difficulty raising money. Jean-Michel Deligny, chairman of the selection committee of the EIC's ScalingUp project put it this way: "Deep tech requires strong endorsement by experienced industry executives to get CVCs and financial investors involved. To achieve that, a company needs a compelling and punchy narrative, which can also be used to raise the company's profile above the noise." But many founders find it challenging to capture the company's strategy in a compelling equity story.

Business Versus Technology Culture. Part of the problem is cultural. While some companies do flesh out high-impact communications materials, it does not come naturally in most European cultures to boast about one's potential success. European deep-tech entrepreneurs have a more conservative mindset than their counterparts in other regions. They tend to focus on facts, data, and scientific expertise rather than the prospective rewards. Written presentations put the emphasis on the technology and research rather than the strategy and business potential. Instead, as one founder put it, companies should "focus more on marketing rather than being 101% ready on technology." Not that they should adopt a "fake it until you make it" mindset, but European deep-tech companies would benefit from developing company narratives that achieve an effective balance between promotion and proof of technology.

Institutional Challenges

Companies and investors value the assistance that EU institutions provide to deep-tech companies, but they think there is room for improvement in a couple of areas. One is assistance in navigating EU institutions. The other is helping to shape EU-wide regulatory regimes with the goal of advancing deep tech as an economic force.

Navigating European Institutions. Institutions such as the EIC and the European Investment Bank are already actively assisting deep-tech companies. The EIC provides both equity and grant financing, while the EIB provides venture debt. Thanks to an ambitious, systematic, and purpose-driven vision, backed by equity tools and grants, these institutions have accelerated the emergence and growth of deep tech in the EU. As successful startups move into the scale-up phase, however, the EIC and others need to raise their sights and their funding thresholds.

Deep-tech companies would also welcome the simplification of what they regularly describe as "heavily process-oriented" and "slow" EIC procedures. Fewer than one in five of the companies we surveyed gave EU institutions high marks for simplicity of process. While they welcome the financial assistance, companies bemoan the burdens of compliance "with heavy administrative processes and up to 60 reports to submit in order to justify a grant." Some companies hire dedicated employees or contract with consulting agencies to manage the grant processes, a significant drain on the actual investment.

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Both investors and companies also complained about the lack of grant flexibility: if the scope of the research evolves during the course of a project, the funding does not always allow the R&D team to pivot. To retain the grant, the team must continue a project that may no longer be relevant to the company's future.

Delays in unlocking financing are another common complaint—of both companies and investors—that the EIC is working to address. In May 2022, the commission announced that it would be implementing changes to speed up the processes

through which startups apply for grants, blended finance, and equity investments. The program has experienced delays in processing grants because of the pandemic and coordination issues with the European Commission.

Shaping European Regulation. The EU has proposed or approved new laws and regulations that include the Digital Services Act, the European Chips Act, and the European Green Deal. In many areas (such as sustainable materials, alternative mobility, space, quantum computing, and pharmaceuticals), deep-tech companies have the relevant experience and expertise to help policy makers and regulators frame the issues and boundaries. Such an insider point of view can shine a useful light on regulatory gray zones that hinder industrialization.

Young companies need help in making their voices heard so they can contribute more substantively to policy and regulatory discussions. They are often frustrated at not being included in debates along with larger and more established players, even when their technology is more advanced. They also cite examples of incumbents and industry lobbies having high levels of influence at both the national and Europe-wide levels, which they wield to protect entrenched positions, sometimes at the expense of broader advancement.

Additional Challenges

Several additional challenges are common to all types of startups, but they present especially steep curves for deep-tech companies because of the advanced technologies involved and the long journey from lab to market. Three of the steepest are collaborating effectively with corporate partners, securing talent—both technical and business—and gaining Pan-European support.

Collaborating with Corporate Partners. BCG and Hello Tomorrow first documented the difficulties involved in working with corporate partners (which exacerbate funding issues) in 2017. Deep-tech companies and their investors continue to cite multiple impediments to gaining access to the market expertise,

customer contacts, and infrastructure that corporations offer—all of which are critical to scaling up.

One issue is simply identifying and gaining access to the right corporate partners. Many young companies would welcome an introduction to large companies, but they rarely know which ones to reach out to on their own. In the US, this role is often played by nonexecutive directors, who bring networks of contacts and credibility to the outreach effort.

Corporate collaboration is further complicated by variations in the speed at which different companies operate and their respective agendas. Corporate partners often place constraints on collaboration and the procurement process , sometimes demanding exclusivity, which both young companies and their investors want to avoid. Corporate partners may also look for products that are 100% market ready, while deep-tech companies often are seeking help with continued development.

Talent and Talent Management. Talent is a multifaceted challenge. Young companies beginning to scale up need to expand their base of technical skills and add business management skills. They must compete for both types of talent in a highly competitive market.

According to our survey, technology-related skills are the biggest need for deep-tech companies and the second biggest for investors. Sales and business development is the highest-priority skill set for investors and the third highest for companies. Deep-tech companies seek business development and sales staff with some technology background or knowledge—often a tall order given that many advanced technologies are only just moving out of the lab and into the marketplace. “Deep-tech companies need to sell, and it

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won’t happen with tech
people,” one investor told us.
But people with these profiles are rare today and most are already working for large corporations.

Building an organization that can scale up often requires filling dedicated senior-management positions—CFO, CMO, and COO—with experienced people, sometimes replacing founders and early employees who have already worn several hats. For some companies, said one investor, “the first objective of their last fundraising was to get enough funds to hire their CFO.”

Pan-European Support. The challenges of scaling up are often more than companies can surmount on their own. In markets such as the US, they commonly reach out to other startups and a network of funders and partners for help. We saw this at work in the company meetings we held as part of our research. When one company discovered that another could help with its technology, the two started exploring possible collaborations and synergies. But Europe lacks the robust supporting ecosystem that such a dynamic requires.

Part of the problem is national. Existing networks and ecosystems tend to be local or country-bound: synthetic biology at France's Genopole research center, materials and electronics at Eindhoven in the Netherlands, and health technology in Ireland, for example. Local institutions are not well coordinated across Europe for sharing knowledge and contacts or identifying synergies. For a broader ecosystem to take shape, Europe needs to overcome its internal boundaries and competitive tendencies in favor of a “coopetition” approach that can promote European winners beyond their home countries. The EIC could play a role in identifying opportunities for collaboration between portfolio companies. One deep-tech investor noted that the council could provide the “glue” for a European ecosystem by expanding its networking events to include deep-tech companies throughout Europe, which would encourage synergies between local institutions.

In the same way as NASA and the US Department of Defense serve as early customers for advanced-technology ventures in fields such as space travel and quantum computing, the EU could play a role in unlocking the European market. Pan-European and country-level public procurement tenders on significant programs would give deep-tech companies market validation and early revenue sources. One investor we interviewed suggested that the European Commission "could purchase the next 20 quantum computers, for sovereignty reasons."

Signs of Progress

Deep tech in Europe faces a significant list of challenges, but there are signs of progress. In March 2021, the European Commission, France, and other EU member states established Scale-Up Europe, which brings together more than 300 startup founders, investors, researchers, and corporations with the goal of supporting the development of ten tech giants, each valued at more than €100 billion, by 2030. Following publication of Scale-Up Europe's first report and recommendations in February 2022, France (as the nation holding the presidency of the EU) announced the launch of the European Tech Champions Initiative, with a European fund of funds managed by the European Investment Fund to support the creation of several funds of at least €1 billion each for technology and innovation. Its success will depend on private investors, including institutional and pension funds, family offices, and corporations, joining in and becoming better educated in deep tech. So far, France and Germany have each committed to contributing €1 billion.

Foreign late-stage investors have been active in partnering with European players. One example is the €1 billion partnership between the US private equity firm Apollo Global Management and the European life science investor Sofinnova Partners, established in May 2022.

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Deep-tech funding may be facilitated in the coming years by more European success stories, with experienced entrepreneurs "giving back" to the ecosystem by taking on roles in venture funds as partners or advisors. The investors and companies we surveyed highlighted the importance of this development from an ecosystem perspective, citing the example of the US, where more experienced entrepreneurs have assumed such roles or returned to entrepreneurship, helping to propel ecosystem growth and maturity. The European ecosystem would benefit from a similar virtuous circle of innovation, entrepreneurship, and investment.

Practical Steps to Scale Up Deep Tech in Europe

Each of the principal stakeholders in Europe's deep-tech future can take action to further progress and help young companies overcome the hurdles of scaling up.

Large Companies. As we have argued before, the combined physical and digital nature of deep-tech innovation—and the convergence of multiple technologies to change entire industrial systems—means incumbents have a better opportunity to get involved early and shape how that change takes place. Our research has shown that 90% of European companies invest in deep tech, and among these corporations, 78% have maintained or accelerated their investments in response to COVID-19. Many companies are working on use cases, proofs of concept, and concrete projects to assess the business feasibility of advanced technologies.

These investors are highlighting how large companies can help energize deep tech by working more closely with their new partners, committing senior resources to boards as nonexecutive directors, and assisting in such areas as market access and customer contacts.

Investors. Investors can accelerate deep-tech development by making bold commitments and remaining focused on the problems their investments seek to address. They need to embrace a problem-solving orientation: a willingness to help address issues that arise in their portfolio companies rather than moving on to something else.

Generalist funds need better access to deep-tech networks or to qualified experts who can help evaluate prospects. Private equity should not feel safe sitting on the sidelines. Deep tech has the potential to rewrite the rules—just as digital technologies did—and because of its focus on large and fundamental challenges, is just as likely to disrupt multiple industries.

Some limited partners are well suited to deep tech. Sovereign wealth funds are frequently tasked with directing their funding toward strategic objectives, such as environmental or societal goals. Family offices are proven champions of patient capital, often investing over a 10- to 20-year cycle before exiting. Events such as the Financing the Future conference, organized by BCG and Hello Tomorrow, can help educate limited partners on deep-tech investing.

Governments and Institutional Funds. Public-sector and academic institutions can play a crucial role in deep tech's development in Europe, as they have done during previous waves of innovation. Public-sector organizations, universities, and large nonprofits have disbursed grants to early-stage ventures, often taking bigger risks than their private-sector counterparts. Such institutions promote beneficial market conditions for deep tech in other ways, including:

- Funding startups as needed, from inception to growth. As Bpifrance's Pascal Lagarde says, "It is necessary to deepen and adapt our support and financing services to meet the specific needs of deep-tech companies. Bpifrance plays a

major role in this respect through subsidies, loans, and its venture capital and growth capital investments."

- Purchasing or subsidizing early-stage products.
- Providing laboratories and other assets to help researchers.
- Fostering connections with potential investors and corporate clients.
- Acting as both regulators and political facilitators for infrastructure and project financing, bringing together stakeholders such as banks, companies, municipalities, industry associations, and private investors.

The European Commission and local governments can further coordinate initiatives to facilitate Pan-European deep-tech business, such as implementation of the Startup Nations Standard—practices designed to foster EU entrepreneurship and accelerate the growth of startups—or policies that promote development of individual technologies, such as quantum computing.

Finally, academic institutions, government agencies, and sovereign wealth funds can all have an outsized impact by fostering accelerator programs—such as the Creative Destruction Lab (which gave rise to the unicorns Xanadu and D-Wave)—that train deep-tech management teams in business and business development skills, as well as by fostering mini-MBA programs and committing more direct investment dollars.

Deep-Tech Startups. As the deep-tech ecosystem grows, successful founders can help a fuller ecosystem develop by sharing lessons learned and advising other companies on the challenges of the scaling phase. In particular, they can help companies improve their narrative skills and make themselves more attractive to investors and customers.

Europe has built exciting and potentially far-reaching capabilities in advanced technologies. New companies working in new technologies will contribute to solving major economic and societal problems, such as climate change and the

looming global food shortage. They can also turbocharge Europe's economy and put the EU on an equal footing with other regions. But these new companies need help if they are to move confidently into their next phase of development. It is in Europe's—and Europeans'—best interests to provide it.

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Authors

Jean-François Bobier
Partner & Director
Paris

Anne-Douce Coulin
Manager, Data & Digital Platform (DDP) Key Digital Product (KDP)
Paris

Massimo Portincaso
Alumnus

Arnaud Legris
Alumnus

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