

Paths to entrepreneurship in the life sciences

Shreefal Mehta

Many biotech companies are founded by scientists. But there is certainly a path, somewhat less trodden but nonetheless viable, for the inspired entrepreneur who may not be a brilliant researcher.

Each year, over a million companies are started in the US with about 5–10% (57,793 in 1998) of them classified as high technology companies¹. Many nascent entrepreneurs exist around us, and thinking about starting a new venture is not an uncommon activity—in fact at any given point in time, over 4% of the working age population might be thinking of an idea for a new venture². Not surprisingly, turning ideas into business ventures is tricky: only about 10% of budding entrepreneurs have a new firm in place within 12–18 months³; the other 90% either fail to define a sound business model that can drive their business idea forward to a new venture or realize their idea was flawed.

A key ingredient in successful entrepreneurship is self-knowledge. If entrepreneurs know their limitations and strengths, they may be able to avoid some common pitfalls in starting up a biotech company. In this article, I distinguish between two types of life sciences entrepreneurs and highlight the traits of each.

Turning science into business

Typically a new life science venture is started up in the United States when a scientist, through initial government or foundation grants, discovers a pathway or mechanism in biology that is particularly interesting and appealing for disease intervention or treatment. The scientist then files a disclosure through the university office and begins discussions with the technology transfer or licensing officer at the university about commercializing the discovery. She or he then writes a small business

innovation research grant to fund the startup activities, rounds up some collaborators (other scientists or business associates) and licenses the discovery from the university.

The scientist-entrepreneur then has two choices: either continue in the university position while developing the company on the side, or leave the academic position (permanently or temporarily on a leave of absence) to actively pursue the commercialization of his or her discovery. In the latter case, funding comes from personal funds, second mortgages on residences, loans, friends, families and other angel investors and venture capitalists. The venture is launched, typically focused on products, with a business model of forming a fully integrated company. The steps in the venture creation process are shown in **Figure 1**.

The opportunity-recognition step (**Fig. 1**) is critical in new venture creation. This gestalt in the entrepreneur's perception of the relationship between the invention and final product³ is refined into a business model that describes how the venture will make money or provide an appropriate return to the potential investors. Over the years, entrepreneurs have shown considerable ingenuity in inventing new business models to support life science ventures⁴.

The traditional entrepreneurial path described above does not, however, appear to be the exclusive route to life science venture creation. On the basis of a survey of founders of biotech startups—comprising over 35 interviews with founders of biotechnology firms carried out in 2003 as part of a larger study⁵—it is clear there are alternative paths to venture creation.

Less-trodden paths

Bioentrepreneurs have backgrounds as diverse as individuals in any other walk of life. The individual cases from the survey were chosen

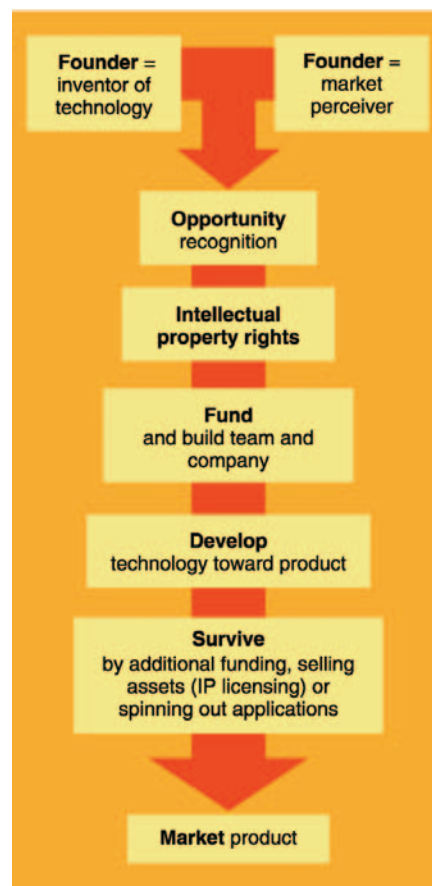


Figure 1 New venture creation process in biopharmaceutical industry. Whether a biotech startup founder is the inventor (technopreneur) or a market perceiver, they must follow the same basic path to grow a successful venture.

because their experiences and entrepreneurial backgrounds are somewhat different from the more typical scientific founders, the 'technopreneurs,' seen among the other company founders in the survey. The entrepreneurs pro-

Shreefal Mehta is at the Lally School of Management and Technology, Rensselaer Polytechnic Institute, Pittsburgh Bldg., 110 8th St., Troy New York 12180, USA. e-mail: mehtas@rpi.edu

Table 1 Strengths and weaknesses of market perceivers and technopreneurs

Venture stage	Market perceiver	Technopreneur
Recognize opportunity	<p>HAS: A comprehensive knowledge of markets. Clear definition of product characteristics that are needed.</p> <p>NEEDS: To find appropriate technology to meet the market's specific needs.</p>	<p>HAS: A solid understanding of and expertise in specific, well-characterized technology. Established credibility with peers, investors and customers (academic researchers, biotechs or big pharma).</p> <p>NEEDS: To confirm that there is a market for the product. To define product characteristics.</p>
Secure IP ^a rights	<p>HAS: A clear understanding of the market application, so IP claims can be formulated easily.</p> <p>NEEDS: To comprehensively harvest IP portfolio.</p>	<p>HAS: A strong position to easily license his/her own invention from the university into the startup.</p> <p>NEEDS: To erase any perceived conflict of interest that may arise by being on both sides of license negotiation, as academic inventor and employee and company executive. An understanding of future IP needs; the inventor often overestimates the novelty of the invention and breadth of patent protection.</p>
Fund team and build company	<p>HAS: Business credibility in creating sound commercialization and business plan with clear market needs.</p> <p>NEEDS: To carefully evaluate timeline for technology development, balancing the attraction of large markets with a plan for growth as technology matures. Strong history of experience to overcome credibility gap if technology is licensed in without inventor participation.</p>	<p>HAS: Strength in early phases of company, where main efforts are on research and most of the personnel are technically oriented. Credibility with investors due to technical expertise.</p> <p>NEEDS: To manage investors' questions in business and commercial areas. To learn how to manage nonscientists.</p>
Develop technology to product	<p>HAS: An external perspective that brings a strong product-focus to the development process. Focus on scaling up production to commercial manufacturing levels, market acceptance and regulatory acceptance.</p> <p>NEEDS: Understanding of the transition from R&D to commercial manufacture—to manage technopreneur's expectations.</p>	<p>NEEDS: Experience of commercial product development, particularly issues in scaling up. Unbiased perspective to evaluate the technology's realistic potential versus its elegance.</p>
Survive	<p>HAS: Sensitivity to the needs of the business and finances so as to strategize and manage IP assets astutely.</p>	<p>NEEDS: To understand that his or her appropriate position within growing company may not be at the helm, but in a specific technical leadership position, such as CTO, CSO or on the Scientific Advisory Board.</p>
Market	<p>HAS: Ability to deliver the market potential message to multiple stakeholders on their terms, put a commercial team in place and strike appropriate business partnerships.</p>	<p>NEEDS: To shift focus from developing technology to building a strong commercial team speedily and efficiently.</p>

^aIP, Intellectual Property

filed here who have followed a different path to high-tech ventures have played no less of a role in building biotech companies.

Case study no. 1. A large-pharma executive, with no specific scientific or clinical training or experience, driven by a desire to be an entrepreneur, met a scientist through a social network contact and learned of his novel

invention. This executive, wanting to break off from his large company and be involved in entrepreneurial activity, built a company around this technology, which enables the development and manufacture of biotherapeutic products. The core idea came from the scientist, but the idea subsequently evolved substantially around that core as the company went through the early formation process.

Case study no. 2. A sales executive for a medical health care provider, trained as a physician, came to understand the diagnostic industry through conversations with his customers. After identifying an unmet need, he used internet research, publications and his social network to assess the need for a new product. Based on the positive feedback, he founded a diagnostics company.

Case study no. 3. Working as a management consultant in a noncapitalist economy, an entrepreneur met a scientist who told him about his ideas and research findings. The consultant suggested founding a biotech company based on the scientist's ideas. They made several attempts to start a biotech venture and found that there was a serious lack of understanding of funding such startups in their country. The entrepreneur and scientist finally managed to come to the US and start their own biotech business. They also set up a subsidiary in their home country where the bulk of research and development work is being done. The company is now funded by US venture capital and moving forward in development.

Case study no. 4. A person with a bachelor's degree in biology took a technical training course at a local medical research center that was taught by a scientist who had been doing R&D for diagnostic tests. The student realized the opportunity for a business in providing R&D diagnostic testing for drug development and incorporated a company with technology licensed from the medical research center. The company has over a decade of successful operation now.

Case study no. 5. An investment banker started a medical device distribution business and soon found that the main product line was going to become obsolete. The company survived financially by continuing the distribution business while the banker and his partners developed a new technology for a diagnostic process service. Now they are marketing the new technology and resulting products themselves.

Case study no. 6. Over 15 years ago, a scientifically minded businessperson read about genetic testing in a magazine and thought that the new technology would make a great business opportunity. His enthusiasm convinced his spouse to get involved, too. He started a business and it slowly evolved to a niche high-tech service. After his death, his spouse took over and has run the company successfully for over 8 years now.

Case study no. 7. A physician treating patients with chronic diseases was not satisfied with existing therapies and thought he would venture out to form his own company and develop a therapy for the clinical need he had identified. He found a business-oriented person to partner with and together they created a business plan, raised angel investment and licensed in some key technologies from universities that could address these diseases. A partnership with another pharma/biotech company has been established to bring in applicable technologies, fund development and to achieve rapid progress without investing heavily in basic R&D internally.

These examples illustrate that venture creation is not a linear process; rather, it is driven by social networks, serendipitous meetings and flashes of insight. The entrepreneurs interviewed here vary in their previous experience from being skilled and technically adept medical practitioners to businesspeople, none with a specific technical background in the technology around which they built their companies.

Essentially, the case studies illustrate an alternative to the more typical venture creation model in which a technopreneur is the key driver and founder for the creation of a new venture around his discovery or invention. This second type of entrepreneur (termed here as a 'market perceiver') recognizes a market need and builds a venture to exploit that recognized opportunity. These market perceivers typically have some exposure to the field, either through their association with scientists or their previous jobs in the healthcare or pharmaceutical industry, which allows them to recognize opportunities to start profitable ventures. However, they are not the scientists who discover or invent the technology. Unlike technopreneurs who look for applications for their innovation, the market perceivers identify a specific need in the market and find or develop the right technology to address that need.

Technopreneurs and market perceivers

The technopreneur brings an internal approach to the new venture (a technology push), whereas the market perceiver uses an external path (a market pull) to technological entrepreneurship. The former model can be viewed as a hammer hunting for a nail (a technology looking for an appropriate market need), whereas the latter is akin to a nail sticking up. As distinct as these two approaches are, there is clearly some mix of the two that occurs in startup processes, as presented in the case studies here and in other recent studies of this phenomenon⁶, which can be summed

Table 2 General considerations for technopreneurs and market perceivers

	Market perceiver	Technopreneur
General considerations	<ul style="list-style-type: none"> • Others could also perceive this opportunity—market need—making it difficult to establish competitive advantage. In-licensed technology has lower value than owned technology from the view of investors. Trade secrets are not easily valued or tradable assets. • Needs upfront capital for licensing-in technology or product solution. Company can be started with late-stage technology that is ripe for commercialization. • Science is complex and founders' credibility in that technical space is not well established with stakeholders: peers, investors and customers. • Often single patents are not sufficient and multiple patents are needed to safeguard a limited monopoly in the market. • Licensing-in technology to develop towards market needs is a common strategy. In some cases, market recognition pushes invention and creation of novel technology solutions. 	<ul style="list-style-type: none"> • Early stage technology may not have well-defined market, and therefore focus in product development is required. Multiple market needs might be addressed with technology platform, so direction for development must be chosen. • Often single patents are not sufficient and multiple patents are needed to safeguard a limited monopoly in the market. • Large capital requirements to commercialize technology or bring it to acceptable low-risk stage. Financing is a challenge.
Summary	<ul style="list-style-type: none"> • Market pull creates a compelling business case for the launch of a new venture. However, identifying the right technology(ies) is not always easy. 	<ul style="list-style-type: none"> • Previous successes will allow serial technopreneurs to gain traction with investors. However, technopreneurs leading their first companies could falter as they try to define the 'killer' market out of many choices for their technology platform.

up as 'hammer-nail codevelopment.' For example, in the typical life sciences venture, the technical founders usually bring in outside management (with guidance from venture capitalists and investors) to add market perspective as the new venture starts to grow⁷.

Most biotech entrepreneurs belong in one of these two groups, each with its own strengths and weaknesses, knowledge of which can be useful when building a business. **Table 1** and **Table 2** summarize the venture creation process steps from each perspective, with the strengths and weaknesses of each type of founder and some recommendations and suggestions for improving performance.

Summary

Most high-tech companies have founders with high levels of technical expertise. Biological science is complex and rapidly changing and requires a specialized knowledge to understand the value of the innovation and its competitive position in the industry⁸. Although life scientists are typically the founders of biotech companies, studies have shown that the most successful high tech startups are founded by a

team of two to three individuals with mixed backgrounds, substantial industry experience and a very clear market and product focus at founding^{5,9,10}.

Although some studies have shown mixed results when correlating founders' backgrounds with the success of new ventures, a recent survey of biotech and telecommunication firms shows that self-identified high levels of technical expertise of founders are negatively correlated with the financial performance of these firms¹¹. Other reports analyzing high-tech ventures and their founders have also accentuated the need for teams with a diversity of skills. For example, Utterback *et al.*¹² observe that "having little diversity of management skills... meaning only technical... skills, almost guarantees that the firm will grow slowly"; Deeds *et al.*¹³ also conclude that "overreliance on technical personnel in the management of the organization detracts from the product development process."

In life sciences ventures, there are established paths to venture creation—namely that of the technopreneur—that have worked and continue to work successfully to give returns to investors and other stakeholders in the market. However, as described here, there is another path, less-trodden in the public view, but

equally viable for successful venture creation in the life sciences, namely that of the market perceiver. A technopreneur might have difficulty in taking on all of the positive aspects of a market perceiver's aptitude, skills and mental processes, just as a market perceiver might find it difficult to evaluate and determine technical milestones, capabilities and limitations¹⁴. Clearly, a successful beginning for a life sciences startup would be to build a team of people bringing all aspects of these two distinct approaches together as soon as possible so that all the stakeholders in the new venture benefit from the best marriage of business and technology.

ACKNOWLEDGMENTS

I thank my colleague Nick Young, who participated in the collection of survey data.

This story was reprinted with some modification from the Building a Business section of the Bioentrepreneur

web portal (<http://www.nature.com/bioent>), 26 October, 2004, doi:10.1038/bioent831.

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